**Abstracts**

**Individual Projects**

**Effects of Nicotine Pretreatment on Reinstatement of Cocaine Self-Administration in Adolescent and Adult Rats**

Kirollos Abdel-Malek  
*Mentor:* James Belluzzi

Adolescence is a period in development characterized by a maturation of the limbic system. During this period, adolescents also engage in risky behaviors such as the initiation of drug use. Teenagers start using tobacco, later moving on to the use of other drugs like cocaine. This has led to theory that nicotine, the main psychoactive component of tobacco, is a “gateway” drug. Our lab has previously shown that brief low-dose nicotine pretreatments enhance the rewarding effects of cocaine. In this study, our goal was to extend these findings and look at the effect of nicotine pretreatment on reinstatement of cocaine self-administration in adolescent and adult rats. Adolescent (P28) and adult (P86) Sprague-Dawley rats were pretreated for four consecutive days with either nicotine (60 µg/kg/0.2 ml) or saline. After the pretreatment, rats were allowed to self-administer cocaine (0.5 mg/kg/injection) for 12 days, or until acquisition criteria were met (reinforced ≥15 and reinforced ≥2 x non-reinforced). Once the criteria were reached, the rats underwent extinction for at least 7 days, or until extinction criteria were met (reinforced ≤25% of self-administration baseline). The day after extinguishing, rats were reinstated with cocaine (10 mg/kg, i.p.). Adolescent rats reinstated regardless of pretreatment, whereas saline pretreated adults did not. Thus, there were age differences in reinstatement, but no effect of nicotine pretreatment.

**France, an International Architect of Human Rights?**

Christine Adam  
*Mentor:* Alison Brysk

France is historically seen by most scholars to be a framer of international human rights norms; however, there is controversy among scholars on this subject. This controversy is based on three issues: first, the gap between France’s colonial and national human rights policies; second, France’s international reasoning for human rights policies versus France’s actual practices in the field of human rights; and third, based on these last two, whether France should continue to be viewed as a leader promoting human rights. As there are no internationally recognized explanations of France’s actions, this study was done to lessen this unknown by arguing that France repeatedly does not show its same policy on human rights in its colonies because France has historically prioritized its quest for power over its spread of human rights ideals. In addition, this power is often seen by France to be directly connected to maintaining influence in former colonies. Research shows that in African nations such as Algeria and Rwanda, France’s quest for power gained so much importance that it led to a complete disregard for human rights, resulting in such human rights abuses as torture and the training of murderous rebel armies. These examples of disregard provide general support for France’s placing power over human rights ideals.

**Diasporas: Compensating Weak Identity with Extreme Ideology**

Aran Aghapour  
*Mentors:* Daniel Brunstetter & Alison Brysk

Advocacy groups, such as AIPAC and the Electronic Intifada, often depict the Israeli-Palestinian conflict as a disheartening battle with no end in sight. However, the Olive Tree Initiative’s (OTI) experience, meeting civilians and organizations that worked towards reconciliation in the region, suggested otherwise. Of course, some extreme opinions were encountered on both sides, but they represented a drastically small proportion of the population. Although a final peace resolution will take time to develop, the majority of Israelis and Palestinians living within the conflict are more pragmatic than their advocates abroad. This is primarily based on the costs of the conflict on their lives. It is easier for diasporas to hold rigid ideologies, perceive absolutes, and refuse concessions when there are no repercussions, and the cause may instead be an integral part of their exile identity. Diasporas more readily view the situation as a dichotomy between right and wrong, because threats to their core constructs challenge the foundation of their being. Members of diasporas have often never been to their homeland, and yet assimilation to their new home can exacerbate the sense of marginality instead of alleviating it. Therefore, the diasporic condition is in a constant state of suspension. At UC Irvine, the Muslim Student Union and Anteaters For Israel pride themselves on educating the campus about the Israeli-Palestinian conflict; but their self-consciousness, weak sense of identity, and corresponding emotions actually cause their ideological position to be more radical than most in the region, stifling their progress towards peace.
Clinical Research Study to Evaluate the Effects of Prototype Dentifrices on Soft-Tissue Architecture
Holly Águigam
Mentor: Petra Wilder-Smith
The maintenance of saliva plays a critical role in oral health. In addition to helping with speech, digestion and alimentation, saliva balances the mouth’s acidity level to prevent infection from oral bacteria. It further protects the oral mucosa from ulcer formation and promotes soft-tissue repair. Xerostomia, commonly termed as dry mouth, is a result of salivary gland hypofunction. Low saliva flow is an outcome of many different factors and contributes to an increased risk of dental caries and mouth sores. This study uses Optical Coherence Tomography (OCT) to quantify the effects of two toothpastes on oral soft-tissue architecture in Xerostomia patients. One product contains an active ingredient that may help dry mouth; the other is a placebo. Our hypothesis is that raised water content in tissue alters light absorption and scattering, permitting in vivo, non-invasive evaluation of the products’ effectiveness in mitigating dryness of the oral mucosa. Six patients with confirmed Xerostomia used each product separately for 15 days, with an interposed 7-day washout period using regular toothpaste. OCT images as well as clinical exams and photographs were gathered on Days 1, 6, 11, and 16 of each trial phase. OCT allowed us to find progressively improved tissue hydration with use of the experimental toothpaste versus no improvement from the placebo.

Effect of Nicotine Pretreatments on Cocaine Seeking Behaviors in Adolescent and Adult Rats
Alyssa Ahmed
Mentor: Frances Leslie
Adolescence is a unique time in development when the limbic brain is actively maturing, and adolescents engage in risky behaviors, such as initiation of drug use. Teenagers typically start using tobacco then progress to other illicit drugs such as cocaine. This has led to the theory that nicotine, the main psychoactive component of tobacco, is a “gateway” drug. Our lab previously showed that brief pretreatment with a low dose of nicotine enhances the rewarding effects of cocaine in adolescent but not adult rats. The current aim is to extend that finding and to look at the effects of nicotine pretreatments on extinction and reinstatement of cocaine-seeking behaviors, which represent craving. Both adolescent and adult Sprague-Dawley rats were pretreated for four days with either nicotine or saline. They were then allowed to self-administer cocaine for a minimum of twelve days or until they acquired cocaine seeking behavior. Animals then underwent extinction by removal of drug and cues for a minimum of seven days, or until their reinforced-responding was 25% of their self-administration baseline. Adolescent rats extinguished responding more slowly than adults. Nicotine pretreatment accelerated the rate of extinction in adolescents such that their extinction responding was similar to that of adults.

Graham Greene and Michael Herr: Negotiating Fact and Fiction in the Vietnam War
Abraham Ahn
Mentor: Barry Siegel
The task of accomplishing verisimilitude has been one of the greatest challenges for writers of the Vietnam War era. In addition to being historically reliable, the work in question must be emotionally resonant and provide a counter-narrative to the repressed histories and institutional obfuscation of the Vietnam War. Graham Greene’s The Quiet American (1955) and Michael Herr’s Dispatches (1977) are two definitive works in the literature about the war. Both works are foundational narratives in our contemporary understanding of the American engagement in Vietnam and offer perspectives on reportorial ethics that were radical for their time. Herr was a devoted reader of Greene’s works and was likely influenced by the British writer’s globe-trotting fiction about war-ravaged countries like Vietnam. In Dispatches, Herr explores the blurring between fact and fiction and the untenable position of objectivity in writing about war. This paper explores the extent to which Greene’s fiction sets the ethical and historical foundations of Herr’s non-fiction war novel and the ways in which the writer’s imagination and creative embellishment work to create a historically reliable and truthful piece of writing.

Ethnicity and its Effects on Treatment Compliance, Therapeutic Errors, Elopement, and Psychiatric Hospitalizations
Suzan Al-Teir
Mentor: Ira Lott
America is home to many ethnicities; this diversity has enriched our nation by introducing global perspectives and productive contributions in all areas of contemporary life. Psychiatric health issues are fundamental to overall health and productivity of all individuals, not limited to just one type of ethnicity. Differences in ethnicity affects many areas of treatment for consumers with these health issues. The purpose of this project is to improve psychiatric services among the developmentally disabled by examining the role of ethnicity in prescription compliance, psychiatric diagnosis, psychiatric hospitalizations and elopement. This has been done through the collection of outcome data on consumers who participate in the Neurodevelopmental and Behavioral Clinic as well as the Regional Center of Orange County and comparing them to factors such as ethnicity. The goal of this project is to provide doctors with information that will assist them in making relevant and appropriate treatment recommendations that are likely to be followed and implemented by the patient’s physicians, parents/caretakers, program administra-
tors/teachers, and other people involved in their care. We have accomplished a better understanding of how different ethnic groups view and respond to mental illness among the developmentally delayed, and possible actions to help educate physicians and the general public.

the city (not without destruction)
Sarah Alaways
*Mentor: Loretta Livingston*

This three-section duet concerns the overall creation of a theatrical environment using sound, props, and costumes to support the choreography. The goal is to build an entire onstage world in which the dance will live. This work also deals with the concept of creating and destroying boundaries between two figures. My research includes using newspaper as a literal boundary, as a high-inference, theatrical object, and as an addition to the sound score. The musical quality of the newspaper creates rhythms that contradict the recorded sound while adding to the existing drive of the movement. Within my research, I discovered the power of using such an object in choreography, including the limitless possibilities of how an object’s use, shape, and meaning can transform throughout a piece.

**Brief Nicotine Pretreatment Has Long-Term and Age-Specific Effects on Male Adolescent Rat Dopamine System**
Jason Albano
*Mentor: Frances Leslie*

Tobacco smoking remains a widespread and deadly habit in contemporary American society. Those who do smoke, research shows, are more often susceptible to the abuse of illicit drugs like cocaine. Smokers overwhelmingly become addicted during adolescence, leading many to hypothesize that adolescence is critical in the initiation of drug use. Using the rodent dopamine system as a model, our study examines the effects of nicotine exposure during adolescence on later drug-induced locomotion and stereotypic behavior. Secondly, we explore the dynamic period of adolescence and examine the differences between early and late adolescent nicotine exposure. Thirdly, we test the long-term effects of nicotine pretreatment on future drug-induced behavior. Rats were infused via jugular catheter with nicotine (0.6mg/kg) for four days followed by a dopamine agonist (quinpirole, 0.4 mg/kg) challenge. Our results suggest that nicotine pretreatment significantly affects drug-induced behavior in adolescents versus similarly exposed adults. Furthermore, while this nicotine pretreatment effect is seen in young adolescents, older adolescents are behaviorally more similar to adults. Lastly, nicotine pretreatment appears to have long-lasting effects; the effects of this brief exposure have marked effects even ten days after pretreatment. Our results reinforce the hypothesis that adolescence is a crucial period in the initiation of drug use and further narrows down the age when the adolescent brain is most susceptible to influence. We also demonstrate how easily influenced the adolescent brain can be, making a strong case for young adolescent-focused clinical programs and therapies to prevent smoking.

**Tracking Changes in Peripheral Muscle Oxygenation versus Cerebral Frontal Lobe Oxygenation Using Near Infrared Spectroscopy**
Brenton Alexander
*Mentor: Albert Cerussi*

Near Infrared Spectroscopy (NIRS) has been established as an effective way to noninvasively measure the hemodynamics of various tissues throughout the human body. Recent developments in NIRS have led to the development of Diffuse Optical Spectroscopy (DOS), which avoids several confounding factors that affect the accuracy of NIRS. Two tissues of interest hemodynamically are cerebral frontal lobe tissue and peripheral muscle tissue. While extensive research has been done individually on these tissues, monitoring both simultaneously under various stressors has not been reported in great detail. To retrieve this data, I have used two commercial DOS devices. The first is a prototype 3-wavelength system from the Hamamatsu Company, which I used to gain initial data on just the peripheral muscle hemodynamics of normal subjects. The second is a commercial two-wavelength system from ISS, which has two channels to simultaneously collect data on both cerebral and peripheral muscle hemodynamics. The project goal is to measure changes in tissue oxygenated and deoxygenated hemoglobin simultaneously in muscle and brain tissues. I will explore a method for correlating these signals to improve the detection and characterization of ischemia, with applications in trauma/hemorrhage, brain functional imaging and sports medicine.

**Representing Mass Imprisonment: Ideology, Popular Culture, and Public Policy**
Maisam Alomar
*Mentor: Jared Sexton*

Accompanying the steady decrease in crime rates since the 1970s has been an unprecedented and exponential growth of the American prison population. Presently, the U.S. is home to less than five percent of the world’s population, but a quarter of prisoners worldwide. Two-thirds of the nearly two and a half million U.S. prisoners are black or Latino. Traditional criminological theories have failed to explain this historic development adequately, leading many notable scholars, from Ruth Gilmore to Loic Wacquant, to view the punitive transformation of the penal system as an attempt by segments of the political and economic elite to retain power against the progressive demands generated by the antiracist, feminist, and antirwar social movements of the 1960s and 70s. The contemporaneous emergence of
the modern police film genre, from Yates’ *Bullit* (1968) to Fuqua’s *Training Day* (2001), suggests that popular culture has played a significant role in the development of the modern penal system and the attendant ideologies of state and society, race and class, and gender and sexuality. Nicole Rafter argues in *Shots in the Mirror* that, generally speaking, while police films raise important ethical concerns about the nature of the criminal justice system, they ultimately advocate social control by conveying policing and imprisonment as fundamentally in the public interest. Gavin O’Conner’s *Pride and Glory* and Neil LaBute’s *Lakeview Terrace* provide good examples of how the cinema of policing can work to endorse dominant social categories of white heterosexual masculinity while justifying the use of the criminal justice system to reassert this dominance in times of crisis.

**The Effects of the Economic Recession on Nonprofit Organizations in Orange County**

**Brenda Andalon**

*Mentors: Joanne Christopherson & Caesar Sereseres*

This study analyzed the effects of the economic recession on nonprofit organizations and their ability to provide social services to underserved communities in Orange County, CA. The purpose of this study was to illustrate the relationship between the economic recession, donations and funding given to nonprofits, and quality of the services the nonprofits provided to the communities in Orange County for the years 2000 and 2008. A review of previous literature regarding nonprofits and their services supported the concept that there is a measurable need for nonprofits in high-risk populations. Further review of past studies indicated that while nonprofits fill the gap in services that government agencies cannot fill, funding is hard to sustain. A review of past literature found that when there is a significant economic recession, nonprofits suffer financially because lower donation rates and fewer opportunities for grants lower the overall funding available for nonprofit organizations. The study conducted an analysis of past literature along with an analysis of secondary data provided by the Gale Directory Library. It found that nonprofit organizations were negatively affected by the economic recession in 2008, compared to 2000. The study found that due to lower rates of public donations and grants, there was a significant decrease in funding, which caused many nonprofits to shut down or reduce services over the past decade.

**Characterization of CRNF: A Potential Neurotrophin in Aplysia californica**

**Deborah Anderson**

*Mentor: Thomas Carew*

Neurotrophins are a family of proteins that influence the proliferation, differentiation, and survival of neurons and are important for learning and memory. Serotonin (5-HT) is a neuromodulator which activates Mitogen-Activated Protein Kinase (MAPK) and induces both short- and long-term memory formation (LTM) in *Aplysia californica*. Previous studies in Carew Lab have shown that BDNF-TrkB signaling is critically involved in 5HT-induced MAPK activation and repeated tail-nerve shocked induction of both long-term facilitation (LTF) and LTM. BDNF (Brain Derived Neurotrophic Factor) with 1x5-HT can achieve MAPK activation and LTF. TrkB-Fc, a TrkB receptor body which sequesters BDNF-like molecules, can block MAPK activation, LTF, and LTM. CRNF (Cysteine Rich Neurotrophic Factor), a neurotrophin believed to be an *Aplysia* analog of BDNF, is likewise important in 5-HT induced MAPK activation. To test this I first applied 4xP9 tail nerve shock (4xTNS) to release 5HT to the pleural-pedal ganglia and saw activation of MAPK in the sensory clusters. Second, I blocked CRNF signaling using CRNF antibody (CRNFa) then induced 5-HT release by 4xTNS, and saw no reduction in MAPK activation. We believe that the negative results may be due to the difficulty of CRNFa to penetrate the ganglia. Since P9 shock induces 5-HT release throughout the entire ganglia it is possible that the 5-HT-induced MAPK in the cell bodies or the synapses deep in the ganglia cannot be blocked by bath application of CRNFa. To overcome this problem, we are testing the effect of CRNFa on massed 5HT induced MAPK activation.

**Relationships that Matter: Human Rights NGOs, Strategies and Alliances in Contemporary Peru**

**Carla Anduaga**

*Mentor: Diana Kapiszewski*

This thesis examines the strategies being used nongovernmental organizations (NGOs) in Peru to advocate for socio-economic rights. The main purpose of this thesis is to answer two questions regarding activities of NGOs. First, why are these organizations using the strategies they are using, and why do they prioritize some instead of others? And, second, why are they forming alliances and cooperating with other actors in their attempt to advance socio-economic rights? Research in the field of social movements presents different theories explaining NGO behavior, but I argue that it is political opportunity that determines the decision of NGOs to choose a strategy and form alliances; that is, CSOs adapt their actions to the political environment that surrounds them, along with opportunity or cooperativeness on the part of the government. This research is important, because it systematizes the repertoire of strategies that Peruvian NGOs develop, and uncovers their strategic nature by showing how they attempt to optimize their impact.
Punished for Another's Crime? Effectiveness of Punishment Determined by Culture
Christine Antonios
*Mentor:* Eric Knowles

Previous research has focused on how effective different forms of punishment are for deterrence and justice, or how different cultures perceive the group and the individual. This research addressed that gap and combined how cultures view these various forms of punishment. This experiment ran two surveys that each presented four scenarios, portraying either broad collective (the entire group held responsible for the crime of an individual within that group), narrow collective (smaller portion of the group held responsible), random (randomly selected individuals held responsible), or individual punishment (the individual who committed the crime held responsible). In the first survey, readers were instructed to select an outcome that provided justice or deterrence in the scenario. Findings show that East Asian American participants approved of broad collective punishment more than European American participants. Furthermore, while European Americans had a much stronger preference for individual punishment than East Asians, East Asian participants showed no preference for individual punishment over the narrow collective punishment. The second survey included Chinese participants in China and American participants at UCI. This survey manipulated the motive of deterrence within the scenarios by altering the publicity of the crime. The second survey sought to explain the results found in the first survey, finding that cultural preferences for collective or individual punishments are related to cultural preferences for seeking deterrence or justice.

COINTELPRO and America’s Imagined Community
TeKeyia Armstrong
*Mentors:* Alice Fahs & Jared Sexton

Many scholars understand the 1954 murder of fourteen-year-old Emmett Till as the event that catalyzed the modern Civil Right Movement. From the start, movement participants were subject to a range of violence, from water hoses and police dogs to outright murder. In the same year that President Johnson signed the Civil Rights Act, 1964, the Ku Klux Klan murdered three civil rights workers in the State of Mississippi. In the wake of continued attacks on civil rights workers, President Johnson called on the Federal Bureau of Investigation (FBI) to investigate the Klan’s organizational activities. In 1966, in the wake of Malcolm X’s assassination in New York City, the Black Panther Party was founded in Oakland, California to bring an end to police brutality and to secure social justice, economic equality and peace for the Black community. When the FBI realized the genuine influence the Party had on Black communities nationally, an investigation was also launched against the Panthers. These investigations, pursued under the banner of the Counter Intelligence Program (COINTELPRO), had very different consequences for each group. COINTELPRO for the KKK provided a means of tracking the Klan’s extralegal activities in defense of white supremacy, while COINTELPRO for the Black Panther Party provided a means to carry out state-sanctioned violence against the Party’s efforts to overturn the white supremacist status quo.

A Model of Preattentive Statistical Judgments
James Aronson
*Mentor:* Charles E. Wright

It has been suggested that visual scenes are not perceived feature-by-feature, but rather as aggregations of individual features. This project explores what “local” characteristics of a set of objects in our visual field enable us to attend to “global” characteristics of the set. We use a popular mean discrimination paradigm, whereby we present a stimulus containing a set of disks of various sizes followed by a single probe disk. It has previously been shown that people are significantly better at judging whether the probe disk was smaller or larger than the mean size of disks in the set than at identifying whether or not the single disk was included within the set. Various modifications have been made, including a reduction in display time to as little as 50 ms, which suggest the ability to perceive the mean may be a preattentive process. Our participants’ performances verify these findings, but further inspection shows that this process is also sensitive to features other than size. A simple model that assumes veridical size perception and an arithmetic mean calculation should be reconsidered if other features, such as the spatial arrangement of disks, influence the perceived mean. This research indicates that some of the noise in performance can be explained by how these other features systematically bias “global” mean perception.

Using EEG to Discriminate among Imagined Syllables
Rajan Preet Arora
*Mentors:* Mike D’Zmura & Bill Winter

Recent studies have shown that different cognitive states can be distinguished using methods for measuring brain activity like electroencephalography (EEG). The ability to make such distinctions is critical to the function of a brain-computer interface (BCI). In the work reported here, we studied whether different syllables produced in imagination can be discriminated using EEG. An experiment was performed in which human subjects produced in imagination 16 different syllable pairs. The 16 syllable pairs were chosen by forming all consonant-vowel-consonant-vowel combinations from the phonemes /f/ /l/ /x/ and /i/). Subjects were first recorded speaking these cues aloud. Using these voice cues, subjects
then imagined speaking the syllable pairs while their EEG was recorded. The EEG data were transformed to the frequency and time-frequency domains using the Fourier transform and wavelet decompositions, respectively. The data feature-space was reduced using linear discriminant analysis and categorized using Bayes classification and matched filter techniques. The predictive success of each technique was measured by seeing how well a random subset of the data (the test set) was classified using that set’s complement (the training set) as a template. Various subgroups were formed from the 16 phonemes (for example, trials beginning with /f/ vs. trials beginning with /l/) to evaluate which phonetic differences have the most predictive success. Results show that predictive classification of imagined syllables varies from poor to excellent, depending on the subject. Work continues with the ultimate aim of producing an EEG-based BCI for imagined speech.

Applying Traditional Cultural Theater-Making Skills to Contemporary Theater Art

Byron Arreola
Mentor: Clifford Faulkner

For artists, diversity in culture and creativity are essential components that inspire the creation of effective theater. My creative research project consisted of garnering the various forms of art, dance and theater-making techniques that I encountered in Ecuador and collectively creating a new theater piece that captured the cultural elements and essence of the various Ecuadorian communities. This project was undertaken to explore the different traditional and contemporary Ecuadorian and Incan art forms that are site-specific to the country, but not part of mainstream Western theater. We used these art forms as tools and sources of inspiration to create new forms of theatrical and performance communication. The process included a 24-day trip, arranged by Dramatic Adventure Theater Company, throughout Ecuador. The locations visited included the capital, Quito, and the indigenous Quechuan community of Quilotoa in the Andes Mountains, Mindo Esmeraldas. The immersion consisted of living among local artists, participating in their festivities, and providing community service. What resulted was a richly spiritual and humanist-powered theatre piece performed in New York City. The show consisted of a performance filled with Quechuan mask dancing, Ecuadorian music, and interpretative theatre storytelling. The overall experience and resulting project showed that the art forms in Ecuador’s culture are strongly influenced by their spirituality and by the condition of their social domains. This implies that to create art forms that are timeless and effective, it is crucial to possess a cultural and spiritual awareness of one’s self and one’s place in the surrounding environment, always addressing the people. It is in this way that artists are able to take from the past and create powerful theater that speaks to audiences.

The National Children’s Study and the Applicability of Community-Based Participatory Action Research Methods

Jessica Arzate
Mentor: Michael Montoya

The goal throughout this project was to create an extensive literature review during the summer that would critique the methodology of The National Children’s Study. This review would then lead to the creation of an adjunct study representative of a major concern for a concentrated community discovered through Community-Based Participatory Action Research methods. Two National Children’s Study hypotheses are used as guidance to create an efficient literature review focused on the kinds of factors that could have effects on child development. The fact that the National Children’s Study was designed both to evaluate the effects of environmental factors during pregnancy, throughout 21 years of age, and prior to community involvement, expresses two major flaws in the study. Community-Based Participatory Action Research proves to be essential to both a long term study and its long term overall success because it is the “community” that provides recognized experts in the lived conditions that define their specific concerns. While the National Children’s Study did not begin with community driven concerns, it is the first of its kind in longitudinal studies, and this literature review aided in the discovery of niches within NCS methodologies.

The Criteria for Admissions to Graduate Programs at UCI

Jay Ashtana
Mentor: Cynthia Feliciano

The goal of the study was to attempt to explain how particular faculty define merit differently from other faculty with differing backgrounds and from various disciplines. Faculty members were asked a series of questions pertaining to graduate admissions to different disciplines within UCI, and the results appear to differ by faculty responses shaped by their own personal experiences. For instance, findings report that faculty from minority backgrounds appear to define merit on a much more personal level than faculty from Caucasian backgrounds, who in comparison generally pay less attention to factors such as ethnicity, gender, socioeconomic backgrounds and life challenges of applicants. The latter faculty generally paid more attention to scores of standardized tests and letters of recommendations from creditable colleagues. Moreover, the findings appear to augment the theory of homosocial reproduction—the alleged process of discrimination used to achieve homosocial outcomes—which thereby provides the theo-
retical basis for modeling the effects of a faculty member’s preference. Furthermore, the faculty member’s gender and discipline appears to have a correlation on paying closer attention to research interests and ethnic backgrounds of applicants applying to their discipline. The conclusion addresses the perceptions of faculty on affirmative action and Prop 209 and their implication for the future. Society and potential graduate school applicants can further benefit from this study because it will share an insider’s perspective when it comes to the application process at the graduate level at UCI.

Investigating the Correlation Between Frontal and Lateral Views of the Face Using Internet-Based Ratings with Facial Analysis
David Avila
Mentor: Brian Wong

Investigating the definition of “ideal” facial aesthetics is a rigorous and complex process. Our research group had previously pioneered an approach of combining a genetic algorithm with facial morphing technology to “evolve” more attractive synthetic anterior-posterior (AP) along with lateral-posterior (LAT) facial portraits, validated an Internet-based approach towards rating facial attractiveness on a large scale, and developed a method to create realistic synthetic lateral facial portraits with morphing technology. Using this system of methods, the approach of this investigation will attempt to discover whether an anterior-posterior view of a face will have any correlation with a lateral-posterior view of the corresponding face. Two different facial projections of the same facial portrait are analyzed; each pair of AP portraits also has their corresponding LAT projection morphed. When the facial portraits have gathered 600 votes on the Internet-based rating system, their “beauty” scores are analyzed on account of how linear the graph is based on the axes of the AP score and the LAT score. No actual images were used in this study due to the intense labor of gathering written consent; therefore, the pool of 600 photographs were developed into synthetic AP and corresponding synthetic lateral facial portraits using morphing technology. The results of this study are pertinent to the reconstructive facial surgeon, because their task is to restore facial harmony, balance, and proportion which are characteristics this investigation studies. Analysis of facial portraits is conducted on AP and LAT pairs when they receive a low correlation score.

The Effects of Rhodiola rosea on Sleep Deprivation and Circadian Rhythms in Drosophila melanogaster
Beina Azadgoli
Mentor: Mahtab Jafari

The herbal extract *Rhodiola rosea* has been shown to significantly increase the lifespan of *Drosophila melanogaster*. The objective of this study was to determine the mechanism of action through which the compound works. In most organisms, including *Drosophila*, as age increases, a decline in sleeping patterns is observed. To determine if the mechanism of action of *R. rosea* is through the organism’s circadian clock, we tested *R. rosea*’s lifespan extension properties under various light conditions as well as in flies lacking a critical circadian rhythm protein known as TIM. We also studied the effects of *R. rosea* and sleep-wake cycles of the flies throughout their lifespan. Under the varying conditions of light, *R. rosea* showed the most robust increase in lifespan in flies maintained in 12-hour light and 12-hour dark cycles, as opposed to flies under constant light. Additionally, *R. rosea* was unable to increase the lifespan of female flies lacking the TIM protein, but still caused a modest increase in male flies, suggesting that this protein is necessary for *R. rosea*’s function in females. In addition to increasing lifespan, *R. rosea* was able to modulate sleep in male flies, but not females. These data suggest that *R. rosea* might function by interacting with various circadian rhythm genes and proteins and do so in a sex-dependent manner.

Latina Undergraduates’ Coping Strategies and Well-Being: A Psychosociocultural Approach
Bianca Barrios
Mentor: Jeanett Castellanos

Although Latina/os are the largest growing racial/ethnic minority population in the United States, this population growth is not reflected in either their college admission or graduation rates. Examining the educational statistics, Latina undergraduates consistently exceed their counterparts and earn higher grades while experiencing a more positive college environment. Although Latinas report higher cultural congruity and college adjustment, there is still a consistent trend underscoring the role of unique psychosociocultural challenges for this group and their impact on retention and well-being. This study examines the fit between the psychosociocultural framework and Latina undergraduates’ academic experiences. In particular, a quantitative design was implemented to measure the influence of psychological (personal strengths, coping), social (perceived barriers, social support, collectivism and individualism), and cultural (ethnic identity, university environment, and cultural congruity) variables on 200 Latina undergraduate persistence patterns and well-being. Given the limited research in this area, two measures were developed to facilitate the analysis; one instrument assessed Latina-based positive coping skills while the second explored the role of collectivism in Latinas’ educational interactions. To date, no work has specifically examined the role of gender-specific coping techniques while integrating students’ role of behavioral relationship patterns. Findings will provide insight regarding retention and gender-cultural specific tendencies for Latina persistence and well-being.
Antibody Targeting of Phosphatidylserine Produces a Cytokine Microenvironment that Enhances Innate Anti-Viral Immune Responses
Sundeep Basra
Mentor: Luis Villarreal
Since many viruses trigger apoptotic events following infection, externalized Phosphatidylserine (PS) has been demonstrated to be a hallmark of virally infected cells. Binding of anti-PS antibodies to virally infected cells and virions renders them susceptible to destruction by antibody effector mechanisms such as antibody-dependent cell mediated cytotoxicity (ADCC) and complement-mediated cytotoxicity (CMC). The added benefit of targeting PS, a host derived membrane component, is the use of one effective treatment against a wide range of viruses. PS targeting antibodies were used to test the concept, which was only tested in cancer cells, not viral infected cells. The test included Complement fixation Assay, a test to see if the complement (Innate immune system) can bind to the Anti-PS antibodies on a virally infected cell and Complement-mediated cytotoxicity Assay, a test to see if the complement destroys cells that are virally infected. The results from the experiments show a success in anti-PS antibodies binding to complement but mixed results found in the mouse forms of the antibodies. There were no clear results in CMC Assay, but further redesign of the assay is needed. There is promise that Anti-PS antibodies can be used in a generic therapeutic treatment for various viruses to help enhance the innate immune system to counteract one or more viruses.

Aggregating Eyewitness Testimony to Determine Truth
Michael Baum
Mentors: Pernille Hemmer & Mark Steyvers
Recent studies indicate that eyewitness testimony is one of the greatest causes of wrongful convictions. Eyewitness testimony research primarily examines methods for reducing individual biases, yet a limited body of research exists on methods for combining the testimony of multiple people who witness the same event. This investigation analyzes methods for improving event recall accuracy by aggregating across groups of witnesses, much like in the wisdom of crowds. Participants individually viewed a set of three videos, which consisted of a purse being stolen, a scene of a crowded mall, and an abstract scene. Participants then answered a series of multiple-choice questions that pertained to each video. Follow-up questions were also included in each question set, which allowed for a more detailed account of a previous question (i.e. “what color was the hat he was wearing?”). Finally, subjects answered a set of general knowledge questions, each with a numerical answer, to assess the knowledge level of each subject. The accuracy of each participant was determined by comparing the number of correct responses to the total number of questions asked using their response pattern. Subjective confidence and general knowledge were also compared to participant accuracy, and each was applied to the modal model. Results indicate that the use of a modal model produces a result closer to the ground truth than a vast majority of individual participants, which is consistent with the work of Surowiecki.

The Role of Rights in the “Animal Rights” Debate
Anahid Bazarjani
Mentor: Margaret Gilbert
Contemporary ethical debates often include references to rights. One such debate deals with the existence of “animal rights.” Talk of “rights” is ambiguous, as it means different things to different individuals. At a minimum, the animal rights debate can be represented as concerning rights in the relatively thin sense of moral standing. More specifically, it can be represented as concerning the question of whether non-human animals can count from a moral point of view. There is the further question of whether such standing would correlate with animal rights in some thicker sense or simply with their ethical treatment. In this paper, I first review four different positions of participants in the animal rights debate: Peter Singer, a proponent of “animal liberation”; Michael E. Levin, an opponent of animal rights; Tom Regan, a proponent of animal rights; and finally, Christine Korsgaard, who provides a Neo-Kantian case regarding our “duties to” animals. On the basis of this review of the “animal rights” literature, I ask in what sense this is an issue of rights. Ultimately, I question the utility of rights-language within this specific contemporary ethical debate. A persuasive case for the equal consideration of animals can be made by appealing to their capacity for pain and suffering. The helpfulness of rights-language is not immediately clear within this debate, since the ethical treatment and equal consideration of animals can be defended without appeals to rights at all.

Looking Through Your Own Eyes: Manipulation of Attention Focus
Beatriz Bello
Mentor: Larry Jamner
Social phobia, or the fear of being judged and being embarrassed in front of others, is among the most prevalent psychiatric disorders. Socially anxious individuals are plagued with an excessive concern with embarrassment and humiliation, and in situations in which they may be evaluated, they often shift their attention inward and engage in detailed self-monitoring that increases anxiety and rumination. This study manipulated participants’ attention from a focus on the self to a focus on the surrounding environment, and examined whether it lowered levels of recalled anxiety and rumination among highly socially
The Effect of a Nitrogen Gradient on Above- and Below-Ground Plant Growth in Salt Marshes
Peris Bentley

Mentor: Jennifer Martiny

The goal of this project was to study the effects of a nitrogen addition gradient on plant productivity in *Salicornia* salt marshes along the California coast. Salt marsh environments are sensitive to eutrophication, of which nitrogen (N) is a major component. Three California salt marshes that differed in their sedimentary nitrogen content were selected for this research: Morro Bay Estuary (MBE), Carpinteria Salt Marsh (CSM), and Tijuana River Estuary (TRE). Thirty-five plots were established in July 2008 in each marsh (105 total plots). There were seven different treatments in the nitrogen addition gradient and five replicate plots per treatment per marsh (0, 10, 20, 40, 80, 160, 320 g N/m²/yr). The plots were fertilized with slow-release nitrogen in the form of urea every 10 weeks for 14 months. To measure above-ground growth, a 12 cm² subplot was marked by flags in each plot, and all of the above-ground biomass in this subplot was collected. To measure below-ground growth, a root ingrowth chamber was placed in each plot. Above-ground biomass increased significantly with nitrogen addition and the nitrogen response curves were similar. In contrast, total (fine + heavy) root growth did not change with increasing nitrogen; however, the heavy root response was dependent on the marsh. This indicates that nitrogen is a limiting factor in plant growth and that plants prefer to use the nutrient for above-ground expansion, possibly for increased photosynthesis.

Preparing Molecules for Use with STM
Humza Bhakhrani

Mentor: Wilson Ho

In modern times, our knowledge of the physical world has vastly increased. We have grown from not knowing what atoms were to knowing the arrangement of electrons in an atom and even further. However, with the use of scanning tunneling microscopy (STM) a new frontier is being opened. With STM it is now possible to resolve images of individual atoms adsorbed on a solid surface at the angstrom scale and even manipulate and characterize their energy states. To study an atom or molecule with an STM requires a time consuming and tedious process. To facilitate this process, one of the main tools used is a doser, which contains milligrams of atoms or molecules to be evaporated onto the surface. The doser is repeated heated, each time removing some of the impurities, until the required purity is obtained. This preparation of the doser can be performed outside the STM and then safely transfer it to the STM when it is ready. In addition, some laboratory automation techniques are incorporated into this process to reduce the amount of time and effort required.

“A Flow” and Academic Success in College
Jeremy Blanco

Mentor: AnneMarie Conley

The definition of “flow” is a measure of deep concentration on a limited stimulus field that excludes everything else from consciousness. Past studies have been done on adolescence and adults in the professional world; however, college students are often ignored. College students (from any discipline) have a great opportunity to explore new activities and find new ways to incorporate their own unique meaning to their activities, school, and work. This study is to show that achieving “flow” in an activity, whether in or outside of school, correlates positively to the

A Trend towards Populism: Locating Barack Obama in the Advent of Populist Rhetoric
Andrew Beshai

Mentor: Daniel Gross

There is a general consensus among scholars of presidential rhetoric that there has been a pattern spanning the time from the traditional to the modern presidents. This is a trend towards populism, in which modern presidents tend to embrace populist rhetoric to a much greater degree than their predecessors. This is measured through stylistic analysis such as sentence length, word length, and amount of arguments as well as content analysis such as word choice, complexity of argument, etc. In both cases the reigning consensus among the experts in the field of presidential rhetoric is that modern presidents are increasingly resorting to populist rhetoric. My thesis focuses on President Barack Obama. Initially it appears that with his lofty diction and eloquent orations he may have deviated from this trend towards populism; however, a cross-examination of his 2009 and 2010 State of the Union addresses indicates just the opposite. The difference between these two speeches reveals that Obama does, in fact, conform to the trend towards populism.

anxious individuals. Forty-three undergraduate students participated in this two-phase experiment in which they were randomly assigned to an external attention focus condition or to a control condition and were then exposed to a socially-evaluative stressor. Before exposure to the stressor, individuals in the experimental condition were instructed to focus on elements of their environment during the session; control participants were given no special instructions. During the task, participants were required to prepare and deliver a 5-minute speech in front of a panel of judges whom they were told would evaluate the quality of their performance. Participants reported on their anxiety levels immediately following the stress exposure and again one week later. The issue of attention focus and its implication for anxiety levels and subsequent rumination among vulnerable individuals will be discussed.
quality of life in college and academic success. Research has suggested positive aftereffects of achieving “flow,” such as increased self-confidence, happier moods, and better work quality. Qualitative responses have been recorded to understand a student’s “flow” experience, quality of college life, and optimism towards his/her school work. This is correlated to a students grade point average, work ethic, and extracurricular activities. It is being found that there are many “flow” inducing activities towards which students generally gravitate, including intramural sport, music, dance and video games. A student’s ability to incorporate their “flow” experiences with academics is important to the student’s academic success. “Flow” should be cultivated to benefit both the student and the University in order to foster student creativity, quality of life, and a more diverse curriculum.

**Inhibition of Histone Deacetylase 3 Facilitates Extinction of Cocaine-Induced Memory**

*Steven Blue*

**Mentor:** Marcelo Wood

Drugs of abuse change the structure and function of neurons within specific regions of the brain. Histones are proteins that package eukaryotic DNA and are the primary protein components of chromatin, the condensed form of DNA that makes up chromosomes. When these histone proteins are acetylated, the interaction between the proteins and DNA is reduced, rendering the DNA more accessible to transcription factors. The administration of cocaine increases acetylation of histones and leads to increased gene activation in this manner, causing long-term changes in behavior. In this study, I tested the ability of a histone deacetylase 3 inhibitor (HDAC3i) to promote extinction of cocaine-induced conditioned place preference (CPP). Mice were conditioned by being injected with cocaine and were confined to one context and given saline while confined to a different context. Immediately following a post-conditioning preference test, they were injected with either HDAC3i or vehicle and subjected to two days of nonconfined extinction. From this study, I determined that inhibition of histone deacetylase 3 leads to extinction of cocaine-induced CPP and has the potential to be an effective treatment of drug addiction.

**Visualizing Lymphocytic Choriomeningitis Virus Transcription and Replication in the Minigenome System Using the Green Fluorescent Protein Reporter Gene**

*Gail Boltron*

**Mentor:** Michael Buchmeier

The enveloped *Lymphocytic Choriomeningitis Virus* (LCMV) has a unique ambisense coding strategy and contains two negative-sense, single-stranded RNA, denoted L and S. The minigenome assay is a robust and highly efficient system that is used in reverse-genetics studies to analyze transcription and replication of the LCMV genome. The LCMV S minigenome encodes the chloramphenicol acetyltransferase (CAT) reporter. Expression of the minigenome CAT (MG-CAT) is quantified by measuring CAT activity. This requires cell-lysis, release of enzyme and product-substrate separation by thin-layer chromatography. To better visualize transcription and replication without lysing cells, the CAT region was removed and replaced with a copy of the green fluorescent protein (GFP). Cells were viewed under a fluorescent microscope to measure MG-GFP expression. Bright green fluorescence was detected in the cytoplasm of cells that were transfected with minigenome GFP (MG-GFP), representing minigenome expression. Quantified with a fluorescent plate reader, fluorescence in cells transfected with MG-GFP was five times higher than cells that were not transfected with MG-GFP. Compared to MG-CAT reporter, there was thirty times more CAT activity in cells transfected with MG-CAT than those that were not. The MG-CAT reporter is more robust, but the MG-GFP reporter detects distinct cells that are actively transcribing and replicating the minigenome. The MG-GFP reporter allows for quantifiable measurement of minigenome expression and detection of green fluorescence within entire cells.

**Effect of Initial Microstructure on the Production of Ultrafine-Grain Titanium for Biomedical Applications Using ECAP**

*Ankita Bordoloi*

**Mentor:** Farghalli Mohamed

Over the past few years, there has been great interest in increasing the strength of commercially available materials. One means to achieve this goal is to produce these materials using techniques that lead to refined grain structures (the Hall-Petch relationship). In this investigation, equal channel angular pressing (ECAP) was used to produce ultrafine-grain (UFG) titanium (Ti) at room temperature. This technique involves pushing a sample of material through two channels of the same cross-section that intersect at an angle. As the sample moves through the angle, it undergoes severe deformation, resulting in submicron-sized (<10^-6 m) grains. Commercially pure (CP) Ti was selected because this material is used in medical and dental implant applications and has the potential of replacing Ti alloys in load-bearing implant applications that require higher strengths (something that CP Ti is currently unsuitable for). The objective of the investigation was to determine the effects of initial microstructure on the microstructure of the material after one pass of ECAP. Samples of CP Ti with three different heat treatments, which resulted in different microstructures, were subjected to one pass of ECAP at room temperature. For each heat treated sample, the microstructure was analyzed before and
after ECAP. Sample textures were examined using X-ray diffraction, and the grain structures were analyzed by polishing and etching the samples for scanning electron microscopy (SEM) and polishing and twin jet polishing samples for transmission electron microscopy (TEM).

**The Maghrib and the Caribbean: Importation of Islamic Building Practices to Cuba in the 16th–18th Centuries**

Kalli Boyne  
*Mentors:* Raul Fernandez & Alka Patel

Considering Muslims had brought Islamicate building practices to Spain to begin with, the most obvious candidates for perpetuating Islamicate architecture in the New World would be Muslims. However, according to Spanish law, Muslims would have never been allowed in the New World, let alone be contracted to erect Spanish cities. There is, however, a constant battle between Spain’s written account of personal identities and building practices in Spain, as well as in the New World, and what actually happened. By examining Islamic architecture and understanding building methods and traditions, we can hope to better understand who actually built these buildings, who created these building practices in the Spanish homeland, and what actually means for a building to be Islamic or Islamicate. Islamicate architecture in the New World not only created brilliant cityscapes and exemplary cathedrals, but it also transformed social constructs and the pure religious ideology of Spain. As the Spanish settled in the New World in the late 15th century, they needed someone to construct buildings that inherited the comforts of the Spanish homeland. This required a knowledge of traditional building practices, a labor force that understood the architectural methods and tastes of Spain. Does the presence of Islam explain the presence of Islamic architecture in the New World, and what allows us to define buildings as Islamic to begin with?

**Effect of Heat Treatment on the Creep Behavior of Al-6082**

Nicholas Briggs  
*Mentor:* Fillmore Freeman

This investigation has focused on examining the effect of diffusion-anneal heat treatment on the creep behavior of a solution-treated and naturally-aged 6082 Al-alloy. The heat treatment was conducted at two temperatures, 400 °C and 530 °C, for 5 hours immediately prior to the creep test. The double-shear creep test was then conducted at two stress levels, 8 MPa and 25 MPa. The data showed that the creep curves exhibited a well-defined secondary stage. Following the creep test, the deformed gauge section was sliced for preparing TEM samples. The deformed gauge sections that were sliced for preparing TEM samples are in the process of being analyzed with TEM, and the results from this will be presented and discussed.

**[2,3]- and [3,3]-Sigmatropic Rearrangements of S-(2-Propenyl) 2-propene-1-sulfinothioate (Allicin)**

Hoangan Bui  
*Mentor:* Fillmore Freeman

S-(2-propenyl) 2-propene-1-sulfinothioate, or Allicin, found in garlic, has potent antiviral, antifungal, antiparasitic and antibacterial activity against a considerable range of microorganisms. Garlic has been used for a thousand of years for medication and food. However, little is known about allicin in literature; and even less is known about its isomers. The structures and relative energies of allicin (1), and its isomers 2-propenoxo-2-propenedisulfide (alkoxydisulfide, 2) and alkoxythiosulfoxide (3) are studied at PBE1PBE/6-311+G(d,p) and B3LYP/6-311+G(d,p) levels of theory. Alkoxydisulfide (2) and alkoxythiosulfoxide (3) isomers are formed through two sigmatropic rearrangements from the staring species, allicin (1). We also studied the conformational rearrangement mechanisms through four transition states: TS1 of the [2,3]-sigmatropic rearrangement of allicin (1) to alkoxydisulfide (2), TS2 of the [2,3]-sigmatropic rearrangement of alkoxydisulfide (2) to alkoxythiosulfoxide (3), TS3 (chair transition state) and TS4 (boat transition state) of the [3,3]-sigmatropic rearrangement of allicin to alkoxythiosulfoxide. The transition states’ relative energies are also examined using density functional theories (DFT) PBE1PBE/6-311+G(d,p) and B3LYP/6-311+G(d,p). We discover the following: alkoxydisulfide has the lowest relative energy; the [2,3]-sigmatropic rearrangement of allicin to alkoxydisulfide, the most stable conformer, is the most feasible rearrangement because it acquires the lowest activation energy; [3,3]-sigmatropic rearrangement of allicin to alkoxythiosulfoxide prefers undergoing the rearrangement through a “boat” six-member ring transition state.

**A Comparative Analysis of the HIV Epidemics in Amsterdam, the Netherlands and in St. Petersburg, the Russian Federation: Can the Solutions Applied by the Netherlands Solve Russia’s Problems?**

Meredith Busch  
*Mentor:* Paula Garb

Since the collapse of the Soviet Union, the number of cases of HIV in the Russian Federation has multiplied uncontrollably, making it one of the fastest spreading HIV epidemics in the world. Particularly at risk are injecting drug users, especially in St. Petersburg. The Netherlands, however, which faced its first cases of HIV in the early 1980s, has spent money, time, and energy on solving the problem of uncontrolled transmission of HIV among injecting drug users, especially in Amsterdam. Now, the transmission within this risk group is virtually nonexistent.
The goal of the study was to analyze the transmission trends in both countries to draw similarities between the two cases of the epidemic in order to determine whether the epidemics are similar enough to apply the Dutch solutions to the problems in the Russian Federation. After analyzing these patterns, a reasonable prescription can be made to confront the transmission of HIV among injecting drug users in St. Petersburg. This prescription of needle exchange, preventive education, and low-threshold methadone programs, however, needed alterations in some ways to be socially and institutionally acceptable in St. Petersburg, where the culture and stigma surrounding HIV differs from that in Amsterdam. By gradually instituting such programs and by funding them privately, at least at first, the adoption of a solution to this dangerous epidemic can be best facilitated. With the implementation of such a program on an organized level, the potentially catastrophic transmission of HIV from high-risk groups to the general population could be prevented.

Synthesis and Properties of Model 1,5-Dicarbonyls

Zoe Cabral
Mentor: Sergey Nizkorodov

Atmospheric organic aerosols play a very important role in the environment as cloud condensation nuclei and as major components of particulate air pollution. If organic aerosols are capable of absorbing visible light they can have a direct effect on climate. We recently observed that biogenic organic aerosols can turn brown when exposed to ammonia, a common atmospheric pollutant. Since brown color is associated with absorption of blue and green light, such brown aerosols might be responsible for causing warming of the atmosphere. We hypothesize that browning occurs as a result of reactions between ammonia and the organic compounds known as 1,5-dicarbonyls, which are quite common in organic aerosols. The purpose of this project was to synthesize model 1,5-dicarbonyl compounds such as 3-methyl-5-oxohexanal, and to study the mechanism of reaction between ammonia and 1,5-dicabonyls in an aqueous phase. The 3-methyl-5-oxohexanal was synthesized by Michaels reaction, and characterized by NMR spectroscopy. The reaction between the simplest 1,5-dicabonyl glutaraldehyde and ammonium was studied using UV-Vis spectrophotometry. It was found that reaction between 1,5-dicabonyls and ammonia is indeed very rapid, although the products are not as intensely colored as the corresponding products of the actual organic aerosol + ammonia reactions. The project will clear up some of the uncertainty as to whether or not chemistry of carbonyl compounds in aerosols is contributing to global warming, a serious issue that can affect the entire world.

“So, How are you Feeling?” Gender and Personality Differences in Emotional Reactivity in Interpersonal Interactions

Patricia Calbay
Mentor: Susan Charles

This study examined gender and personality differences in emotional reactivity during stressful and non-stressful interpersonal interactions. Sixty-two undergraduate students (25 males and 37 females) from the University of California, Irvine participated in the study. The study examined individual differences in emotional and behavioral reactions to social interactions they may experience in their everyday lives, based on gender and personality traits. Specifically, the study examined how gender and levels of extraversion and neuroticism were associated with emotional responses to positive and negative interactions with another person. During the experimental session, the participant was randomly assigned to either a positive (pleasant) or negative (unpleasant) condition in which he/she worked collaboratively with a member of the research team, who posed as another participant, in a social task where they engaged in an informed discussion regarding hypothetical situations. Results indicate that in the positive condition, positive affect increased while negative affect decreased, whereas in the negative condition, negative affect increased and positive affect decreased. Extraversion was significantly correlated to positive affect and neuroticism was significantly correlated to negative affect. Taking affect and behavior together, a high frequency of escalating conflict led to increased negative emotions. In terms of gender, females engaged in more positive behaviors while men were more likely to decrease conflict.

“Do I Have your Attention?” An Ecological Momentary Assessment of Recurrent Headache Pain

Cynthia Canfield
Mentor: Larry Jamner

To improve accuracy in the assessment of chronic pain, some researchers have advocated frequent momentary assessment of pain experience. However, such assessment may increase the extent to which participants attend to their pain. In this study, participants with recurrent headache pain were randomly assigned to report experiences of pain frequently or less frequently. Relative to those in the infrequent reporting condition, those in the frequent reporting condition were hypothesized to report more headaches of greater intensity and adverse functional consequences (hereafter, combined and referred to as pain experience). Further, dispositional catastrophizing was hypothesized to potentiate the effects of frequent reporting on pain experience. Implications of the study results are discussed with respect to measurement accuracy and human research ethics.
Effects of Stress and Transdermal Nicotine on Cardiovascular Activity of Smokers and Nonsmokers with ADHD
Thanh Cao
*Mentor:* Jean Gehricke

Individuals with attention-deficit hyperactivity disorder (ADHD) tend to self-medicate with nicotine to regulate their behavioral symptoms. Nicotine, the main psychoactive ingredient in cigarettes, can be used in nicotinic treatment as an alternative to ADHD stimulant medication. Nicotine and stress are each known to increase systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR). The aim of the study was to examine if nicotine and stress would have a negative interactive effect on cardiovascular activity of adults with ADHD. It was hypothesized that the combination of nicotine and stress would further raise cardiovascular activity to unhealthy levels. SBP, DBP, and HR were measured in 24 adults smokers and 27 adult nonsmokers with ADHD over two days on nicotine patch compared to two days on placebo patch. Participants carried out normal activities and recorded their stress levels with an electronic-diary. Results showed that nicotine and stress each had main effects on SBP, DBP, and HR. Furthermore, nicotine and stress had an interactive effect only for SBP. Post-hoc analysis on SBP revealed that smokers and nonsmokers on nicotine patch had no reactivity to stress. SBP unresponsiveness to stress may be detrimental in situations where an individual must adapt to stimuli (e.g. strenuous tasks). People are encouraged to quit smoking, and if they consider nicotine patches, they should still be cautious of stressful situations. Despite its usefulness in smoking cessation, nicotine has side effects that should be considered when using nicotine for other purposes like treating ADHD behavioral symptoms.

Quantitative Phosphoproteome Analysis of Normal vs. PIM-1 Kinase Expressed-Modified Mouse Prostate Cells
Joseph Capri
*Mentor:* Paul Gershon

The aim of this study was to quantitate the relative levels of phosphorylation at a range of sites across the proteins of *Mus* prostate cells that had been cultured under three different sets of conditions in cell culture that over expressed PIM1 kinase. This was done via a quantitative phosphoproteome approach: protein extracts from the three cell pellets were proteolyzed, differentially stable-isotope labeled and mixed, then the mixture was subjected to two stages of phosphopeptide enrichment followed by nanoLC-MS/MS. 872 unique phosphorylated peptides that were differentially isotope labeled were identified with high confidence in this initial experiment, via peptide fragmentation, and the relative abundances of these phosphopeptides were measured from the parent mass spectra. The methods employed in this analysis were developed by myself and used for the first time in my host lab, and form the basis for deeper investigations into the phosphoproteomes of these cells.

African American Undergraduate Females’ Coping and Well-Being
Ashley Carey
*Mentor:* Jeanett Castellanos

As racial ethnic minority students on college campuses, African American students encounter several educational barriers as they transition and adapt to higher education. These barriers often lead to distress and affect African American students’ general health and well-being. In particular, African American females are subjected to multiple forms of educational challenges unique to their experiences as double minorities navigating the educational system. Although their steady representation in higher education can lead administrators to believe that this group is well adjusted and persisting, other literature clearly underscores the importance of examining the quality of the experiences and the students’ means of coping with their challenges. The purpose of this study is to learn—through a Psychosociocultural framework—the coping processes used by African American undergraduate females and how these processes affect their well-being. Findings will help academic institutions foster a healthier environment for African American females and gain more knowledge about how to retain high persistence levels.

Composing Movement
Jay Carlon
*Mentor:* Lisa Naugle

An artist seeks her or his voice with truth, honesty, dignity; and with curiosity when approaching research. To understand this voice I set out, in summer 2009, to participate in three workshops (two national and one international). Discovering my artistic voice—my point-of-view—meant a journey into the personal and creative process. In San Francisco, I learned from Benjamin Levy of LEVYdance about the poetry and depth of dance making. In New York City at the Movement Research MELT Composition Workshop, choreographer Tere O’Conner offered knowledge of abstraction and how breaking convention can offer a less presentational reality of dance. At the end of the summer, I participated in Improvisation Intensive under the artistic direction of Lisa Naugle, who was the choreographer in Residence at the International Composers’ Festival in Andalucía, Spain. This experience was grounded in collaborative approaches for improvisation performance and I was able to work with the musicians, composers choreographers, and dancers as well as develop video and dance for the stage. I used choreographic elements ac-
quired from each of these workshops to create *Cumulus*, a dance about innocence and corruption inspired by the nature, behavior, and density of clouds. Producing *Cumulus* helped me come closer to finding my voice as a choreographer and as an artist. My presentation will include excerpts of *Cumulus* and other visual images from the workshop.

**Project Management in Nonprofit Organizations**

*Elaine Cartas  
Mentor: George Meier*

America’s economic crisis has curtailed the resources of the nation’s 1.6 million nonprofit organizations, which in turn has reduced their ability to provide services. Thus, nonprofit organizations face disruptions in their organization and projects. They have to increase their efficiency to make better use of their resources. A proven method to this end is the application of project management and the eight principles for ensuring a project’s successful completion developed by the Project Management Institute. The Project Body of Knowledge (PMBOK) formulates these eight principles as the management scope, time, cost, risk, quality, procurement, communications and human resources. The objective of this study is to examine how the project managers from Mentoring Program and Youth Alliance managed their projects. This study uses a qualitative approach to shadow the project manager. Prior to being shadowed, the project manager and team members were interviewed, with questions based on PMBOK’s eight principles. Observations focused on how the project manager used these principles in developing, implementing, and completing assigned project work. Results illustrate that when all eight principles are applied, the project team accomplishes the objectives faster and with less effort. Research that examines project management in nonprofit organizations is still rare; thus, this case study will hopefully provide a much-needed and clearer understanding.

**Thermal Properties and Ionic Conduction of Block Copolymer Electrolytes**

*Monica Castaneda  
Mentor: Nitash Balsara*

The dilemma of dendrite growth in secondary solid-state lithium batteries can be solved through increasing the mechanical properties of the electrolyte; unfortunately, common polymer electrolytes show a decrease in conductivity as the strength increases. However, studies have shown that polystyrene-block-poly(ethylene oxide) exhibits a decoupling of electrical and mechanical properties, making it a favorable alternative electrolyte. This is possible due to the phase separation of the poly(ethylene oxide) from the polystyrene into lamellae. The insertion of a lithium salt into the block copolymer allows for ionic conduction through the softer poly(ethylene oxide) due to the segmental motion of the chain, while the glassier polystyrene retains its mechanical stiffness. The mechanical and conductive properties of the polymers are governed by molecular weight and salt concentration. To observe these effects, differential scanning calorimetry and conductivity measurements have been used. Differential scanning calorimetry can be used to observe the melting and transition glass temperatures of polymers. Glass transition temperature data combined with conductivity measurements at varying temperatures make it possible to correlate conductivity dependence on the thermal state of the block copolymer as predicted by the Vogel-Fulcher-Tammann equation. A better understanding of these effects will lead to a clearer knowledge of the applicability and proper design of block copolymer electrolytes.

**Nonsensical Word Recall in Mandarin-English Bilinguals**

*Derek Chen  
Mentor: Mary Louise Kean*

The objective of this research was to examine if there are verbal working memory differences between Mandarin-English bilinguals and English monolinguals. We wanted to see if bilinguals have an advantage in learning a new language since they are familiar with more sounds and sound combinations when compared with English monolinguals. Since learning a new language involves learning novel sounds and sound combinations, being bilingual may mean having a head start on this process. Participants completed the experiment by following a computer program that displayed English word lists in a variety of patterns and cued the participant to recall the words that were presented on the screen. The word lists contained groups of words that rhyme, have semantic relationships, or are non-words. We were particularly interested in the non-words that used English sounds but have no meaning, because these words can be used to simulate foreign sound combinations that are not usually found in English. Results showed that there were no significant differences in recall for non-words between the bilingual participants and the English monolingual participants. A closer look at the phonology of the two languages indicated that these results can be attributed to the many sounds and sound combinations that overlap in English and Mandarin. The overlap means that the Mandarin-English bilinguals do not have much of an advantage over English monolinguals when it comes to identifying with novel sounds and sound combinations.
Effects of Class Size on Course and Professor Evaluations across Disciplines

Dorothy Cheng
Mentor: Dan Bogart

While increasing class sizes is among the first strategies to alleviate higher education budget cuts, its impact on students and instructors is debatable. Using a comprehensive data set, this study takes a different approach to estimate class size effects, and does so across disciplines. Student ratings of learning, professor quality, and course value serve as alternative measures of educational outcomes. Fixed-effects models controlling for heterogeneous courses and instructors reveal the effect of increasing class size on evaluations. Of the 24 departments analyzed, economics, anthropology, political science, sociology, computer science and engineering, electrical and computer engineering, communication, theatre, Chinese, and literature are negatively affected by higher enrollment. Mathematics sees a positive relationship. Others show no significant difference. These findings can have policy implications, especially in light of an economic crisis. This study is the first to use self-reported ratings of learning as a measure of educational outcomes.

Le Corps Idéal du Corset: Ideals of Feminine Beauty and the Corset’s Role in the French Belle Époque, 1871 to 1914

Rachel Cheng
Mentor: Lynn Mally

The word corset originates from the French root morpheme corps, literally derived from a human conceptualization of the body. While today we are inclined to view the corset primarily as a high fashion or fetish garment, it was the most fashionable and necessary feminine undergarment little more than a century ago. During the Belle Époque, which lasted from 1871 to 1914 in France, the corset evolved alongside the often contradictory social ideals of the female body and beauty in French society. This paper follows the corset’s evolution, examining three styles of corsets—the Swan Bill, the leisure/waist clincher, and the S-shape—alongside variations in the female silhouette created by each particular corset styles. The different feminine body parts emphasized by the resulting silhouette of each corset style reflected continuously changing popular notions of the quintessential French feminine and fashionable beauty. Eventually, the corset came to serve the additional purpose of modifying feminine posture and proportions. Following the First World War, the corset fell out of fashion as ideals of feminine beauty changed with post-war French society.

Alkaline Phosphatase Activity of Synechococcus Strain WH8102 Under Phosphate Limited Conditions

Brian Cheung
Mentor: Adam Martiny

In this experiment, we investigated the effects of nutrient availability on the alkaline phosphate activity of Cyanobacterium Synechococcus. Synechococcus plays a major role in regulating carbon fixation in marine ecosystems via photosynthesis. Nutrient availability is an important factor in influencing the growth of Synechococcus, which may be limited by phosphorus availability in oligotrophic oceans. Under phosphate limited conditions, Synechococcus has been known to induce alkaline phosphatase to increase their phosphate uptake. To monitor this activity, paranitrophenyl phosphate (p-NPP), a substrate that binds to alkaline phosphatase, was added to each sample, and absorbance was measured. We subjected Synechococcus strain WH8102 (open ocean strain) under both phosphate replete and deplete conditions and analyzed the difference in alkaline phosphatase activity. The absorbance was read daily to measure the alkaline phosphatase activity, and a ratio of absorbance/fluorescence was created to compare the alkaline phosphatase activity to cell density over time. We would expect the absorbance/fluorescence ratio to increase at day 7, since upregulation of alkaline phosphatase activity occurs seven days after transfer, and to peak at 11 days when grown in residual phosphate.

A Comparative Examination of the Elemental Stoichiometry of Synechococcus Strains CC9311 and WH8102 Under Phosphate Limited Conditions

Brian Cheung
Mentor: Adam Martiny

The purpose of this experiment is to investigate the effects of nutrient availability on Cyanobacterium Synechococcus. Synechococcus plays a major role in regulating carbon fixation in marine ecosystems via photosynthesis. Nutrient availability is an important factor in influencing the molar ratio of Synechococcus, and growth can potentially be limited by phosphorus availability in oligotrophic oceans. We subjected two different Synechococcus strains, WH8102 (open ocean strain) and CC9311 (coastal strain), to phosphate limited environments and analyzed the phosphate uptake as well as the intracellular carbon (C), nitrogen (N), and phosphorus (P). Cultures were maintained in a chemostat apparatus, and we were able to manipulate the retention time to control growth rate indirectly by adjusting the flow rate in the chemostat vessel. The adjustment in retention time in effect manipulates the cell quota. We expect that both strains will have a higher C:P, N:P, and overall C:N:P ratio compared to Redfield’s ratio (106C: 16N:1P), since these cultures were grown under phosphate limited conditions. We would also expect the open ocean strain (WH8102) to have a much higher elemental ratio than the
Asian Americans, as the study shows smoking rates vary; but that argument cannot be made for all smokers. The research will be a secondary data analysis of works that focused on smoking patterns of Asian Americans. I will examine the data, how each study focused on the topic, and the conclusions they drew, either challenging or developing supplementary conclusions to the study. Much of the data I have found suggest acculturation issues as a reason for high smoking rates. However, a linear trend between blood pressure (systolic and diastolic) and level of neuroticism was observed. Individuals who scored high on neuroticism were also found to have higher systolic and diastolic blood pressure over time in exposure to social stressors.

**Why Asian Americans Smoke**

Leng Chhuo  
*Mentor*: John Liu

Cigarette smoking is the most preventable cause of premature death and heart disease. Although the percentage of smokers in the U.S. has gone down over the past years, a significant number of racial populations in the U.S. continue to smoke at high rates. The purpose of this project is to find why a specific portion of the population continues to smoke, in this case Asian Americans. The research will be a secondary data analysis of work that focused on smoking patterns of Asian Americans. I will examine the data, how each study focused on the topic, and the conclusions they drew, either challenging or developing supplementary conclusions to the study. Much of the data I have found suggest acculturation issues as a reason for high smoking rates; but that argument cannot be made for all Asian Americans, as the study shows smoking rates vary across ethnic lines. The goal of the research is to develop a general explanation for the high smoking rates among Asian Americans.

**Cardiovascular Reactivity to Social Stressors and Neuroticism**

Doug Cheung  
*Mentor*: Susan Charles

Neuroticism is a prevalent personality trait commonly defined as a broad spectrum of individual differences in like-lieness to experience negative emotion and psychological distress. This pilot study examined the physiological reactivity of psychological stressors on individuals in association with their levels of neuroticism in response to social stressors. Undergraduate students from the University of California, Irvine were recruited in this study (n=8). Participants were prescribed *Eysenck's Personality Scale (EPS)* as a measurement of an individual's neuroticism score. Participants were also subjected to experimental exposure to different social stressors. A high social stress condition or low social stress condition was randomly given to recruited participants. Systolic and diastolic blood pressures were measured every three minutes to determine the participant's physiological reactivity. Results did not show correlational significance between the level of neuroticism and mean systolic blood pressure and mean diastolic blood pressure. However, a linear trend between blood pressure (systolic and diastolic) and level of neuroticism was observed. Individuals who scored high on neuroticism were also found to have higher systolic and diastolic blood pressure over time in exposure to social stressors.

**Neuroticism**

Susan Charles

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**Investigating the Molecular Mechanisms of C1q-Mediated Modulation of Inflammatory Responses in Phagocytic Cells**

Elysia Chin  
*Mentor*: Andrea Tenner

The C1q protein is a recognition subunit of the classical complement pathway and plays a vital role in initiating the pathway, thus triggering host defense mechanisms. The interaction of C1q with phagocytic cells has also been shown to enhance their phagocytic ability. In previous studies, under the same conditions in which phagocytosis was enhanced, C1q was shown to modulate cytokines towards an anti-inflammatory response; however, there were observed differences in specific C1q-directed cytokine responses, depending on the differentiation state of human monocytes, macrophages and dendritic cells, and on the nature of the ingested particle. Therefore, it may be useful to investigate the molecular mechanisms by which C1q applies its effect on phagocytic cells via ligand receptor interactions. It was previously shown in human monocytes that C1q triggers the induction of the NFkB transcription factor p50p50 complex and the increased phosphorylation of CREB (pCREB). We investigated the responses of human monocyte-derived macrophages and immature dendritic cells to C1q to see if C1q induces the NFkB p50p50 complex and pCREB similar to human monocytes. Human monocytes, monocyte-derived macrophages and dendritic cells were plated on immobilized C1q, or fed apoptotic cells in the presence of C1q and immunocytochemistry, flow cytometry or Western blot were performed to evaluate transcription factor activation. By exploring the molecular mechanisms by which C1q exerts its defensive anti-inflammatory effects, novel therapeutic targets may be identified for treatment and/or prevention of autoimmunity during the clearance of apoptotic cells or cellular debris.

**Do Marine Cyanophages Adapt to Seasonal Changes in Sea Surface Temperatures?**

Susan Cho  
*Mentor*: Jennifer Martiny

Marine viruses that infect cyanobacteria are an important part of biogeochemical cycling in the marine environment due to their role in lysing their photosynthetic hosts. Seasonal variability in the composition of marine *Synechococcus* cyanophages has been detected, but the reasons for such temporal patterns are yet unclear. These patterns may in part be due to the adaptation of cyanophages of different clades to different sea surface temperatures. This would suggest that cyanophages may adapt to temperature through homologous evolution. Alternatively, each clade may adapt to each season through parallel evolution. To address this question, I test whether a cyanophage’s temperature-decay rate (that is, the cyanophage ability to sur-
vive outside of its host) differs between seasons and between two phylogenetic clades. The decay rates of cross-incubated cyanophages from two different clades, at cool and warm temperatures, are being calculated through plaque counts formed by viral lysis of *Synechococcus WH7803* on soft agar plates. If homologous evolution is the major evolutionary process that governs temperature adaptation, I expect to find that the optimum temperature for plaque formation is predictable according to clades, which are phylogenetically constructed based on conserved g20 genes. Alternatively, if parallel evolution plays a greater role, I expect to find that the optimum temperature is predictable based on the sea surface temperature from which the virus was isolated. This study will help build knowledge on environmental factors that enhance and inhibit the virulence of marine cyanophages. This will in turn further the understanding of the interactions between their hosts.

**Treatment of Malignant Brain Tumors Using Non-Viral PAX6 Gene Therapy and Photochemical Internalization.**

Chih Hsuan Chou  
**Mentor:** Henry Hirschberg

Glioblastoma multiforme (GBM, WHO grade IV) represents 60% of all malignant brain tumors, and carries a very dismal prognosis. The tumor cells have astrocytic cell features and are highly invasive; therefore, with current surgical techniques the removal of the tumor is impossible. Therefore, the overall objective of this research was to investigate the utility of photodynamic therapy and photochemical internalization (PCI) for the treatment of malignant brain tumors (gliomas). To study the ability of PCI to enhance the PAX6 gene insertion into glioma cells, a cell line known to be deficient in PAX6 expression (F98) was transfected with and without AlPcS2a-mediated PDT *in vitro*. The study has shown, both in viral and non-viral vectors, that PCI clearly can be used to enhance the delivery of suppressor genes like P53 and PAX6 in malignant glioma cells. This was shown by GFP and luciferase reporter, which indicated a 5-fold increase in gene expression instead of the 20-fold increase that previous studies have shown. Interestingly enough, other studies have shown that PCI can eradicate multidrug-resistant cancer cells *in vivo*; therefore, additional animal studies will be required to fully understand the implications of these results. All of these studies are done in hopes that in the future this treatment can be performed on humans and serve as a new therapy for GBM that is both non invasive and effective.

**Wide Gamut Cameras**

Jonathan Chu  
**Mentors:** Robert Brown & Gopi Meenakshisundaram

We are conducting research on developing wide gamut cameras to try to capture colors in the human gamut range more effectively. Currently, typical camera technology can only capture colors within the limited RGB color space. It normally takes extremely costly hyper spectral imaging to capture large-color-gamut images, so our goal has been to create a new camera design that would expand the gamut to include a larger area of the CIE color space. Most cameras use prisms, so instead we studied the effects of using a micro lens array combined with a diffraction grating to achieve greater color fidelity. The fundamental idea is to use spatial resolution to capture the spectral resolution at every pixel. In other words, many pixels in the camera will be used to represent many wavelengths representing a single pixel in the conceptual image. In the calibration step, three lasers corresponding to the red, green, and blue are used to identify the corresponding camera pixels that capture these narrow wavelength bands. Intermediate wavelengths will be converging to intermediate camera pixels between the pixels corresponding to red, green, and blue. Once the camera-pixel to wavelength-band correspondence is established, any image can be resolved into its wavelength components, from which true wide gamut image can be synthesized. My specific project will be to resolve the exact pixel location at which the wavelength bands used in the calibration converge, using blob detection algorithm. I will then convert the values read from the camera pixels to CIE-XYZ coordinates and synthesize the image.

**Characterization of the Mutant Mycobacterial Heme-Degrading Protein, Rv3592 A71F**

Christopher Chun  
**Mentor:** Celia Goulding

The pathogenic bacterium *Mycobacterium tuberculosis* (*Mtb*) causes tuberculosis, a deadly disease responsible for over 2 million deaths each year. Iron, which is essential for the survival of *Mtb*, is predominately found as heme in the human body. The Goulding lab has proposed a novel heme uptake pathway in *Mtb*, in which heme is sequestered by a secreted hemophore Rv0203, transported into the cytosol by putative heme transporters Rv0206c and/or Rv0202c, and degraded by Rv3592 into iron and other products. Rv3592 shares sequence and structural homology to *Staphylococcus aureus* heme degraders IsdG and IsdI. Interestingly, Rv3592 can bind two molecules of heme per monomer, while IsdG and IsdI only bind one. In the active site of Rv3592 compared to IsdG and IsdI there is an alanine substituted for a phenylalanine, which could play a significant role in its ability to bind two heme molecules. We want to observe how the introduction of the A71F mutation in Rv3592 will affect its binding and degradation of heme. To begin this project, I transformed pET-22b-Rv3592 A71F gene into *E. coli* BL21-GOLD cells, over-expressed and purified Rv3592 A71F, and set up crystal screens. Crystal trays are still being observed to obtain...
conditions that will be optimal for crystallization. To determine the stoichiometry of heme to protein, heme titrations and isothermal titration calorimetry experiments were conducted. The results indicate that despite the mutation, the protein is still able to bind to two heme molecules.

**A Radiation Analysis for UCISAT-1 and UCISAT-2**
Steven Chung  
*Mentor*: Benjamin Villac

Though performing a space radiation analysis is not a mission critical task in most student satellite projects, the effect of space radiation on spacecraft electronics should not be overlooked. This paper summarizes a radiation analysis of the University of California, Irvine’s UCISAT-1 CubeSat mission and offers fellow students guidelines to choosing radiation hard electronic components for their budgeted satellites. The analysis included simulating a projected orbit aboard an Inter-Orbital System’s rocket set to launch in late 2010 (not yet confirmed) and calculating expected total ionizing dose, displacement damage dose and a range of other useful parameters for an assumed mission duration using SPENVIS (Space ENVironment Information System) from the European Space Agency (ESA). The differences between worst case scenario generalizations and more refined and mission-specific cases are distinguished. NASA/GSFC’s database on radiation-tested components was used for the analysis as well. This paper also combines a sea of literature into several guidelines for piece-part evaluation of radiation hard or soft components. A sample application of the procedures outlined in this paper is also given for the upcoming UCISAT-2 project, the second major project of the satellite program at UCI.

**Search for Super Symmetry in Dilepton Events at the Large Hadron Collider**
Max Clark  
*Mentor*: Daniel Whiteson

The Large Hadron Collider will collide particles at higher energy levels than any previous collider, allowing us to probe more deeply for fundamental theories of physics, such as Supersymmetry (SUSY). This theory provides for a unification of the strong and electroweak forces at high energy levels and so solves the Hierarchy Problem. It also provides a candidate for dark matter, which is thought to compose 24% of the matter in the universe. SUSY predicts a partner particle for each Standard Model particle; one of these is the Lightest Supersymmetric Particle (LSP) that does not decay. Because the ATLAS detector at the LHC is sensitive to leptons, we search for SUSY decays that result in the LSP and two leptons. To understand the background signal in the detector and our sources of error, we build upon the last generation of particle physics simulations and run an analysis on these theorized dilepton events, tracking the masses, momenta, and energies of the particles. Because of SUSY’s many predictions, we limit our search using an Effective Lagrangian and specify only the interactions we want to examine. The decays that result in detectable Supersymmetric particles and two same-sign leptons are quite rare. However, technical delays and understanding of theory has not reached a satisfactory level yet to conclude whether the dilepton channel is worthwhile.

**Who Initiated a Breakup Predicts Rumination?**
Darya Claussen  
*Mentor*: Sally Dickerson

When romantic relationships end, many respond by thinking about why it ended and what went wrong. For some, this thinking may be negative and excessive. Preliminary evidence suggests that rumination may be more likely to occur in individuals who were rejected in the relationship (rejectees) compared to those who initiated the breakup (rejectors). This study examined those who recently experienced the end of a romantic relationship and assessed current ruminative thoughts. We hypothesized that those who were rejectees would report more current rumination compared to rejectors. We also examined whether relationship length or recency of breakup influenced amount of rumination, and whether rumination on the past breakup was associated with other negative well-being such as depressed mood and anxiety. We predicted that those who ruminate on the breakup are more likely have greater depressed mood and anxiety. The sample included 90 undergraduates who had broken up with a romantic partner within the last year. Participants provided information about the relationship, including relationship length, recency of breakup, and whether or not they initiated the break-up. In addition, participants reported current ruminative thoughts on the ended relationship. Consistent with hypotheses, rejectees reported more current rumination on the break-up compared to rejectors. This difference was significant when controlling for relationship length and recency of the breakup. However, there was no correlation between rumination and negative emotional response (depressed mood, anxiety). Future studies should test how long these effects may persist, as prolonged rumination may have important implications for emotional well-being.

**Understanding Breeding System Evolution Through Outgroup Comparisons**
Dana Clifford  
*Mentors*: Ann Sakai & Stephen Weller

The incompatibility relationships in a tristylos population of *Oxalis alpina* from the Cascada de Basaseachic in Chihuahua, Mexico, were investigated to see whether this population is closely related to *Oxalis alpina* populations in the Sky Islands. All possible crosses of floral morphs were performed within the Cascada de Basaseachic population to compare incompatibility relationships of this population...
growth is attenuated by deleting both virulence of biosynthesis of pantothenate, has been implicated in the therapeutics against the infectious disease tuberculosis. Mycobacterium tuberculosis

Mentor: Marinor Anne Concepcion

The emergence of HIV and multi-drug resistant strains of Mycobacterium tuberculosis (Mtb) drive the need for new therapeutics against the infectious disease tuberculosis. Pantothenate synthetase (PanC), an essential enzyme in the biosynthesis of pantothenate, has been implicated in the virulence of Mtb. Previous studies have shown that Mtb growth is attenuated by deleting both panC and panD genes, thus making PanC a probable anti-TB drug target. Previously, the apo-PanC crystal structure was solved, revealing a Rossmann fold structural motif dimer with a single active site in each subunit. Our goal is to elucidate the structure of PanC with various inhibitors. My research focuses on obtaining PanC crystals with possible inhibitors. To this end, recombinant PanC was over-expressed in E. coli BL21 (DE3) cells and purified using a series of liquid chromatography steps. PanC crystals with inhibitors bound were obtained either by co-crystallization or soaking. X-ray crystallography diffraction data reveals the presence of several inhibitors in the active site of PanC, although electron density maps are not sufficient to fully resolve the orientation of the bound inhibitors. Further understanding of the structure of PanC with inhibitors may play a role in developing new anti-TB drugs.

Crystals of Pantothenate Synthetase from Mycobacterium tuberculosis with Inhibitors

Mentor: Celia Goulding

The Influence of Perceived Social Support on Motivation to Attend College, Academic Success, and Persistence toward Graduation in College Students

Jennifer Cook
Mentor: Thomas Parham

Among the many factors that are perceived to influence college students’ attendance rates of high school students are good grades, family expectations, counseling services in schools, and personal goals and visions of a future career choice that requires formal educational training at the college/university level. While these elements impact the decisions to attend college, there are other variables like social support that may influence that outcome as well. Social support is defined as the existence or availability of people on whom we can rely, people who let us know that they care about, value, and love us. The goal of this study is to examine whether perceived social support has an impact on motivation to attend college, academic success, and persistence toward graduation in college students. To address this question, this study is examining the relationship between social support and motivation to attend college, the relationship between social support and academic success, and the relationship between social support and persistence toward graduation. While the data is currently being analyzed, it is anticipated that social support will have a positive influence on motivation to attend college, academic success, and persistence toward graduation.

Back to the World: Closing the Gap within the Military Transition Process

David Curry
Mentors: Caesar Sereseres & David Snow

Exiting active-duty military service consists of a very complex role transition in which the servicemember undergoes a process of role exit from the military and role entry into civilian society simultaneously. The ability to engage adequately in anticipatory socialization can facilitate the mobilization of requisite human and social capital necessary for successful assimilation and entry into a new role. For this study, we analyzed the military transition process by looking specifically at the Marine Corps Transition Assistance Program and its ability to facilitate positive transitional outcomes. In defining positive transitional outcomes, this study looks primarily at dependant variables of status attainment such as employment, occupational prestige/mobility, educational attainment and home ownership. Further, this study measures dependant variable outcomes against independent variable predictors such as available human capital and access to social capital during the military transition process. Among the key findings within the sample was a strong relationship between a lack of transferable occupational skills/human capital and a social capital deficit that created substantial barriers to a successful military transition. These findings were supported by the population data that was compiled by analyzing existing population datasets. Finally, these results support the alternate hypothesis that the Marine Corps Transition Assistance Program has severe limitations in providing the requisite access to human and social capital that facilitate positive transitional outcomes for the population of exiting enlisted servicemembers, thus falling far short of its intended purpose.
Wnt Inhibitors Frzb and WIF-1 Inhibit Lung Metastasis of Osteosarcoma

Arielle Czerwinski  
Mentor: Bang Hoang

Despite the development of chemotherapy and surgery, lung metastasis remains the main cause of death in osteosarcoma patients, indicating the need to develop novel therapeutic strategies. Wnt inhibitors WIF-1 and Frzb have been reported as metastasis suppressors in other cancers, but their role in osteosarcoma has yet to be explored. In this study we showed that WIF-1 and Frzb expression was reduced in osteosarcoma cells compared to normal osteoblast, showing their important role in osteosarcoma. Therefore, we re-expressed WIF-1 and Frzb in the osteosarcoma cell line LM7 by stable transfection and injected the stable transfectants into the nude mice by tail vein to establish the orthotopic lung metastasis model. We found that re-expression of WIF-1 and Frzb in the LM7 osteosarcoma cell line decreased in vivo lung metastasis in the lung metastasis mouse model. The inhibition of lung metastasis may be related to the down-regulation of S100A4, which has been shown to have an important role in metastasis. This study suggests that the Wnt inhibitors WIF-1 and Frzb have an anti-metastasis effect on osteosarcoma. Therefore, re-expression of these inhibitors in WIF-1 or Frzb deficient osteosarcoma could prove to be a novel strategy for the treatment of lung metastasis of osteosarcoma.

Does Aggression Hinder One’s Adaptation to and Satisfaction from Social Roles?

Meril Dagher  
Mentor: Valerie Jenness

Previous research has shown that exposure to aggressive stimuli leads to increased aggressive behavior or behavioral problems, that aggression is expressed differently among men and women, and that increased aggressiveness can be maladaptive to the individual. The purpose of this study is to better understand how well aggressive individuals adapt to and how much satisfaction they derive from their social roles. It is hypothesized that individuals who score higher on the Aggression Questionnaire (AQ) will neither report adapting as well to their social roles nor deriving much satisfaction from their social roles as compared to individuals who do not have high scores of aggression. Two kinds of aggression will be distinguished: direct aggression and indirect aggression. Direct aggression consists of physical and verbal aggression in which the recipient is confronted; indirect aggression does not involve confrontation. The main social roles being addressed include the roles of being a student, family member, and friend. The AQ and the Social Adjustment Scale-Self Report (SAS-SR) were administered to undergraduate research participants through an online survey. Preliminary analysis suggests that there is a correlation between an individual’s aggression level and how socially adjusted he or she reports being.

Exploring the Testing Effect

John Dandurand  
Mentor: William Batchelder

Tests are routinely used to assess what has been learned; however, tests can also be beneficial to learning. Recent studies have illustrated that tested items are better remembered than untested items and refer to the phenomenon as “The Testing Effect.” This project is a replication and slight extension of a study by Toppino and Cohen, who found that a test trial resulted in better long-term memory than a corresponding additional study trial. Our study involves a 2x2 design, where we test participants’ ability to retrieve Swahili-English word-pairs. All participants receive four initial study trials on the pairs. The next trial is either a study trial or a test trial. All participants receive a final test trial, either immediately or delayed by 48 hours. We expect that participants given two test trials will perform better than individuals given only one test trial in the delayed condition and that participants given an additional study trial (for a total of five study sessions) will perform better in the immediate condition, suggesting that long-term memory is promoted by additional testing. Accordingly, we hypothesize that the benefit of a test trial is that the trial will provide a boost in long-term memory on the items that were correct on the initial test. Data collection is still ongoing, and the presentation will compare our results with the original Toppino and Cohen results. Our long-term goal is to develop a mathematical model to explain the Testing Effect.

Relationships with Parents, Siblings and Peers during Childhood and Adolescent Years Can Be Predictors of Adult Depression

Amarjit Dass  
Mentors: Rimal Bera & Ravi Patel

It is normal to feel depressed, due to various stressful life events, and overcome the emotional battle. However, an individual who has experienced a traumatic event is likely to be clinically depressed and continue to struggle. As childhood trauma is listed as the primary cause of depression in adults, not all depressed adults have encountered trauma or any negative experiences. In contrast, the relationships these people had with their parents, siblings and peers may be indicators of being diagnosed with depression as adults. Little research has been conducted in analyzing childhood and adolescent events and relationships in depressed adults. New studies need to be established to find further evidence of early relationships with certain groups as predictors of adult depression. Whereas past studies have focused on relationships with one of the three groups (parents, siblings, peers), all groups and other vital factors can be involved.
factors will be studied to determine whether past studies are accurate. Data obtained from survey questionnaires will determine whether the quality of relationships is correlated to depression. The expected results should be that experiencing negative relationships during the course of an individual’s childhood and adolescent years will affect the individual’s health by increasing the likelihood of being clinically depressed. Consistency between further studies and past studies can be beneficial in setting interventions to prevent individuals from being diagnosed with the disorder in the future.

**Endometrial Adenocarcinoma: A Retrospective Study on Histopathology at the University of California, Irvine, Medical Center**

Jayson de Guzman  
*Mentor:* Krishnansu Tewari

The objective of the study was to determine concordance of preoperative, intraoperative frozen section, and final pathology of women undergoing surgical staging for endometrial cancer. A retrospective study of women with endometrial adenocarcinoma, treated at the UCIMC from 1995–2007, was performed to review for frozen section and final pathology. Criteria examined included histology, grade, depth of myometrial invasion, and stage. We identified 101 cases with a median age of 57 years (range 33–87 years) at time of diagnosis. In 49 cases with preoperative grade present, 59.2% of cases corresponded to final grade, and in 42 cases with preoperative histology present, 54.8% corresponded to final histology. In 85 cases where frozen section grade was available, 82% of frozen sections were accurate in grade, compared to final grade. In 94 cases where intraoperative histology was available, 78% of intraoperative histology corresponded to final histology. In 94 cases where intraoperative myometrial invasion was available, 88% of myometrial invasion corresponded to final myometrial invasion. Risk group stratification analysis, however, demonstrated a high risk diagnosis in 31% of cases diagnosed with less than 50% myometrial invasion by frozen section, though lymphadenectomy may have been indicated for other reasons (grade, histology). Myometrial invasion, grade, and histology determination by frozen section alone appear reasonably accurate for endometrial cancer staging surgery at UCIMC. Frozen section determination at UCIMC can therefore be used routinely in determining whether to perform pelvic and para-aortic lymphadenectomy in endometrial cancer staging surgery to avoid complications, such as further intraoperative blood loss and lymphedema.

**Cultural Variation in the Expression of Positive Emotion in Couples**

Alexandra de Lory  
*Mentor:* Belinda Campos

Cultures vary in their approach to emotion, emotional behavior, and self-reported emotional experience. Chinese culture values emotional control and moderation. On the other hand, Mexican culture values open and uninhibited expression of positive emotion. This study examined whether members of cultural groups who differ in how they value emotional expressivity also vary in the intensity and frequency with which they express nonverbal positive emotion, specifically Duchenne smiles and laughter. Specifically, I tested the prediction that Latinos will display the most positive emotion and Asians will show the least positive emotion during social interaction. Data was drawn from a study of 63 heterosexual couples who came from three cultural backgrounds—Asian, Caucasian, and Latino. The couples were videotaped while engaging in four structured social interaction tasks. The study examined a one-minute time period during an interaction in which each couple talked about their first date, a task that was designed to elicit feelings of romantic love. This video footage was coded for frequency of both Duchenne smiles and laughter, and Duchenne smile intensity. Though data coding is ongoing, preliminary results indicate that there are differences in expression between members of all three cultural groups, with Latinos exhibiting the most frequent and intense nonverbal displays of love and Asians exhibiting the least frequent and intense nonverbal displays of love.

**Global Cardiovascular Risk Associated with Hypertension and Extent of Treatment and Control According to Risk Group**

Jennifer Dede  
*Mentors:* Stanley Franklin & Nathan Wong

We examined the estimated 10-year global risk of cardiovascular disease (CVD) in U.S. persons with hypertension (HTN), associated cardiometabolic risks, and how treatment and control of HTN varied according to risk category. We analyzed data from 30-year old adults with HTN (n=1509, projected to 60.6 million) from the National Health and Nutrition Examination Survey 2005–2006. We used the data to determine the proportion of persons with HTN in 10-year global CVD risk groups (<10%, 10–20%, >20%), presence of high cardiometabolic risk (diabetes, metabolic syndrome or three additional CVD risk factors), and pre-existing CVD (heart disease, stroke, heart failure, or chronic kidney disease), and HTN treatment and control rates. Among persons with HTN, 24.4% were low (<10% risk), 21.1% intermediate (10–20% risk), 22.6% high (>20% risk), and 31.9% in the CVD group. High cardiometabolic risks were present in 45% of low and 60% of
intermediate risk groups. The proportion of subjects with HTN on treatment was 58%, 66%, 66%, and 75% for <10%, 10–20%, >20%, and CVD groups, respectively. Control rates for HTN were 80% for younger lower risk persons, but under 50% for older higher risk and CVD groups. Nearly two-thirds of men and 50% of women with HTN were in high global and CVD risk groups and 35% of both sexes in the low and intermediate risk groups had high cardiometabolic risks; these persons in particular should be treated adequately to achieve BP goals. However, despite improved treatment in high-risk HTN subjects, control rates were lower than in low-risk subjects.

**Transition into College among Latina/o Students: Effects of Participating in a Cultural Outreach Program**

Alexandria Delgado  
*Mentor*: Jutta Heckhausen

Social support is a predictor of success in life transitions such as the transition to college. This study focuses on the sense of social support experienced by Latina/o students in college who participated in cultural outreach programs, and examines potential predictive relationships with the students’ academic outcomes. For minority students, knowing other students of their own ethnicity on campus could instill a sense of social support and feeling that one fits in with the cultural climate of the campus. Through this research we may begin to understand whether cultural outreach programs influence how minority students navigate their transition to college, recruit sources of social support, adjust to the college environment, and manage their academic achievement. An online survey is being conducted in which variables such as demographic information, academic performance, sense of social support, perceived importance of contact with other students of their own ethnic or social group, campus involvement, self-identity, and post-graduation aspirations are assessed. We expect to find that students who participate in cultural outreach programs and later become involved in an on-campus club or organization will have a better sense of social support, feeling-in, and higher academic performance than those who do not. The findings of this study will allow us to better understand how to reach out to underserved communities and aid in minority students’ perception of social support and cultural fit with the campus climate in order to help them optimize their academic achievement and subjective well-being.

**Latina Undergraduates, Coping, and Well-Being: A Psychosociocultural Analysis**

Ashley Delgado  
*Mentor*: Jeanett Castellanos

Although Latinas are enrolling in and graduating from four-year institutions at a higher rate than their male Latino counterparts, Latinas face many unique obstacles that affect their educational pursuits, causing them to report more stress. Specific barriers engaged by Latinas include: cultural incongruity, discrimination within their educational context, negotiating home and school responsibilities, and financial constraints. Given the complexity of Latinas’ educational journeys and the value of higher education, it is critical to examine the means by which Latinas cope throughout their undergraduate experience while maintaining their well-being. This study will incorporate the psychosociocultural framework by implementing the psychological (coping), social (social support), and cultural (cultural congruity) dimensions. These dimensions will explore factors that contribute to Latinas’ coping processes and the attainment of well-being in higher education by using a qualitative approach through which eight Latina undergraduate students of any class standing (i.e., freshman, sophomore, junior, senior) will be interviewed. Findings will provide additional understanding to important psychological processes and their combined influences on Latinas’ educational experiences, adjustment, and reported well-being.

**Extra-Curricular Activities as Predictors of Academic Attainment in Latinos**

Jorge Delmuro  
*Mentor*: Caesar Sereseres

According to McNeal, “participation in high school extra-curricular activities is often viewed as a non-essential and non-central element of an adolescent’s education.” As a result, extra-curricular activities are always targeted first for budget cuts. With an increasing Latino/a student population, there is a need to better understand the effects that extracurricular activities have on Latino/a students’ educational attainment. This study examines and displays how extra-curricular activities positively affect educational attainment in Latinos. Extra-curricular activities are organized into two categories, school and non-school provided. Research indicates that both settings provide students a greater opportunity to become more involved and successful in their academics. However, there is a lack of research relating to extracurricular activities and its impact on Latino/a students’ academic attainment. The goal of this study is to determine whether participation in extracurricular activities helps Latino/a students succeed academically. The majority of the individuals who participated in extracurricular activities have excellent GPA scores and a greater desire to continue their education. In addition, school-provided extra-curricular activities have a greater influence on Latino/a students’ academic attainment and success. These results provide greater evidence that budget cuts to extra-curricular activities hamper Latino/a students’ educational attainment because participation in extracur-
rictacular activities is correlated to academic attainment and success in Latino/a students.

**The Influence of Time Management on College Adjustment: A Comparison of Asian and White Students**

Tiara (Vubataz) Din  
*Mentor*: Chuansheng Chen

Ethnic differences in academic achievement between Asian and White American K–12 students are well-documented by previous research; however, less is understood about these differences among college students. Several recent studies have shown that the college years are particularly challenging for Asian Americans as compared to their White counterparts. This study compared Asian (*N* = 160) and White (*N* = 275) college freshman in their adjustment to college, with a particular focus on time management and its relation to parenting behaviors, adolescents’ psychosocial maturity, and well-being. Independent sample t-tests were conducted to test mean level differences between Asian and White students. Bivariate correlations were run separately for Asians and Whites to examine the associations among time management, parenting, maturity and well-being. Results showed that Asian college students scored lower in time-management and psychosocial maturity than did Whites. These differences could be accounted for by parenting practices, which showed similar relations to adolescent outcomes for both ethnic groups.

**γS-Crystallin and the Mutations that Cause Protein Aggregation**

Harmony Dixon  
*Mentor*: Rachel Martin

Cataracts are caused when the proteins in the eye lens, known as crystallins, aggregate. It is hypothesized that this is caused by misfolding of the protein due to environmental factors, or mutations in the protein’s DNA. The G18V mutation of γS-crystallin has been shown to cause congenital cataracts. The purpose of this research is to better understand how mutant G18V crystallin aggregates in the eye by observing what kinds of interactions cause the mutant G18V crystallin to aggregate. This was done by carrying out binding assays of wild type and G18V with tripeptide probes synthesized by SPOT synthesis. Results from SPOT synthesis have been attained and show varying degrees of binding between the crystallin and the tripeptide probes. These results are currently being analyzed for further testing. Future studies will be done using Surface Plasmon Resonance on the tripeptide combinations that were successful binders to G18V and not wild type to gain binding constant data. These experiments will help to increase the knowledge of γS-crystallin and contribute to the development of better treatments for cataracts.

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**New Media in Social Movements**

Emmeline Domingo  
*Mentor*: David Meyer

Social movement activists use mass media to communicate their concerns and activities to a broader public. How to do so effectively is a matter of much scholarly and activist debate. Most of the literature focuses on how activists can use mainstream media to their advantage, but this literature is outdated for two interrelated reasons. First, activists face an environment in which mainstream media are losing audiences. Second, there are now alternative media outlets including social networking websites, blogs, websites, and direct electronic communication. New media have the advantage of communicating with more people over longer distances in a shorter period of time. However, this advantage is undermined by inherent problems of miscommunication and misinformation. In this study I examine the implications of new media on social movements through a case study of the U.C. Student Movement of 2009–2010, and I compare old and new media strategies in terms of access and reach. I conclude that although new media has advantages for social movements, analysts and activists do not yet understand all the implications; therefore, more research needs to be done.

**Mechanism of Cellular Response to FTY720**

Eun Dong  
*Mentor*: Aimee Edinger

FTY720, a sphingosine analog, is a drug that is being tested for its use as a cancer therapy. Preliminary studies show that FTY720 causes a decrease in the surface level of nutrient transporters and internal accumulation of the transporters in the cells. However, mechanism and cellular compartments responsible for these changes are still in question. To clarify this question, I used immunofluorescence and stained for nutrient transporter and other cellular compartments to block biosynthetic pathway. The results showed that there is partial co-localization between trans-Golgi and nutrient transporters, implying that nutrient transporters and internal accumulation of the nutrient transporter and cellular compartment and (2) any changes in cellular compartments. Additionally, the cells were treated with cycloheximide, a protein synthesis inhibitor, to block biosynthetic pathway. The results showed that there is partial co-localization between trans-Golgi and nutrient transporters, implying that nutrient transporters are trapped in trans-Golgi under the effect of FTY720. At the same time, trans-Golgi is abnormally dispersed throughout the cell when treated with FTY720, denoting that FTY720 causes internal accumulation of nutrient transporters by disrupting trans-Golgi. Also, under the effect of cycloheximide, the internal nutrient transporters disappear, suggesting the possibility of biosynthetic disruption by FTY720. Therefore, this study indicates that FTY720 downregulates nutrient transporters in two distinct mechanisms, rapid internalization of nutrient trans-
porters from cell surfaces and rather slow disruption in biosynthetic pathways.

**Which Banks Get Federal Bailout Dollars and Why: A Historical Approach**

Sean Dowsing  
*Mentor: Gary Richardson*

This paper looks at what characteristics of banks in the 1930s increased their probability of receiving a federal bailout loan from the Reconstruction Finance Corporation (RFC) and what dictated the size of that loan. Studying past bailout plans helps shed light on current economic recovery efforts, such as the Troubled Asset Relief Program (TARP) plan. This paper is unique because it studies the role politics played in one specific facet of Roosevelt’s New Deal plan as opposed to studying the plan as a whole. This paper uses a dataset that consists of all the banks in the states of Alabama, Mississippi, Arkansas, Tennessee and Michigan for the years 1932 and 1933; the data has county- and bank-level statistics. To estimate the effects of politics in the RFC’s loan distribution, several regression methods are used: logistic regression to measure the probability a bank received a loan, OLS to analyze what methods are used: logitistic regression to measure the nates with 1H and 13C but lacks the 15N channel that is needed to completely characterize proteins. We are modifying this existing probe by adding a 15N channel to the circuit and making the probe triple resonance. This will create some hardware design challenges since the resonance of the nitrogen channel is 1/10 the proton frequency, and the probe/coil do not naturally resonate at that frequency. By using a layered capacitor model to add additional capacitance to the nitrogen line, we hope to change the resonance and solve this issue. An alternative hardware solution could be the cross-coil design. In this hardware design, two coils with orthogonal fields (so as not to interfere) are used: one is a solenoid and the other a saddle coil. The solenoid would resonate at the higher frequency (proton) while the saddle coil would resonate at the lower frequencies (nitrogen and carbon). In doing so, the low capacitance of both the nitrogen and carbon channels would become non-issues, as the solenoid coil would cater specifically to their resonate frequencies.

**Development of a 500 Mhz Triple-Resonance SAS Probe**

Vincent Duong  
*Mentor: Rachel Martin*

Switched angle spinning (SAS) is a solid state NMR technique used to obtain dipolar coupling information that can be used to extract long range interactions. We have built a 500 MHz double resonance pneumatic SAS probe in order to study membrane associated proteins. The probe resonates with 1H and 13C but lacks the 15N channel that is needed to completely characterize proteins. We are modifying this existing probe by adding a 15N channel to the circuit and making the probe triple resonance. This will create some hardware design challenges since the resonance of the nitrogen channel is 1/10 the proton frequency, and the probe/coil do not naturally resonate at that frequency. By using a layered capacitor model to add additional capacitance to the nitrogen line, we hope to change the resonance and solve this issue. An alternative hardware solution could be the cross-coil design. In this

**Mechanisms of Age-Associated Plasmacytoid Dendritic Cell Dysfunction**

Marc Anthony Esposo  
*Mentor: Anshu Agrawal*

Plasmacytoid dendritic cells (PDCs) are a subset of dendritic cell that secrete the cytokine Interferon-alpha, which plays an essential role in responding to bacterial and viral infections. Studies have linked lowered IFN-alpha secretion in aged individuals with increased susceptibility to disease, but the specific molecules and signaling mechanisms involved are not well understood. To address this question, PDCs from young and old individuals were exposed to Cpg and influenza (stimuli that activate PDCs and induce the secretion of IFN-alpha). Activation status of signaling molecules, Interferon regulatory factor-7 (IRF-7) and Nuclear Factor kappa b (NFkB), known to be essential for production of IFN-alpha, was determined using flow cytometry. This study found that aged individuals showed less activation of IRF-7, and NF-kB in comparison to young individuals when subjected to bacterial and viral stimuli. Such findings indicate that impaired function of these molecules may account for the decreased IFN-alpha secretion observed in the aging community.

**Politics of Hip Hop**

Cyrus Fard  
*Mentor: Katherine Tate*

Hip hop emerged in the latter part of the 20th century as a black cultural movement. A question typically asked by those unfamiliar with the genre is whether the lyrics and messages of the artists contain political value, or exist simply as a glorification of sex, drugs, and violence. The influence of Black Nationalist ideology, promoted by groups such as the Nation of Islam and the Black Panther Party, on prominent rappers primarily between 1987 and 1994 suggests their words do have value. Their efforts led to a politicized aesthetic and content shift in the genre that challenged what they saw as anti-black oppression during the twelve-year Republican administrations of Reagan and Bush. Through an analysis of the words and political stances of major hip hop figures during the aforementioned era—specifically Ice Cube, Public Enemy, and 2Pac Shakur—their philosophies and references reveal similarities and ties to the rhetoric of Black Nationalism. How-
ever, the subsequent increased commercial success of the “gangsta rap” aesthetic, the racial hybridization of hip hop (a black genre), with pop (a white-dominated genre), and the notable decline of Black Nationalist ideology in black politics by the late 1990s, have all but alleviated politics from the forefront of discourse in mainstream hip hop music. The lack of radical politics in contemporary hip hop appears to be enduring in a “post-racial” society that seems less concerned with racial issues in the current political and social climate.

The Making and Consuming of New York City in John Dos Passos’ Manhattan Transfer
Danielle Farrell
Mentor: Richard Godden

In his 1925 New York City-based novel, Manhattan Transfer, John Dos Passos demonstrates the city’s consumption of its inhabitants. Away from rural communities and nature, New Yorkers are individualized and look at surrounding structures as means of survival. Analysis of Dos Passos’ work alongside sociological and historical studies displays a shift away from the traditional American literary model of land as hero to a focus on the effects of industry on individuals. Dos Passos compares several characters, like the newly-arrived farmer Bud Korpenning, to buildings. Though high-rise buildings lend themselves to the very image of New York City’s landscape, Dos Passos continually displays them burning or being destroyed. Like their contrasting counterparts in the novel, characters burn and/or commit suicide. The wealthy, aspiring architect Stan Emery commits suicide by burning his body inside a building, causing the skyscraper’s demise alongside his own. Ultimately, the bodies lose their biological connection in that, like the buildings, they are replaceable and, therefore, not individuals.

Generating Antibodies Specific for FoxH1 Transcriptional Factor Mediating TGF-β Signaling and Mesendodermal Formation
Cyrus Farzaneh
Mentor: Ken Cho

Nodal members of the transforming growth factor-β (TGF-β) superfamily are well known to play a major role in mesoderm and endoderm specification during early vertebrate development. A winged-helix domain DNA-binding transcription factor, FoxH1, has been categorized to mediate nodal signaling in vertebrates including Xenopus, in addition to nodal ligands. To further explore the role of FoxH1 in mesendoderm formation during early frog development, it is essential to identify FoxH1 direct targets. Antibodies are a key reagent for this type of endeavor. Because antibodies for the FoxH1 protein are not readily available for research, the goal of this project is to generate high quality polyclonal antibodies specific for FoxH1.

Western blotting and chromatin immunoprecipitation analysis confirmed that we have in fact successfully acquired a polyclonal anti-FoxH1 antibody. Immunolocalization studies using the FoxH1 antibodies were performed to visualize FoxH1 localization. With further research, using this antibody in immunoprecipitation will help identify and decipher the role of FoxH1 at the genome-wide level.

Identification of Possible Mutations in Synechococcus that Confer Resistance to a Cyanophage
Aayah Fatayerji
Mentor: Jennifer Martiny

Studies have shown that Synechococcus and cyanophage can undergo numerous cycles of coevolution in laboratory experiments, whereby the host evolves resistance to a phage and the phage, in turn, evolves to infect the resistant host. This project aims to identify some of the possible genes in Synechococcus that could be targets of these co-evolutionary genetic changes. A Synechococcus strain, WH7803, was inoculated with a cyanophage (S-RIM8) into four replicate chemostats. Genome sequencing of the ancestral and a final Synechococcus isolate revealed eight mutations over the course of the six-month experiment. To analyze if one or more of those mutations are responsible for the phenotypic changes, we PCR amplified the regions around those mutations in 13 chemostat strains. In seven of the eight genes analyzed, there was no variability among the strains, suggesting that the mutations were specific to the strain that was fully sequenced. In contrast, one gene was variable among the 13 strains (at location 103283) on the Synechococcus genome. This gene encodes glucose-1-phosphate thymidyltransferase, an enzyme that participates in nucleotide sugar metabolism. Using this information, we are sequencing the complete gene of all the 13 chemostat strains as well as seven other strains present in the lab to detect if additional mutations exist in the region. We are also testing the correlation between these mutations and which host strains are sensitive or resistant to viral infection. Together, this will allow us to compare genetic diversity of the analyzed gene with Synechococcus’ phenotype.

Biotelemetry—Heart Monitor
Kevin Fok
Mentor: Arthur Zhang

Telemetry monitoring refers to the monitoring and analyzing of data that are transmitted from a distance. It is becoming more common in hospitals because it allows patients to be monitored, while giving them the freedom to move around instead of being confined to their beds. Typical telemetry devices employed in hospitals monitor patients’ cardiac health wirelessly using electrocardiography (ECG). However, ECG monitoring devices usually require patients to place multiple electrodes around the body to
accurately monitor the heart’s electrical activity, which can be obstructive to the patients. For my research project, I intended to create a low powered, low profile wireless heart monitor that attaches to a patient’s wrist. I proposed to use a small electret microphone to record the patient's pulse, and then translate the noise into comprehensible data that describes their heart rate and heart condition. Through my initial experiments, I discovered that the recordings did not resemble the sound wave of a typical heartbeat, but instead, the microphone acted similar to a pressure sensor and only recorded the palpitations of the pulse. Although the device does not definitively monitor heart activity, the experiments show that the electret microphone can still be used to measure heart rate and indicate heart conditions.

Characterization of Amygdalar Corticotropin Releasing Hormone in Middle-Aged Rats Exposed to Early-Life Stress
Kimberly Fok
Mentor: Tallie Z. Baram

Chronic psychological stress (CES) occurring during the early stages of mammalian development may contribute to impairments in stress reactivity and learning and memory in adulthood. The mechanisms by which CES provokes these effects are not fully established, but may involve the molecular components of the stress-responsive hypothalamic-pituitary-adrenal (HPA) axis; specifically, increased release of corticotropin releasing hormone (CRH). Altered levels of CRH in the amygdala (CeA), a region involved in regulating the HPA axis, may contribute to the long-term adverse outcomes following CES. Animal models provide a critical tool for defining the effects of chronic early-life stress on the HPA axis system in humans. Therefore, we used a rat model of CES in which the dam had limited access to nesting material during the first postnatal week (postnatal days 2–9), and this rearing environment reliably produced chronic stress in her offspring. CRH-immunocytochemistry was performed on middle-aged (12-month old) CES and CTL rat brain sections. Optical density and cell counting techniques are being used to assess CRH-CeA levels in the two groups to determine the potentially long-lasting consequences of CES on CRH content in amygdala. Understanding how CRH is regulated in the amygdala after CES may provide clues about the influence of early-life psychological stress on affect and cognition later in life, and provide a potential molecular target (CRH) for stress related disorders.

The Cambodian Genocide and its Moral Implications
Warren Fong
Mentor: Susan Davis

“The Cambodian Genocide and Its Moral Implications” consists of a critical and a creative component. My re-
problems associated with colonization, which have increased feelings of frustration and injustice among Muslims. Combined with the fragmented organization of the second-generation harki movement, the result has been a superficial recognition of these French citizens, while no long-term solution has been reached for elevating the socioeconomic status of harkis in France.

21st Century Privateers: How Privatization Can Help Reform the U.S. Intelligence Community
Michael Fuller
Mentor: Patrick Morgan

Since its creation in 1947, the U.S. intelligence community has been faced with a number of consequential problems. These problems range from structural to psychological and pervade every aspect of the intelligence process. The major reforms that took place as a result of the Intelligence Reform and Terrorism Prevention Act of 2004 made many significant contributions to restructuring and reorganizing power within the community. However, in many cases, it merely substituted one problem for another and ignored other problems altogether. Recent trends have shown an increase in the use of private sector and outside entities other problems altogether. The major reforms that took place as a result of the Intelligence Reform and Terrorism Prevention Act of 2004 made many significant contributions to restructuring and reorganizing power within the community. However, in many cases, it merely substituted one problem for another and ignored other problems altogether. Recent trends have shown an increase in the use of private sector and outside entities.

The Effects of Egf and Fgf on the Transcription of Genes Involved in the BMP Signaling Pathway
Nicole Furr
Mentor: Edwin Monuki

BMPs are signaling molecules responsible for proper development throughout the body in all organisms. They signal through a small number of tyrosine-kinase receptors, which phosphorylate a receptor Smad protein (R-Smad). R-Smad then associates with another protein specific to BMP signaling called Smad4. This complex then travels to the nucleus to act on target genes. Although this pathway is consistent, different expression patterns are somehow achieved. Because Smad have low binding affinities for DNA and low selectivity for binding sites, I hypothesized that there may be other transcriptional cofactors used to stabilize the DNA-Smad interaction and identify appropriate targets for expression. Because the Smad binding region is 46 bp, the number of possible cofactors is small. Our BMP reporter gene, BRE-LacZ (BLZ), has been found to exhibit ultrasensitive to BMP4. However, this ultrasensitivity decreases when the growth factors, Fgf2 and Egf, are removed from the environment. It has been proposed that ultrasensitivity leads to sharp border formation in the brain, which is essential for proper neural development. By testing which candidate genes exhibit similar expression patterns to BLZ, I have attempted to determine which genes could be associated with Smad and thus the regulation of ultrasensitivity. To test my candidate genes, E12.5 mouse cortical cells were cultured in the presence and absence of Fgf2/Egf for 48 hours. I designed and validated primers for my genes of interest, and compared their expression in the cortical cells in the presence and absence of growth factors using qRT-PCR. Of the candidate genes tested so far, none have exhibited a significant expression difference due to the growth factors.

Neural Mechanisms Underlying Age Differences in Dopaminergic Drug Sensitivity
Gabriela Ganddini
Mentor: Frances Leslie

Adolescence is a critical developmental period that spans from 12–18 years in humans, and from postnatal day 28–42 in rodents. During adolescence, extensive reorganization of the dopamine (DA) system occurs, which may underlie the increased incidence of drug abuse and the emergence of neuropsychiatric disorders observed at this time. Both human and rodent adolescents show blunted behavioral and biochemical responses to indirect DA agonists (like cocaine and amphetamines). Through preliminary studies, we have shown changes in functional sensitivity of D1 and D2-like receptors during adolescence, which suggest a shift from D2 receptor control of locomotion and stereotypic behaviors during adolescence to D1-like control during adulthood. To determine age differences in the neural circuitry underlying the behavioral effects of D1 and D2 receptor agonism, alone and in combination, brains were collected from behaviorally tested animals and processed for in situ hybridization for the immediate early genes (IEG) c-fos and arc. Animals of both ages show strong activation of central stress nuclei following D2 receptor stimulation. Adolescents show unique patterns of IEG activation from D1/D2 stimulation compared to adults. Furthermore, network analysis suggests that D1/D2 stimulation alters functional integration of the limbic system in age-specific ways. These data highlight the importance of age as a consideration in dopaminergic drug design and clinical application.
Basic-Aromatics in alpha-Defensin Bactericidal Activity: Structural Analysis of a Synthetic Protein from a Consensus Sequence

Kevin Ganesh
Mentor: Melanie Cocco

Defensins are short immune system peptides less than 100 residues long and are secreted in μg–mg per mL concentrations in the epithelial cells of plants and animals. They exhibit broad spectrum activity against fungi, bacteria, and viruses, and can promote the activity of immune system cells to the sites of pathogenic infection. In this study, I examined the role of the defensins’ basic-aromatic clusters in the inhibition of bacterial growth. I produced a synthetic defensin, designated “Synfensin,” from a consensus defensin sequence designed exclusively to retain the structural properties essential for antimicrobial activity. In a microbicidal assay, Synfensin’s antimicrobial activity was found to be significant against several *Escherichia coli* species. 1-D H-NMR spectroscopy correspondingly suggested Synfensin’s basic-aromatic clusters were structurally comparable to that of natural α-defensins, and that they structurally interact with bacteria.

The Shared Physical Infrastructure Between Mexico and the United States

Ces’Ari Garcia
Mentor: Caesar Sereneres

Border security drew much of the United States’ attention after September 11, 2001, which then created a renewed focus on the border region between the United States and Mexico. The terrorist attacks may have spurred new debates in regards to the border region; however, this region has been a source of conflict ever since the two neighbors first made contact in 1819 through the Adams-Onis Treaty. As globalization increases, it is crucial that the United States and Mexico maximize their relationship for economic gains instead of quarreling. It was the hope of this study to reveal the interdependence of the United States and Mexico by analyzing physical infrastructure. The study has shown that the United States and Mexico are significantly interdependent, which is why infrastructure that aids in promoting isolation, like that of the border fence, can be detrimental to both countries’ global competitiveness. The study delves into the analysis of types of shared infrastructure such as transportation, energy, and security.

A Closer Look at Hometown Associations: A Case Study on Reinas de la Cana

Jeannette Garcia
Mentor: Susan Coutin

Hometown associations are composed of migrants who come together to support their community of origin. They do this by raising funds for development projects, such as paving roads, purchasing school supplies for children, or establishing youth centers. Through such activities, these organizations create and promote community building, cultural exchange, and the dissemination of information. Governments of immigrant sending countries have developed strategies to encourage this sort of transnational yet local aid. At the same time, these associations face barriers that prevent them from effectively completing projects that aid in their development. The motivations for participating differ among the members, causing commitment issues that interfere with the effectiveness of their projects. The motivations for participating in such associations also vary from cultural, political, economic, social reasons, and may not match those that governments encourage. The goal of this case study of Reinas de la Cana, a Salvadoran hometown association, is to explore the motives of members of this group and how these have evolved throughout their time of membership, as well as how the members’ activities compare to those promoted by the Salvadoran government. The motives for the majority of the members have changed since joining the group because of familial pressures or enjoying their participation for personal growth and knowledge. The purpose of Reinas de la Cana is not only to raise money to fund various projects in Cojutepeque, El Salvador, but also to create cultural ties among Cojutepequeños in Southern California.

Maywood Residents vs. L.A.U.S.D.: Documenting the Controversy behind Site 18

Jeannie Garcia
Mentor: Catherine L. Benamou

Two years ago the Los Angeles Unified School District (L.A.U.S.D.) decided they needed to relieve the overcrowding of Senior Bell High School, which is located in the city of Bell neighboring Maywood (south East Los Angeles), and is overseen by school board member Yolie Flores. They decided that Maywood would become the home of a new high school. Many residents voiced their concern that the new school would lead to the destruction of existing homes, although multiple populated sites were proposed. For the past year and a half I have been documenting these debates as well as the experiences of Maywood residents who have faced eviction. I wanted to show their struggle in securing a home for their families; at the same time, I show the complexity of the process of constructing and publicly funding a new high school. As a Maywood resident myself, I was able to gain the trust of the community. I gathered footage of events such as the community outreach meeting provided by L.A.U.S.D., protests by opposing residents, and fundraisers held by the residents of site 18. I conducted oral history reports and will show a few clips from this footage, taken using a small two-person video crew. All of the interviews have been
saved and will be turned into a medium-length document (58 minutes).

The Effect of Online Social Networking Tools on the Mobilization and Support of the Iranian Green Movement
Raha Ghasemi
Mentor: Bojan Petrovic & Caesar Serereses

While studies reveal the ability of social networking technologies to direct and enhance global political discourse, they fail to show the ways in which Internet-based platforms aid in the development of social movements. My study explores the uses of social media technologies in initiating and coordinating the political protests following the 2009 Iranian presidential election. Despite the Iranian government’s control over the media and communication apparatus, the tech-savvy Iranian youth used social networking sites and mobile phone technology to mobilize for political action, both domestically and internationally, against the reelection of President Mahmoud Ahmadinejad. Methods used to perform this study include content analysis of Twitter posts, Facebook groups, and YouTube videos pertaining to post-election unrest, as well as comprehensive examination of secondary sources, including news articles, journals and scholarly reports. The study concludes that, aided by the vast “multimodal” digital space”—a term that has emerged in reference to a burgeoning online public sphere—cyber activists and regular users have harnessed leadership over the movement in a manner that transcends the reformist political leader, Mir Hossein Moussavi. In the absence of centralized leadership, social networking sites provide citizens the tools necessary to organize protests and raise awareness, thereby creating a formidable opponent against the regime despite challenges of censorship and oppression.

The Effects of the Active Ingredients of Rhodiola rosea, Salidroside and Rosavin, on Lifespan Extension in Drosophila melanogaster
Nelli Ghazaryan
Mentor: Mahtab Jafari

*Rhodiola rosea* is a proposed adaptogenic drug, as it has been shown to have antiaging properties and to extend lifespan in *Drosophila melanogaster*. The pathways through which the extract works are unknown and, through this project, we have attempted to look at the properties of two possible active compounds found in the extract; salidroside and rosavin. By acting on the free radicals that are thought to be the driving force behind aging, these compounds can shield the organism from such stresses and extend lifespan without having any adverse effects on the secondary physiological mechanisms such as fecundity and metabolic rate. Flies were tested for lifespan expansion with assays in 24 hour light and a 12//12 light dark cycle, their health-span properties were measured by doing locomotion and fecundity assays. Salidroside and rosavin were both shown not to have a negative effect on the fecundity of the organism, and locomotion was not altered. There was a marginal lifespan increase in the mean of male *Drosophila* and a much more significant increase in females. Assays should be replicated to confirm results. These data show that salidroside and rosavin have properties that suggest that they are adaptogenic compounds and that they may in fact be acting through the free radical theory of aging.

Natural Gas and Security in Europe
Aleksan Giragosian
Mentor: Yuliya Tverdova

An increasing reliance on natural gas imports has made Europe more vulnerable to foreign actors. As the largest exporter of natural gas to Europe, it is feared that Russia is accumulating an inordinate amount of political and economic influence. This has led the EU and the U.S. to sponsor two separate pipeline initiatives known as Nabucco and White Stream. If constructed, these pipelines would import gas from the Former Soviet Union, avoiding the Russian pipeline network and decreasing Europe’s reliance on Russian gas. European imports of Russian gas have allowed Russia to dominate the European energy market, which has resulted in an overall decline in Europe’s energy security. In an effort to maintain its dominant position, Russia has proposed the South Stream pipeline project. Due to demand and supply factors, the South Stream pipeline cannot be built simultaneously alongside Nabucco or White Stream. The question of which pipelines will be completed has important implications for European security. This thesis seeks to determine which of the three pipelines has the highest probability of completion, the resulting political and economic ramifications. The likelihood of construction is determined according to three factors: the availability of external sources of financing, the availability of sources of natural gas supplies, and the support of transit countries. I posit that the Nabucco pipeline has the highest likelihood of success because it has satisfied the three criteria to a greater degree than either the White Stream or South Stream pipelines. As a result, Europe will be able to decrease its dependence on Russian natural gas and, thereby, increase its energy security.

The Involvement of the Melanin-Concentrating Hormone (MCH) System in Seizure Susceptibility
Krupa Gohil
Mentor: Olivier Civelli

The Melanin-Concentrating Hormone (MCH) system, originally found to be involved in feeding regulation, has been shown by previous studies to play a role in enhancing excitatory transmission in areas of the brain involving epi-
lepsy. These results are significant to indicate that the MCH Receptor, which is highly expressed in the hippocampus, and its antagonists may be the central target in developing anti-epileptic drugs. To address this question, pentylenetetrazol (PTZ) was used to induce seizures in both MCH1R knock-out and wild type mice for thirty sessions in order to determine the role MCH plays in seizure susceptibility. Based on a pre-determined scoring system, various seizure behaviors were recorded thirty minutes after PTZ administration in knock-out and wild type mice. It was found that mice lacking the MCH receptor were highly resistant to PTZ-induced seizures in comparison to wild type mice. Wild type mice were found to be highly kindled to PTZ while MCH-R knock-out mice were mostly resistant to clonic-tonic seizures. Concluding data indicates that the MCH system positively modulates the regulation of seizure threshold. Through these findings it can be concluded that the MCH system is prevalent in the development of anti-epileptic drugs by testing MCH-R antagonists in various seizure models.

Drinking and Driving: Perceived Stigma and Consequences
Janine Golino
Mentor: Roxane Cohen Silver

This study investigated how college students respond to and perceive others convicted of driving under the influence (DUI), based on variation in the severity of the consequences of the offense. We recruited 152 female students from the University of California, Irvine and randomly assigned them to interact with a confederate who had one of two potentially stigmatizing conditions (received a DUI that did not harm another person or received a DUI that resulted in physical harm to another person) or provided no information (a control). Participants were interviewed about their life experiences, listened to a tape recorded interview in which the confederate described her background, completed a series of questionnaires, and then participated in a video-recorded interaction with the confederate. Findings suggest that preference for social distance is related to the participant’s past experiences. Group affiliation, perceptions of risky behaviors, and media exposure also play a role in the acceptance of deviant behaviors depicted within these stigmatizing conditions.

Generation and Atomization of Oil-Water Emulsions
Guillermo Gomez
Mentor: Vincent McDonell

With today’s growing need for fuels with minimal environmental impact, the role of water/fuel emulsions is likely to increase. As a result, the study of the behavior of these emulsions is increasingly important. One of the key questions that must be addressed is how the emulsified state affects fuel injection behavior. To study this, an experimental facility has been developed to generate and spray emulsions that can be repeatable and consistently created. Diesel fuel and water are mixed in the laboratory to create an emulsion that consists of microscopic water droplets dispersed in a continuous phase of diesel fuel. Surfactants are added to stabilize the mixture. The two liquids are introduced together through a shearing device where water droplets are formed throughout the fuel. The water droplets are then digitally imaged with a microscope and sized with laboratory computer image processing software. The shearing device can be controlled to generate different types and sizes of emulsions. The data from each condition (water to diesel ratio and mixing frequency) are then analyzed to provide the average droplet size and the stability of the emulsion. Supporting measurements of emulsion density, viscosity, and surface tension are also collected. The data gathered is then further analyzed using existing correlations developed to predict droplet sizes for pressure swirl atomization. The ultimate purpose for the experiments performed in the laboratory is to understand what types of emulsions will result in smaller spray droplet sizes. Smaller droplets produced by the atomizer will result in more efficient operation and lower combustion temperature in gas turbine applications, which will, in turn, result in decreased pollutant emissions.

The Solar Degradation of Endocrine System Disrupting Chemicals
Grant Gontarski
Mentor: William Cooper

Many pharmaceutical compounds used by the general population are not completely broken down in the body and are passed into the water supply and surrounding environment. The compounds diethylstilbestrol, 4,4 dihydroxystilbene, and trans-resveratrol all have varying levels of activity as estrogen in the human endocrine system. The solubility of these compounds in water is relatively low (micrograms per liter), making the detection in solution very difficult using UV spectrometers. Using more sensitive fluorescence detection, the exact concentration of the compounds may be known and tracked. These highly conjugated compounds have displayed absorbance above 300nm in solution, which lies within the spectrum of natural solar UV radiation. This absorption leads to the degradation of the compounds from exposure to natural solar radiation. To imitate natural radiation, a solar simulator lamp is used to provide constant exposure to the compounds. Each compound is shown to be fully degraded within two hours of exposure to solar radiation. All compounds have followed a direct photolysis reaction pathway, such that the degradation and byproduct formation of each compound may be seen using HPLC separation. Although the lifetime of the initial mother compound is very short in the presence of UV solar radiation, the chemical structure...
of the byproducts is more stable and long lived under solar radiation. Further investigation into the chemical structure of these byproducts will yield better understanding of the fate of these compounds in the environment.

**Jaw Morphology and Structure in Lamniform Sharks**

Brian Goo  
*Mentor*: Adam Summers

The Lamniformes (Chondrichthyes) are a diverse lineage of highly predatory sharks. Though taxonomically few, they vary widely with regard to trophic morphology and ecology. However, the functional morphology of their feeding apparatus is difficult to study *in vivo,* due to the large size, rarity, and pelagic nature of many of the species. To determine whether and how skeletal performance varies with phylogeny and ecology, we calculated an indirect, shape-based measurement of jaw stiffness (second moment of area (I_n)) from digital cross-sections of CT scans (1mm slice thickness) of adult animals. We examined six closely-related lamniform sharks (shortfin mako, sandtiger, salmon, goblin, crocodile, and bigeye thresher) and two outgroup species (Orectolobiformes: nurse shark; Carcharhiniformes: blue shark), all of which feed on nektonic prey. By calculating second moment of area along the length of the jaws, we examine the contribution of shape to skeletal flexural stiffness, locating areas of reinforcement and defining their magnitude, and describing the suggested orientation of loading among species. Our results suggest that although these sharks have similar diets, there may be large and mechanically-important differences in the morphologies of their jaws. For example, the salmon (Lamna), sandtiger (Carcharias), and nurse (Ginglymostoma) sharks show comparatively low moment values. Furthermore, we found four of our species (Mitsukurina, Psudocarcharias, Carcharias, Isurus) exhibit a “corkscrewing” of the orientation of loading from the rostral to caudal ends of the jaws.

**Prochlorococcus and Synechococcus in the Global Map**

Rodolfo Gordillo  
*Mentor*: Adam Martiny

Marine photosynthetic organisms are key players in the carbon cycle because they are responsible for fixing carbon dissolved in water, for supplying organic carbon (and energy) to the components of the food web, and for exporting carbon into the deep ocean. Two cyanobacteria, *Prochlorococcus* and *Synechococcus,* explain up to 80% of ocean primary production, which is the formation of organic compounds by means of photosynthesis. In recent years, there has been a big effort to describe the abundance of *Prochlorococcus* and *Synechococcus* in the ocean at local and regional scales. However, the global distribution still remains unclear. Our goal is to estimate the distribution and abundance of *Prochlorococcus* and *Synechococcus* in the ocean at a global scale. To achieve this goal, we gathered and unified all available observations of *Prochlorococcus* and *Synechococcus* around the world, building a master database. Then, we developed a probabilistic model to estimate the abundance of *Prochlorococcus* and *Synechococcus* based on environmental variables (light, temperature, nitrogen and phosphate). In a one by one degree grid, we obtained environmental variables from public repositories, such as NOAA and WOA, to feed our probabilistic model. In this way, each grid had an estimation of *Prochlorococcus* and *Synechococcus* abundance using the probabilistic model and environmental variables. We found contrasting patterns between the abundance for these cyanobacteria primarily based on temperature. *Prochlorococcus* flourished in equatorial warm waters while *Synechococcus* did the same at higher latitudes. By obtaining these maps we were able to evaluate the global distribution in the ocean of *Prochlorococcus* and *Synechococcus* and identify environmental variables that can shape global change scenarios and potentially impact the carbon cycle.

**The Effect of Bank Failures on Businesses: Are Durable Goods Firms More Affected than Non-Durable Goods Firms?**

Michael Gou  
*Mentor*: Gary Richardson

Most Economists agree that the banking runs that began in the United States during 1930 deepened the Great Depression. These banking runs left the country in an economic shambles. Economists are still trying to explain what effect these runs had on the U.S. economy. A theory exists suggesting that credit-dependent firms were more affected by economic shocks that caused a decrease in the access to credit. By analyzing monthly data on the number bank failures and business failures in the U.S., this study finds evidence suggesting that bank failures precede business failures, but business failures do not precede bank failures. This study also finds that bank failures are associated with durable goods firms. On the other hand, firms that sell nondurable goods are not associated with bank failures. From the results drawn from this study, it may be implied that when the banks were failing in the 1930s, firms that sold durable goods also started failing. By anticipating that durable goods selling firms are likely to suffer from economic shocks that cause a decrease in credit, proper policy decisions can be made to help prevent those firms from failing.

**An Evaluation of the Instruction and Implementation Of B-Mode versus M-Mode Transthoracic Ultrasoundography in the Detection of Pneumothorax**

Michael Gragnani  
*Mentor*: John Christian Fox

The purpose of this study is to compare the instruction and use of B-mode and M-mode transthoracic ultrasono-
graphy in the detection of pneumothorax, the results of which would emphasize benefits of the use and teaching of one modality over the other. Transthoracic ultrasonography as a diagnostic for pneumothorax has emerged as a reliable and efficient method in recent years. B-mode is the primary scanning modality taught to residents, emergency physicians, and medical students in comparison to M-mode. Rotating medical students involved in an emergency ultrasound course were enrolled in the study and asked to identify the presence or absence of pneumothorax in twenty different images and video obtained from both B-mode and M-mode ultrasounds. Prior to their analysis of the clips, they were given a short instructional presentation on the use of both scanning modalities in the detection of pneumothorax. The sensitivity, specificity, level of agreement, and negative predictive value for B-mode were found to be notably higher than those observed for M-mode. The obtained results for B-mode were slightly lower than those observed in similar studies. The findings strongly suggest that B-mode remains the primary teaching modality for the detection of pneumothorax and further substantiate the use of ultrasound for its efficiency, accuracy, and ease of use.

SineQuanon Theater Project: Directing for a Non-Profit Theater Company
Skyler Gray
Mentor: Don Hill
To gain the knowledge and skills necessary to run my own theater company I had to work for an already established company. Last summer I worked with Children’s Musical Theaterworks in Fresno, CA to stage a production of Disney’s High School Musical 2 with 70 children ages 11–16. The delegating, managing, business, and collaborating skills I gained from working with an established theater company was incredible; it was an experience that I needed. I am now able to put the experience I had last summer to good use with my own theater company, The SineQuanon Theater Project here at UCI. I have a lot to learn about running my own company, but the hands-on experience has helped me in our first year to start something new and exciting for UC Irvine and Orange County.

Helem: The Emergence of the First Gay Rights Movement in the Arab World
Christina Guirguis
Mentors: Lina Kreidie & Caesar Sereseres
The purpose of this research project is to determine the major factors that led to the emergence and continuity of Helem, the first visible gay rights organization in the Arab World, which was founded in Beirut, Lebanon in 2004. This study investigates why this organization was able to emerge in Beirut, as opposed to any other Arab capital, and how it continues to function in a relatively hostile environment where homosexuality is illegal under Article 534 of the Lebanese Penal Code. As a repressed and marginalized sector of Lebanese society, homosexuals face myriad obstacles, including fear of familial and societal condemnation, as well as discrimination and violence with no legal redress. Little research is available related to homosexuality in Lebanon and the Arab World. This is the first independent study on Helem or the gay rights movement in Beirut. During a fact-finding mission to Beirut, informal interviews were conducted with members of Helem and the gay community to gather the information required for the study. Based on observations, interviews, and analysis of both first-hand documents and available literature, the two main factors contributing to Helem’s emergence and continuity are the sociopolitical and economic conditions unique to Beirut, and the strategic framing of their methods, goals, and ideals for their conservative environment. Understanding the conditions that serve as a foundation for liberal progressive social movements like Helem and the strategies used to sustain them is essential in facilitating the process of liberalization, which is an imperative precur- sor to a truly democratic system.

A Graphical User Interface for Human Robot Interaction Study in Games of Conflict
Chelsea Guthrie
Mentor: Jeffrey Krichmar
Neuromodulators can have a strong effect on how organisms learn and compete for resources in games of conflict and cooperation. To better understand the effect of neuromodulation on decision-making, we constructed a model of the dopaminergic and serotoninergic systems, which are important for predicting rewards and punishments, to guide an agent's behavior in a Hawk-Dove game against human subjects. We designed a Graphical User Interface (GUI) in which human subjects could play against a computer agent or against a robot. In the Hawk-Dove game, opponents either share or fight over a resource. Our version contained a color-coded display, in which a location was colored to indicate that it was open, fought over, or shared. The GUI, which allowed human-computer interaction, displayed the current state of the game, and gave performance feedback to the players. The game software also needed to communicate in real time with a robot playing the game. The robot interacted with colored floor panels that matched the human subject's GUI. Our model suggests how the neuromodulatory systems can shape decision making and adaptive learning in competitive situations. Preliminary tests of the game indicate that dopamine is necessary for reward assessment, and serotonin is necessary for risk assessment. In studies with human opponents, we will get a better understanding of how the

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human brain handles this same situation, and if humans change their strategies when playing against a robot as opposed to a computer opponent.

**Human Trafficking Victim Services**

Silvia Gutierrez  
*Mentor: Caesar Serereses*

Human trafficking is defined as the recruitment, harboring, transportation, provision, or obtaining of a person’s service, through the use of force, fraud or coercion for the purpose of subjection to involuntary peonage, debt bondage or slavery. After being identified as a human trafficking victim, the victim is able to receive assistance. Every human trafficking victim is different; therefore, every victim’s needs vary. The goal of this study is to learn the current amount and type of assistance available for human trafficking victims and assess current efforts to combat human trafficking through the use of these services. Data was collected by interview of current employees in victim services (law enforcement/Non Profit/ NGOs) and US government documents. The result of this study provides a general understanding of the participation of victim services in a Human Trafficking taskforce and current efforts to combat human trafficking.

**Human Annexin A2 and its Interactions with Anti-Tumor Compounds and Acidic Phospholipids**

Maria Hadi  
*Mentor: Hartmut Luecke*

The protein Annexin A2 is capable of binding to withaferin, which inhibits metastasis. Understanding this protein-drug interaction can lead to the discovery of other angiogenesis-inhibitory drugs that are helpful in cancer research. Another goal of this project has been to co-crystallize Annexin A2 and inositol (1,4,5)-triphosphate, so the location of IP3 can be determined. Through the process of transformation, plasmid DNA containing Annexin A2 were transformed into *E. coli*. The cells were streaked onto LB+Amp agar plates for selection. After centrifugation, the collected cell pellets were passed through the French Pressure Cell to lyse the cells. The cell extract was centrifuged, so the Annexin A2 would be pooled together, dialyzed and concentrated. Through the process of Western Blot, the existence of Annexin A2 was verified, and an SDS-PAGE gel containing the sample was used to determine the purity of the protein. The protein was mixed with two buffers containing withaferin and inositol (1,4,5)-triphosphate, and through Hanging Drop methods, the crystals were x-rayed. We have been able to obtain plate-like crystals, but they only diffract to about 4.0Å, and we are not seeing electron density for withaferin. Therefore, our current effort is to produce crystals that will diffract to a higher resolution. Through the process of Mass Spectroscopy however, we found that withaferin binds cova-

lently to Anx2 with a 1:1 stoichiometry. For inositol (1,4,5)-triphosphate, we do not have perfect results, but the process of Lipid Strip Binding Assay seems to suggest that Anx2 binds PIP and PIP2.

**Public Memory and American Holocaust Museums**

Vanessa Hadox  
*Mentor: Emily Rosenberg*

The Holocaust plays an interesting role in American cultural history. It does not necessarily belong in our collective narrative historical memory, and yet it is unmistakably pervasive within our academic, social, and cultural consciousness. Museums play an important role in the creation of the Holocaust as an American memory through the use of experiential exhibitions to create prosthetic memories for the American audience that would otherwise not have any familial, religious, or national ties to the event. Museums such as the Los Angeles Museum of the Holocaust and the United States Holocaust Memorial Museum use survivor testimony to recreate a kind of intergenerational family history narrative, as well as scale models and video footage to make visitors feel as though the Holocaust belongs in American public memory. American museums have cemented the idea that the Holocaust is an American story, more so than other international genocidal events and more so than other domestic events, by creating memories within the American audience that mimic those of Jewish or European peoples that have a closer relationship to the Holocaust.

**Functional Interactions Between Astrocytes and Blood Vessels in the Intrahippocampal Kainic Acid Injection Model of Epileptogenesis**

Huzaifa Hakimuddin  
*Mentors: Devin Binder & Kiran Rajneesh*

Although astrocytes have been proposed to tightly regulate the integrity of the blood-brain barrier, few studies have observed the interaction of astrocytes with blood vessels during epileptogenesis. In this study, we investigated the changes in vascular density, the cell-specific and time-course dependent expression of angiogenic factors, and alterations in glial-vascular interactions in the intrahippocampal kainic acid injection model of epileptogenesis. Our study showed progressively increased vascular density in the stratum lacunosum molecularae (SLM) of the CA-1 ipsilateral to the injection site through FITC-conjugated lectin. We observed an astrocyte-specific increased expression of the angiogenic factors vascular endothelial growth factor (VEGF) and angiopoietin (Ang-1) following status epilepticus. Interestingly, changes in the time course of the expression of these angiogenic factors was altered in mice lacking the glial water channel aquaporin-4 (AQP-4). Furthermore, astrocytic coexpression of aquaporin-4 and the tight junction zona occludens-1 (ZO-1) in wild-type mice...
revealed no significant changes in the contacts between glial cells and blood vessels. These data suggest that astrocytes have a functional role in regulating angiogenesis and maintaining the integrity of the blood-brain barrier during epileptogenesis.

Social and Economic Embeddedness of Fundraising in On-Campus Student Organizations
Adam Hall
*Mentor:* Nina Bandelj

Despite the centrality of fundraising to the operations of many organizations, there seems to have been little sociological investigation into why it occurs in the ways that it does, or what influences its effectiveness. This is especially true in the case of smaller organizations, which seem to be overlooked in the literature that does exist. To explore this topic, officials from several student organizations at UC Irvine were interviewed to determine which factors influenced the choice and successfulness of their fundraising methods. Nearly all non-Greek organizations that had the option sold food goods on campus or at events. In addition to this basic method, organizations often used more unique fundraising methods, most commonly those that dovetailed somehow with the other activities that they performed. Most of these methods can be categorized as sales fundraisers, event fundraisers, support from larger groups, or restaurant fundraisers. The choice of each of these event categories seems to be influenced by the nature of the social and organizational ties an organization has at its disposal, as well as by its purpose. Large event fundraisers seem to be the most effective in terms of yield, but require significant time, effort, and seed funds to organize. Thus, most organizations rely on combinations of methods from various categories to provide more consistent funding over time.

Layered Object Detection for Multi-Class Segmentation
Samuel Hallman
*Mentor:* Charless Fowlkes

A challenging and important task in computer vision is identifying regions into which an image naturally separates. To achieve this, it is important that individual objects in a scene are segmented accurately. For our summer work, we considered the problem of segmenting objects from a number of object categories. We began by exploring the use of bounding box object detections for producing pixel labels, during which it became clear that we had to consider depth ordering to account for overlapping detections. By the end of the summer we had developed a simple probabilistic model that captures the shape, appearance and depth ordering of a collection of detections within an image. We train our system on the PASCAL segmentation challenge dataset and show good test results with state-of-the-art performance on several object categories, including segmenting humans. Careful analysis of our results yielded insight into the contribution of bottom-up grouping constraints, layering and other model components to overall performance. We found that grouping was helpful for objects with strong boundaries, and that the number of images for which layering improves performance tends to be small since inter-class object overlap is less common than we had suspected.

The Plastic Ocean: An Inventory of Marine Debris at Crystal Cove State Beach, California
Tova Handelman
*Mentor:* William Cooper

The world’s oceans are divided into five gyres, which are characterized by circular current patterns. Since Captain Charles Moore’s groundbreaking study discovered a ratio of 6:1 plastic to plankton mass in the North Pacific gyre, several reports have quantified the amount and types of marine debris in the open ocean and along the beaches of remote islands in the Pacific Ocean. The plastic clearly originates from the mainland, given that these islands do not manufacture the staggering amount of plastic found on their beaches. Yet few studies have tried to quantify the amount of debris found on mainland beaches. To fill this gap in data, I conducted a beach survey at Crystal Cove State Beach, based on McDermid and McMullen’s 2004 study on the Hawaiian Islands. Transects of sand measuring 1m x 1m were sieved, and the debris particles that remained were classified into three categories: pre-production plastic pellets, post-production plastic fragments, and Styrofoam fragments. Each category was weighed, and averaged with transects from areas with a low plastic density to better predict how much plastic could be found on the beach. Findings identify the amounts and types of plastic found at Crystal Cove and can help further estimate the contribution of plastics to the North Pacific gyre from local mainland sources. This study can help to advance environmental policies to prevent more debris from reaching the North Pacific, as well as promote public awareness to help facilitate large-scale behavioral shifts away from plastic usage.

The Fiction of Widows’ Responsibility: The Role of Women in Medieval London
Sarah Hanson
*Mentor:* Nancy McLoughlin

This study examined wills registered in the London court of Husting from 1259–1317 to determine what bequests in wills indicated about women’s responsibilities in marriage and in widowhood as a means of assessing to what degree, if at all, wives were valued as partners to their husbands and women were considered adult citizens. The wills in the court of Husting demonstrate a legal fiction in which more
responsible responsibilities were attributed to women during their marriage than they had the power to fulfill. While these same responsibilities ascribed to women in marriage were realized when a woman entered into widowhood, widows often did not have enough legal or social power to perform their new responsibilities in London’s patriarchal society, and they experienced economic and social vulnerability as a result of their lack of male protection. Chaucer’s Troilus and Criseyde embraces the legal fiction present in the Hustings wills, indicating a disjuncture between the reality of women’s situation and the portrayal of women in both the legal system and in fiction. While medieval English literature may have reinforced legal and social fictions about medieval women, the real experiences of women complicate the historian’s understanding of women’s roles. The power and responsibility attributed to women in medieval England reinforced society’s anxiety about women, and especially widows, while ignoring the real situation of women’s vulnerability in England’s patriarchal society.

Dispositional Differences in the Experience of Love of Humanity
Tiffany Hays
Mentor: Louis DeSipio

Previous research has established a relationship between positive emotions and prosocial behavior. However, spontaneous prosocial behavior needs to be further investigated. A recent study on love of humanity (LOH) provides self-report data that suggest dispositional differences in the tendency to experience positive feelings toward humanity. This study investigates the overall hypothesis that LOH is related to observable prosocial behaviors. A secondary data analysis was performed on residence hall data from the previous LOH study to compare self-rated LOH to enacted prosocial behavior. It was predicted that participants with a higher self-rated LOH score would have a higher rate of first person plural pronouns (we, us, our), which may be related to the prosocial relational aspect of commitment. Participants’ video sessions were first transcribed and then analyzed using Linguistic Inquiry and Word Count, a text analysis software. As expected, participants with higher LOH scores used first person plural pronouns more frequently.

Exhaled Gases in Emergency Patients with Respiratory Complaints
Calvin He
Mentors: Shahram Lotfipour & Jeffrey Suchard

Contemporary chemical analysis of the air now permits the precise determination of chemicals in the parts-per-trillion (ppt) scale. This has greatly enhanced the opportunity to examine the exhaled gas samples of individuals. Major differences in gas samples between individuals may be used as an indication for common respiratory problems. Exhaled breathing has already been verified to be a useful diagnostic tool for infectious diseases. A similar pilot study at the University of California, Irvine Medical Center showed that patients diagnosed with pneumonia exhaled greater amounts of methane, ethane, toluene, carbon monoxide, and dimethyldisulfide relative to healthy control individuals. This study will examine the gas contents in the ppt scale of patients with respiratory complaints such as shortness of breath, wheezing, cough, and/or phlegm production in the Emergency Department at the UCI Medical Center. Gas samples will be contained inside a sterilized canister. The goal of this project is to generate different hypotheses based on the eminent differences in the chemical compositions of respiratory patients. It is expected that the exhaled gas will exhibit patterns that may correlate with different types of respiratory disease (either infectious, obstructive, or cardiopulmonary) and may even change depending on the severity of the disease. This is an ongoing study, and no results are available, as the data is still being analyzed in the Rowland/Blake laboratory.

Children’s Analogical Reasoning: A Closer Look at Individual Differences
Sandra Helmy
Mentor: Lindsey Richland

Analogical reasoning lies at the core of human cognition and creativity and is implicated in virtually all aspects of human life. An analogy is a similarity between two situations sharing a common relationship among their constituent elements while the elements themselves differ. Analogies enable children to draw on prior knowledge to analyze novel phenomena and build generalizable knowledge. Piaget’s work suggested that higher-order reasoning was not available to children until adolescence. Later studies disproved this, showing that children three and four years of age were able to identify and match patterns across context; however, they do not approximate adult level reasoning until adolescence. This study tests the effects of two strategies hypothesized to reduce processing demands and increase reasoning success at earlier ages: context familiarity and gesture. The study teases apart elements noted to cause processing errors in children—working memory, attention control, and relational prerequisite knowledge. Approximately forty 3–4 year old children participated in activities that involved a matching-to-sample task and an analogy generation task. Children were asked to label an experimental pair as similar or different from one another, select one of two pairs below with a pattern similar to the initial experimental pair, and match the selected pair to the tray with similar items. Initial results suggested that children were successful on the task at both ages, and that the analogy generation task was more taxing than the matching-to-sample task. The tested strategies may be effective at reducing processing demands, but the
According to many dantisti, it is the “personalism” of Dante’s *Divina Commedia* (especially the first canticle, *Inferno*) that draws readers into the “reality” of the epic poem. Because of this personalism, the *Inferno* has received the bulk of critical attention. Scholarship has analyzed almost every facet of the poem, including Dante’s connections with Florence, his classical influences, his work as a burgeoning poet, and more. These studies, ranging from the medieval period to the present century, offer in-depth information about multiple specific aspects of the poet and the poem. Although the studies analyze the same text, the readings often fail to engage with one another. Hence, a scholarly dialogue between the readings of Dante is absent in *Inferno* commentary. Canto X of *Inferno* provides a revealing example of this problem. Here, Dante-protagonist and his guide, Virgil, enter the sixth circle of Hell and encounter the heretics Farinata (military leader) and Cavalcante (father of Dante’s poet friend, Guido Cavalcanti). From discussions regarding the political clash between Ghibelline Farinata and Guelf Dante to discussions contemplating the meaning of Cavalcante’s timely interruption, scholars have produced innumerable interpretations of this canto. However, each reading remains locked up within its own scholarly world, resulting in what seems like the analysis of different texts altogether. In my paper, I review several popular readings of *Inferno* Canto X and place them into dialogue with one another. In so doing, I hope to show how scholars can glean a more inclusive understanding of Dante and his work.

Northern Uganda: Effective Components of Reintegration Program for Former Child Soldiers

Emily Hetu

*Mentor:* Deborah Avant

*The Coalition to Stop the Use of Child Soldiers* reports that between April 2004 and October 2007, nineteen countries actively used children in armed conflict. While in captivity, these child soldiers suffered extreme human rights violations. Once they escape or are rescued, the horrific crimes they witnessed, endured, or were forced to commit cannot be easily forgotten. In northern Uganda, the civil war has continued on for more than two decades, with hundreds of thousands of children abducted to fight against the government. Reintegration programs have the potential to help former abductees transition from violence back into normalcy. My goal was to analyze different components of reintegration programs in the region in order to narrow down which were more effective, and suggest what components are necessary for programs to be beneficial. I concluded that there are four major elements that reintegration programs should take into consideration when establishing their programs. The first is the need for foreign influence, beyond simple financial support. People from outside Uganda’s borders can offer fresh perspectives and work with community members. Second, reintegration programs need to have an education or teaching element. Whether it is through school or learning a specific trade, it is necessary that former child soldiers gain knowledge that can benefit their livelihoods and give them confidence in themselves. Third, therapy is essential in any form of recovery for the formerly abducted. Research about children’s mental capacities and the prevalence of PTSD points directly to the need for psychological help before any real progress can be made to move on in life. Lastly, reintegration programs cannot be exclusive. All civilians in northern Uganda have been affected by the war in one way or another. For this reason, programs only for former child soldiers will hinder both them and the outside community.

Search for a 4th-Generation Down-Type Quark

Matthew Hickman

*Mentor:* Daniel Whiteson

We report the most restrictive direct limits on masses of a fourth-generation down-type quark $b'$, and quark-like (non-hadronic) composite fermions $B$ and $T\frac{5}{3}$, decaying promptly to $tW^\pm$. We search for a significant excess of events with two same-charge leptons ($e, \mu$) several hadronic jets and missing energy. An analysis of data from proton-antiproton collisions with an integrated luminosity of 2.7 fb$^{-1}$ collected with the CDF II detector at Fermilab yields no evidence for such a signal, with $m_{b'}, m_B > 338$ GeV/c$^2$, $m_{T\frac{5}{3}} > 365$ GeV/c$^2$ at a 95% confidence level. In addition we present search strategies for fourth-generation quarks at the ATLAS experiment, a general purpose detector at the Large Hadron Collider.

Servers, Waiters, Waitresses, and Cocktails: The Gendered Work of Serving

Carly Hiebert

*Mentor:* Samuel Gilmore

The occupation of waiting tables in full service restaurants has traditionally been segregated by gender; historically, males have dominated serving in fine dining establishments as “waiters.” This ethnographic study examines how historical trends in the gendered divisions and organization of work between table servers in full service restaurants has persisted despite attempts at gender integration and the rise of the gender neutral term “server.” The study focuses on data gathered through interviews of servers from three restaurants of different prestige levels—a bar, a chain res-
taurant, and a fine dining establishment. The interviews focus on past serving experience, social structures and power relationships, fraternization, how work tasks and shifts are allocated, and how these processes vary by the prestige of the restaurant in order to flesh out what effects the gender of the server and the gender of the occupation has on the organization of work. The results of the study are twofold. The first major conclusion is that gendered conceptions of servers according to the prestige of the restaurant persist and are enforced by workplace cultures despite the rise of the generalized and gender neutral term “server.” The second conclusion is that referring to one’s self as “server” acts conceptually to salvage a masculine professionalism for servers of lower prestige restaurants that allows them to differentiate themselves from other, still feminized and hence less prestigious occupations.

**Financial Takeover: Revolving Door Politics of TARP**

*Arman Hirose-Afshari*

*Mentor: Kitty Calavita*

Instrumentalism and Structuralism, theories of power under Karl Marx’s Conflict Theory, reflect the hierarchical nature of power in capitalist democracies and its reflection in law. Structuralist theorists argue that the interdependent nature of Wall Street and Main Street allows capitalist elites to employ sheer investment power to influence governmental policy. Instrumentalism asserts that the capitalist elite must make proactive efforts to create government influence. These measures include, for example, campaign contributions and “revolving doors” between industry and government. Past research has treated these theories as mutually distinct. This study examines the role of major newspapers in rhetorically crafting a sense of urgency to pass the Emergency Economic Stabilization Act with haste and little oversight. Content analysis of lead articles pertaining to TARP was conducted to analyze how Bush officials framed the bailout as necessary and if newspapers gave officials a disproportionate platform to advocate their agenda. A critical look into the revolving door between government positions and private banking corporations affected in TARP was also conducted and revealed a consistent pattern of such behavior within the Bush administration. There is significant evidence to show that newspapers gave a greater representation to Bush officials in their reporting. Bush officials used the language to highlight the relationship of well being between Main Street and Wall Street and the disastrous consequences if TARP failed to pass. Results indicate that Structuralism must be integrated with Instrumentalism to properly explain the campaign to pass TARP.

**The Role of Gender, Leadership, and Similarity in Team Interaction**

*Stephanie Ho*

*Mentor: Mona Lynch*

A field study of the Chinese Association, University of California, Irvine Dragonboat Team was conducted to understand the foundation of a successful team. Focus was placed on gender, leadership, and the homogeneity and heterogeneity of the team members. Through semi-structured interviews and naturalistic observations, around 60 people were closely observed when interacting with each other, and several were interviewed. It appears that gender does play a significant role in how members act individually and perform as a team. Leadership is also crucial to how well a team does, and the responsibility put on those in a leadership position is heavy. The aim of this study was to determine which variables lead to an effective, working team, and it was found that the most significant variable to a team’s chance of success is the similarity of the team members. Research findings showed that a more homogeneous group will often work well as an effective team, while a heterogeneous group leads to internal conflict over goals of the team.

**Theory of Mind and Severity of Symptoms in Autism Spectrum Disorder**

*Erin Horowitz*

*Mentor: Wendy Goldberg*

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by deficits in language ability, social behaviors, and certain areas of executive functioning. Individuals with ASD are also believed to lack a theory of mind, or the ability to consider the perspective of others, but little is known about the connection between theory of mind and the degree of severity of the disorder. The aim of this study is to examine the relationship between deficits in theory of mind and severity of ASD symptoms. We predict that deficits in theory of mind will be related to the severity of the disorder, such that classification into low and high functioning groups will be associated with the frequency of passing theory of mind tasks. Children previously diagnosed with ASD, ranging from 4 to 12 years of age, were administered a battery of theory of mind tasks. These tasks included measure of false beliefs, which was assessed both verbally and non-verbally, and the ability to distinguish appearance from reality. One parent of each child completed the Social Communication Questionnaire (SCQ), which is used to determine severity of symptoms. A preliminary analysis will include bivariate correlations between a composite theory of mind score and autism severity. Additional analyses may include separate ANOVAs examining group differences between children with low and high severity of symptoms on both a composite measure of
theory of mind performance and separate scores from each individual theory of mind task.

The Curtailment of Women’s Rights with the Arrival of the Islamic Republic of Iran
Asal Hosseini-Bidokhti
Mentor: Mark LeVine
After the 1979 Iranian Revolution, women’s rights in Iran were severely curtailed. During the reign of the Shah, women were granted specific rights through civil codes and through the Shah’s discretion. In addition, the Shah’s government during the Pahlavi era supported women’s groups lobbying against polygamy, child marriage, women’s exclusion in public, and education segregation. It also worked towards strengthening the 1967 Family Protections Law, which was revolutionary for the time and the region. However, when the Islamic Republic took over, changes took place overnight. Sharia Law was expanded to place a larger limitation on women. The progressive 1967 Family Protections Law was repealed, Islamic dress codes were forced onto women of all faiths residing in the country, and segregation began to take place between the sexes in society. Over a short period of time, Iran’s stance on women’s rights went from being tolerant and enlightened to becoming almost obsolete. This descriptive comparative study looks at women’s rights in Iran under two different regimes within the past century.

Iris Size and Attraction
Naveen Hothi
Mentor: Donald Hoffman
It is widely known that pupil size and attraction are correlated. However, this effect has not been studied in relation to iris size and attraction and their possible interaction. Our experiment was designed to explore this possible relationship. Are wider irides viewed as more attractive? Our participants viewed two copies of faces, one original and one with 20% larger irides. They rated attractiveness of these two pictures in a two alternative forced choice task. The analysis of variance showed that the wider iris was rated as significantly less attractive in comparison to the original. This result may be because the pupil plays a silent role. The wider iris may make the pupil look smaller than in the original picture. Future experiments can test this relationship.

Identification of Glioblastoma Multiforme Stem Cells
Nelson Hsu
Mentors: Yuanjie Hu & Yi-Hong Zhou
The identification of stem cells in glioblastoma multiforme (GBM), one of the most common and aggressive types of brain tumor found in humans, is a crucial step in verification of tumor ability was done through inter-cranial injection in mice in which the grown cells did develop into tumors. The ability to recognize GBM is a cornerstone for all projects involving brain tumors. These results clearly indicate the presence of tumor stem cells and their tumor generating ability.

Female Chinese American Undergraduates: Influence of Childhood and Adolescent Experiences on Attitudes towards Ideal Division of Household Labor
Laurel Hui
Mentor: Catherine Bolzendahl
This study examines expectations of an ideal division of household labor among female Chinese American undergraduates and how this relates to perceptions of childhood and adolescent experiences. Past research supports the importance of parental modeling in the formation of attitudes towards an ideal division of household labor and gender-differentiated family roles, particularly among Caucasian Americans. However, not much research exists on whether these findings hold true for the expectations of Chinese Americans. The purpose of this study was to gain a deeper understanding on how the attitudes and behaviors of Chinese immigrant parents may have an effect on their American-born children’s beliefs about the family. Some attention is paid to immigration and cultural differences between Chinese and Chinese Americans, followed by a more detailed discussion of factors in childhood and adolescent experiences that explain expectations of an ideal division of household chores, child care, economic decision making, and any other work pertaining to the family. A comparison between traditional versus egalitarian families and the definition of fairness were also explored.

Overexpression of Human OPA1 in D. Melanogaster Opa1-Like Mutants and Prospective Rescue of the Glossy Eye Phenotype
Dan Huynh
Mentor: Taosheng Huang
Dominant optic atrophy (DOA) is the most common inherited optic neuropathy affecting 1 in 50,000 people worldwide. Mutations in the optic atrophy gene (OPA1) are the major cause of DOA. The Drosophila gene equivalent to the human OPA1 gene (dOPA1) is dOpa1. Mutations in dOpa1, known as opa1-like, result in the complete loss of the dOPA1 protein and have been shown to produce a rough and glossy eye phenotype in eye-specific so-
mantic clones. The phenotype was proposed to result from cytochrome c release and increased reactive oxygen species (ROS) levels. Our study aims to verify the functional replacement of *dOpa1* with *hOPA1* isoform 1 by overexpressing *bOPA1* in the eyes of *opa1*-like mutants. To achieve overexpression, a series of crossings were performed to introduce UAS-*bOPA1* into flies that carried the *opa1*-like mutation. Phenotypic rescue was determined by scoring the eyes of the flies carrying all of the aforementioned transgene for the severity of the glossy eye phenotype and comparing them to those flies without overexpressing *bOPA1*. The preliminary results indicate that under a microscope, no observable rescue of the eye phenotypes was achieved. Further data are required to validate whether this molecular model can be used to study pathogenesis with known human-disease causing mutations of OPA1.

### The Role of Microphthalmia-Associated Transcription Factor in the Chemoresistance of Human Melanoma Cells

Christopher Hwe  
**Mentors:** Feng Liu & Frank Meyskens

Microphthalmia-associated transcription factor (MiTF) is a transcription factor that is known to play an important role in melanoma progression and cell proliferation. It is unknown whether or not the expression of MiTF actually initiates the development of melanoma. It has been hypothesized that the expression of MiTF allows for greater resistance against chemotherapeutic drugs. The purpose of this study was to prove that certain lineages of human melanoma cells contain the MiTF protein, and then confirm that the presence of the protein in these lineages conferred greater chemoresistance by measuring the IC\(_{50}\) for different drugs. To further confirm the role of MiTF in chemoresistance, SK-Mel-28 cells were grown with and without Doxycycline in an attempt to create both MiTF-positive and MiTF-negative knockdown clones. When compared to the original MiTF-positive SK-Mel-28 cells, decreased chemoresistance in the MiTF knockdown clones would confirm the importance of MiTF in chemoresistance. It was found that MiTF-positive cell lines did have a greater IC\(_{50}\)’s for various chemotherapeutic drugs, which is indicative of greater chemoresistance. The attempt to create knockdown clones for SK-Mel-28, however, was not successful, so there was no further confirmation of the role of MiTF in chemoresistance. Establishing a relationship between MiTF expression and chemoresistance will allow for new steps to be taken in developing melanoma treatments. There have been several hypotheses about how MiTF functions in chemoresistance. Ape/Ref-1 and Hif1α, for example, can both enhance chemoresistance in melanoma tumors and are possible targets for the MiTF protein.

### Development of a Silver-Catalyzed Propargylation and Allenylation of Pyruvate Derivatives

Naoko Ichiishi  
**Mentor:** Elizabeth Jarvo

Silver catalysts provide selective allenyl and propargylic reactions of pyruvate derivatives to form \(\alpha\)-hydroxymethoxy ester. This stereo-motif is present in various natural products such as citric acid and cimicifugic acids; therefore, developing propargylation and allenylation reactions to form the enantioselective ester will provide access to small molecule building blocks for natural product synthesis. For the allenyl and propargyl reactionants, choice of the silver halides and additives control the selectivity of product formation. In the absence of halide additive, allenic alcohols were the major product. This selectivity profile occurs with a series of pyruvate derivatives. Further investigation of the mechanism and enantioselectivity of the allenylation and propargylation reactions will be described, as will rearrangement reactions of the products.

### Transport of Nanospheres Through Conical Nanopores

Laura Innes  
**Mentor:** Zuzanna Siwy

Nanopores have attracted a great deal of scientific interest. This is because biological nanopores, called channels, are the basis for many physiological processes in a living organism. Nanopores are also the basis for biosensors. The purpose of this study was to investigate the latter application of nanopores. Single nanopores in polymer films were used to detect single polystyrene nanospheres as they passed through a pore. The nanospheres are spherical in shape with diameters of 40 and 60 nm. Detection of the nanospheres uses principles of the so-called Coulter-counter (or resistive-pulse) technique, in which single molecules present in a nanopore are detected as transient blockages of ion current through the pore. The transient current blockages are related to the size of the detected molecules. The nanopores used in this study were prepared by the so-called track-etching technique based on the irradiation of a polymer foil with a single, swift heavy ion and subsequent chemical etching of the irradiated foils. The nanopores are conical in shape with the narrow and wide openings having diameters of several tens of nanometers and ~1 micrometer, respectively. The optimal conditions for nanosphere detection will be determined by studying the dependence of the ion current and its blockades on the nanosphere concentration and size as well as on the pH level of the solution.
The Role of the Glycocalyx Layer in Endothelial Cell Mechanotransduction and its Presence \textit{in vitro}

Deena Jamal  
\textbf{Mentor:} Elliot Botvinick

The dynamic response in endothelial cell morphology and function due to shear stress can affect many factors in the body, such as blood pressure regulation and vascular development. Studies have shown that in atherosclerosis, plaque build-up occurs in arterial areas of non-laminar flow; this build-up can eventually lead to blood clot formation, stroke, or heart attack. In diabetes, these lesions form even in locations where flow is laminar, suggesting a defect in the cells’ mechanosensor—the mechanism by which the cells detect force. If the mechanosensor is known, we may be able to manipulate the cells’ ability to detect shear stress and, consequently, reduce side effects of both diseases. Conflicting studies have suggested that either the glycocalyx layer on a cell’s apical surface or focal adhesions on a cell’s basal layer serves as the mechanosensor. To test these hypotheses, I used optical (laser) tweezers to spin vaterite beads near the surface of cells, inducing laminar flow, and to pull on fibronectin-coated beads attached to the cells’ surface, applying force on the integrins. The experimental cells were stained for nitric oxide (NO) production—an endothelial response to shear stress—and changes in NO were observed. I also attempted to verify the presence of the glycocalyx \textit{in vitro} by observing the rotation rate of spinning vaterite beads at incremental distances from the cells’ surface. The data collected was not conclusive, however, and various changes were made to improve the design of the experiments for the future.

Serotonergic Projection from NRP to rVLM in Electroacupuncture Inhibition of Cardiovascular Reflexes

Fang Jiang  
\textbf{Mentor:} Stephanie Tjen-A-Looi

Acupuncture has become a popular alternative to treat several illnesses, including heart diseases. Experiments have been conducted to examine the neurophysiologic mechanisms in treating cardiovascular diseases with electroacupuncture (EA). Past studies have established serotonergic (5-HT) neurons in medullar nucleus raphae pallidus (NRP) and a sympathoinhibitory pathway from midbrain ventrolateral periductal grey (vLPAG) to rostral ventrolateral medulla (rVLM) during EA inhibition of cardiovascular response. However, the role of serotonin in NRP and rVLM in EA-modulation is still unknown. This study examined the role of serotonin in the pathway from NRP to rVLM during electroacupuncture (EA) attenuation of cardiovascular response to gallbladder stimulation. Cats were anesthetized and ventilated, and heart rate and mean arterial pressure were monitored. Bradykinin (BK) applied to the gallbladder every 10 min induced consistent cardiovas-
and physical impairments. Previous studies have demonstrated the brain’s ability to regain normal physiological and physical functioning following an ischemic injury, and often this recovery occurs via plasticity-based changes within the cortex. This study sought to determine if sensory induced plasticity via whisker stimulation may be protective of ischemic injury. Four groups of Sprague Dawley rats underwent permanent middle cerebral artery occlusion (pMCAO) and were administered sensory stimulation 0 hour, 1 hour, 2 hours, or 3 hours after stroke onset with recording of neurological activity and intrinsic signal optical imaging (ISOI). Animals that received sensory stimulation immediately and within 1 hour of ischemic onset were comparable, both structurally and functionally, to control animals without stroke. Subjects that received stimulation 2 hours after stroke onset were also protected from ischemic injury, though protection at 2 hours was less consistent than when given at 0 or 1 hour post onset. Animals that received single-whisker sensory stimulation 3 hours post ischemic stroke onset suffered considerable cortical injury. Results and data analysis of ISOI and post-mortem assay of infarct supported the hypothesis that whisker stimulation was beneficial for stroke recovery if sensory stimulation is administered within a critical time window of 0 to 2 hours post stroke onset.

Amalfi Coast Music Festival
Shabnam Kalbasi
Mentor: Darryl Taylor

As a Vocal Performance major, attention to detail is not suggestive but a necessary element in one’s study. Whether it is an art song, opera excerpt, or song cycle, it requires musical understanding beyond the face value of notes and text. It requires analysis, character development, historical implication and overall artistic interpretation. The Amalfi Coast Music Festival in Italy provided an environment for budding classical vocalists to hone in on the musical and theatrical components of performance in order to present their best work as artists while also supplying memorable performances for the audience. One aria, “Parto, ma tu in mio” by Mozart received special attention from faculty abroad and will be presented for the Symposium presentation.

The Effectiveness of Osmolarity Shock on the Removal of Biofilm
Leda Katebian
Mentor: Sunny Jiang

Marine bacteria that form biofilm on the reverse osmosis membrane cause biofouling, a significant problem in the desalination industry because it reduces the efficiency of freshwater production and increases energy consumption. To find efficient ways to remove biofilm, this research explored the effectiveness of osmosis stress on the removal of biofilm. In this study, marine bacteria isolated from the Carlsbad pilot plant were tested using a simulated membrane biofilm detector. This recirculation model includes 5 µm pore size, 25 mm diameter membrane filters installed in the circulation stream. Enriched bacterium was inoculated into filtered seawater in the seeding experiment. The pump speed, flow rate, and operating pressure were set at the beginning of the experiment and monitored periodically after each osmosis shock during the 72 hours of operation. Periodic osmolarity shock using 30% NaCl solution was initiated at 24 hours after the establishment of the system with bacterial seeded seawater. The control stream was injected with artificial seawater in order to compare the effectiveness of 30% NaCl osmolarity shock. The results illustrated that the differential flow rate of the stream injected with 30% NaCl solution increased rapidly after the initial osmolarity shocks when compared to the control stream. The pressure change of the system with no osmolarity shock showed a pressure difference that was twice as much as the system with osmolarity shocks. The outcome of this research suggests that osmosis stress has the potential of removing marine bacterial biofilm and minimizing the energy used for desalination.

Automatic Programming with Reuse-Informed Search
Samuel Kaufman
Mentor: James Jones

Many kinds of programming produce source code similar to that which exists in other systems, templates, texts, etc., and much work has been done to integrate code reuse more deeply into software engineering, with some success. However, the cost of appropriating nearly suitable small-scale code remains too high to be practical for the everyday developer. As a first step in exploring the efficacy of general, automated tools for reuse, debugging, and code generation, we present two novel algorithms. The first models the structural properties of corpora of code in aggregate. The second leverages such a model alongside reusable examples to automatically generate functions that satisfy automated tests in a general-purpose programming language.

A Search for Self-Cleaving Ribozymes in Anopheles gambiae Mosquitoes
Mina Kazemian
Mentor: Andrej Luptak

Malaria has long devastated the world population, and only recently has the scientific community been able to better understand the disease’s complex relationship between the human host, the mosquito vector, Anopheles gambiae, and the parasite, Plasmodium falciparum. Recently, five families of HDV-like ribozymes were discovered in A. gambiae. Understanding the location and prevalence of these ribozymes in the species through Northern blot analysis will pave the way for future research.
way discovering novel modes of regulation in the species as well as allow for design of more efficient drugs to better fight the disease. The optimization of the blotting techniques shows that the Northern blot is capable of detecting the level of prevalence and expression of the ribozymes in extracted total RNA. In addition, we determined that 5' end labeling with γ-32P ATP is the most sensitive way of probing the ribozymes on the positively charged membrane.

**Awareness of Pain in Patients with Mild or Moderate Alzheimer's Disease**

Matthew Keating  
*Mentor: Rimal Bera*

Procedures evaluated awareness of pain associated with chronic conditions from the perspective of patients with mild or moderate Alzheimer's disease (AD). The primary objective centered on whether AD patients' poor awareness of their own cognitive deficits follows or accompanies poor awareness of their own pain. Patients completed a survey that assessed their awareness of pain relative to chronic conditions. The patients' caretakers completed a similar survey, serving as the standard to measure against patients' self-awareness of pain. From this comparison, it was determined whether or not the patient fully realized his or her pain. Mean pain scores were calculated based on a series of questions, and each question was isolated to determine its significance to the overall score. Despite a small sample size, two questions neared significance. Poor pain awareness, if in fact a precursor or cofactor of cognitive deficits, could be used as an indicator of how far the disease has progressed.

**Behavioral Contributors to Obesity in Different Racial/Ethnic Groups**

Tanya Khamis  
*Mentor: John Billimek*

Obesity is a health concern that affects a wide range of individuals in different age groups, ethnicities, and economic states. It may predispose individuals to lifelong diseases such as chronic heart problems, hypertension and specifically diabetes. This research looks at various factors that contribute to type 2 diabetic patients being overweight within three racial/ethnic groups: Non-Hispanic White, Hispanic, and Vietnamese. The data were collected via surveys distributed to the patients. All data were self-reported and extracted from a larger study called Coached Care for Diabetes Program. Data were analyzed using ANOVA and a two-sided t-test. The results suggest that different health behaviors contribute to patients being overweight in each racial/ethnic group. The obese non-Hispanic White patients more often added high-fat dressings to their food, more often ate snack foods high in fat, and less often performed physical activities. Non-Hispanic White patients from lower-income households were more susceptible to being obese. The Hispanic patients showed significant differences between the BMI (body mass index) groups in how often they ate foods high in sugar and how often muscle strengthening was performed. The overweight Hispanic patients more frequently ate foods high in sugar and performed less muscle strengthening activities. Eating breakfast was the only health behavior that was significant between the Vietnamese BMI groups; the obese plus overweight patients were more likely to skip eating breakfast. This research suggests that further investigation is necessary to formulate cultural based diets rather than a general diet for all.

**Inattentive Symptoms are Associated with Eating Habits in Men with ADHD**

Kevin Khouie  
*Mentor: Jean Gehricke*

Although childhood Attention Deficit Disorder (ADHD) has recently become better understood, little is still known about adult ADHD. There have been no studies conducted on adult ADHD eating habits. The purpose of this study is to analyze the eating habits of men with ADHD to determine if a relationship exists between eating habits and severity of ADHD symptoms, and which habits have a higher prevalence among the ADHD population. It was predicted that those with stronger ADHD symptoms would have overeating problems because of the high prevalence of obesity and bulimia nervosa among people with ADHD. Eating habits were assessed in a sample of 35 men with ADHD. The participants had the severity and subtype of their ADHD diagnosed by the faculty advisor, and were given one survey on eating preferences to identify whether inattention or hyperactivity had any relation to distinct eating behaviors. Results showed that there was a significant correlation between eating habits and the degree of inattention, but only for men, and that smokers were more likely to want to eat when angry, tense or worried. These results invite further investigation into possible causes of eating disorders.

**Incompatibility Relationships in the Mid-Styled Morph of Three Oxalis alpina Populations**

Diana Khuu  
*Mentors: Ann Sakai & Stephen Weller*

Tristylous populations of Oxalis alpina vary in the extent of modification of incompatibility, and crosses that normally produce similar numbers of seeds may differ among populations. We tested the hypothesis that reduced seed production following crosses of the mid-styled morph using mid-level pollen of the short-styled morph (M x m/S) relative to crosses of the mid-styled morph using mid-level pollen of the long-styled morph (M x m/L) results from poor pollen tube growth (reduced pollen tube growth rate...
and total number of pollen tubes) in M x m/S crosses. Using controlled M x m/S and M x m/L pollinations, we counted the number of pollen tubes for each cross type in three populations at three different times after pollination. In the population with modified incompatibility and reduced seed production in M x m/S crosses, growth of pollen tubes 4 and 5 hours after pollination was similar to that of M x m/L crosses, but the total number of pollen tubes produced 24 hours after pollination was lower, results consistent with our hypothesis. In the population with no modification in incompatibility and the population with modified incompatibility but no reduced seed production in M x m/S crosses relative to M x m/L crosses, pollen tube growth rates and total number of pollen tubes were similar for the two crosses. Reduced pollen tube growth following M x m/S crosses may explain the retention of the mid-styled morph despite modifications of tristylos incompatibility selecting against this morph.

**Language and Literacy Practices in a Technologically Intensive Environment**

**Eunjae Kim**  
**Mentor:** Mark Warschauer

One of the most serious educational issues facing California and the nation is the education of English language learners. New technologies hold the promise of improving language and literacy development of English learners, but, as of yet, little research has been conducted on this topic, and some people believe that introduction of new technologies will amplify divides rather than bridge them. The goal of this study was to examine the ways in which young English language learners participate in language and literacy practices in a technologically intensive learning environment. The study took place in two second-grade classrooms in a public school in Southern California where a majority of students are immigrants from Korea. Instruction in the school is technology-intensive, with each student possessing an individual laptop computer for use throughout the school day and at home. Study methods included five months of classroom observation once or twice a week for two hours, interviews with teachers and students, and a parental survey about technology use by students at home. Findings suggest that technology use served to heighten student engagement, facilitate individualized learning, and enhance the quantity and quality of feedback students receive on their work—all factors that are important in education and are especially valuable for English language learners. These results can inform future efforts to use technology with English language learners, particularly through the deployment of individual laptop computers.

**Control of Costal Cartilage Warping Using Electromechanical Reshaping**

**Jinwan Kim**  
**Mentor:** Brian Wong

Surgery of the head, neck and upper airway often requires cartilage grafts for repair or reconstruction of damaged or deformed structures. Of the possible cartilage sources in the body, costal cartilage (rib) provides an abundant source for graft material. However, peripheral costal cartilage segments tend to warp over time, which can prove to be a problem in a patient’s body; hence, these segments are discarded. Our previous research determined that laser heating can accelerate the warping process in costal cartilage tissue to rapidly achieve steady-state shape. However, laser heating leads to both tissue and matrix injury in cartilage. One potential approach is to alter costal cartilage behavior using Electromechanical Reshaping (EMR), a cartilage reshaping technique that relies on oxidation-reduction reactions to alter stress-strain relationship without generating excessive heat. The method also operates using small platinum electrodes that are fairly inexpensive. Through varying configuration of electrodes and voltage, this study attempted to arrest or stabilize peripheral costal cartilage warping without generating damaging heat. The experiments were conducted with paired controls and used digital photography to analyze shape change following EMR. The specimens were photographed at 0-minute, 30-minute, 60-minute and 24-hour intervals following EMR. The warping coefficient for each specimen was then calculated. The results displayed a favorable increase in warping over shorter time for EMR specimens in comparison to the controls. Future investigations will focus on refining this approach with the long-term aim of establishing clinically relevant control of shape change.

**Ozonolysis of Undecylenic Acid**

**Kathy Kim**  
**Mentor:** Sergey Nizkorodov

Photodegradation of organic peroxides and carbonyls can lead to efficient processing of atmospheric organics in aerosols and in cloud droplets. This work focuses on the mechanism of photodegradation of organic peroxides and carbonyls produced by ozonolysis of undecylenic acid. We rely on high resolution electrospray ionization mass spectrometry to unambiguously identify condensed-phase photolysis products by their accurate masses. The photolysis is conducted in an organic film to simulate chemistry occurring in organic aerosols, and in a dilute aqueous solution to simulate photochemistry in cloud droplets. The mechanism of photolysis is inferred from the analysis of the condensed phase products. Molecules that are photodegraded the fastest include various acyloxy hydroperoxides and hydroxyl hydroperoxides produced by ozonolysis of undecylenic acid. The photolysis of hydroxyl hydroper-
oxides and acyloxy hydroperoxides appears to proceed primarily by cleaving the OO peroxy bond. Carbonyl functional groups, if present, can also be photolyzed via Norrish type-I and type-II photodissociation pathways. On the whole, results of this study suggest that the primary products of atmospheric oxidation of unsaturated fatty acids are relatively short lived under daytime conditions because of their efficient photodegradation by the actinic solar radiation.

Identifying the Benefit and Limits of an Artificial Periodontal Ligament Associated with a Dental Implant
Soo Ye Kim  
Mentor: James Earthman

The periodontal ligament (PDL) acts as a shock absorber for a natural tooth to protect the tooth from excessive impact loads caused by occlusal forces or trauma. By contrast, there is no element for dissipating mechanical stress when an implant is placed into the alveolar bone. As a result, excessive mechanical stress can affect the teeth adjacent to the implant or the implant itself and surrounding bone. It follows that, if the periodontal ligament that is attached to natural teeth could be attached to implants, then many problems resulting from excessive mechanical stresses could be avoided. The present challenge was to create an artificial periodontal ligament that would exhibit mechanical characteristics similar to a natural periodontal ligament and have sufficient longevity in the mouth. For this study, the candidate artificial PDL material was silicone containing nanoscale titanium oxide particles. This nanocomposite held potentially both the damping characteristics of silicone and the bio-inductive properties of titanium dioxide. Dental implants were coated with this nanocomposite to evaluate the hypothesis that these favorable characteristics can be achieved with a nanocomposite coating that has sufficient adhesion, strength, and fatigue resistance to be a viable addition to current bone implant materials and methods.

Recruitment and Motivation behind Participation in the Intramural Sports Program at the ARC
Yoonji Kim  
Mentor: Katherine Faust

The demands of college life require a significant amount of time dedicated to one’s studies, which limits participation in extracurricular studies. This study investigates the motivational reasons behind one’s decision to participate in the extracurricular activity of intramural sports at the campus recreation center and also the recruitment processes involved in forming a team. A combination of surveys and interviews were conducted on all team members with a focus on team captains. Most intramural sports participants became more heavily involved in the program as their social networks grew at the recreation center. After overcoming the initial challenges of developing enough relationships and sharing information to form a team, most students tend to continue to participate in the program until they graduate. Thus, the density of one’s social network tied to sports and the recreation center exerts a strong influence on their participation.

Characterization and Expression of Bacterial Fatty Acid Biosynthesis Genes for the Production of Short Chain Carbon Molecules in Saccharomyces cerevisiae
Max Klement  
Mentor: Nancy Da Silva

The chemical industry represents a $400 billion enterprise in the United States alone, producing 300 pounds of consumer products derived from petroleum per year. It is becoming more evident that there is a need to shift to a renewable carbon source to maintain long-term sustainability within the chemical industry. The objective of this project is to develop a system in Saccharomyces cerevisiae that produces short chain carbon molecules as precursors for chemical catalysis. One approach is to introduce a heterologous fatty acid biosynthesis pathway (from Escherichia coli), to allow for independent regulation of the various enzymes and introduction of new promising enzyme activities. The host S. cerevisiae is a well-characterized, industrially important eukaryotic organism with a short generation time, fully sequenced genome, and potential ability to reduce the effects of short chain carbon molecules on cytotoxicity. The expression of E. coli fatty acid biosynthesis genes was confirmed by Western blot by using histidine antibody binding. Optimization of the system included growth curve studies to determine optimum harvest time based on cell health and reproducibility; it was established to be eight hours after inoculation. Optimization of the extraction buffer, to a urea based buffer, and extraction protocol, using a French press to lyse the cells by pressure, produced improved results. Ongoing Western blot and activity studies aim to confirm expression of the entire E. coli pathway, and insertion of all nine genes into the yeast host has been initiated.

Characterization of Secondary Organic Aerosol Photolysis by Quartz Crystal Microbalance
Joshua Klobas  
Mentor: Sergey Nizkorodov

Volatile organic compounds from biogenic sources, such as terpenes, compose a large fraction of aerosol in the upper atmosphere. These particles contribute to many processes implicated in climate change, including effects on radiative forcing through increased cloud albedo and changes in precipitation patterns through the reduction in cloud condensation droplet size and increased lifetime of clouds. Ozone photochemistry is considered to be the
primary process through which these compounds are removed from the upper atmosphere. We describe a quartz crystal microbalance (QCM) technique for the characterization of secondary organic aerosol (SOA) photolysis kinetics. Limonene and other representative compounds were reacted with ozone and deposited using a unique deposition apparatus incorporating a scanning mobility particle sizer (SMPS) for aerosol characterization. The resulting film of impacted SOA was further scrutinized with scanning electron microscopy. Photolysis experiments were conducted on films of SOA and representative compounds deposited on the quartz crystal by the aforementioned apparatus. A xenon arc-lamp/Schott BG filter was employed for UV irradiation and mass loss was observed as a function of time.

Racecar Design
Galen Ko
Mentor: Michael McCarthy

The world-wide focus on sustainability is driving innovation in the automotive industry toward hybrid gasoline electric vehicles. Our project carries this further to design a racecar implementing compressed natural gas as the fuel and a hybrid electric system that includes energy regeneration. Our vehicle is developed with the idea that it will be operated under typical road car usage, being able to run up to 55 mph to meet freeway speeds, operating efficiently in simulated stop and go traffic conditions, and operating efficiently with performance in an urban setting. Our design is unique because few hybrids focus their system design on racecar-style performance. The fuel choice selected for this vehicle is compressed natural gas, as it is the lowest cost solution. The electrical systems are powered by batteries and an ultra-capacitor for recovered energy. The vehicle platform is developed to be modular so that the power plant that drives the vehicle can be swapped out for an all-gasoline high-performance vehicle if the owner chooses to use the vehicle to compete in competition classes that require non-hybrid systems. The goal of this project is to develop a vehicle that is both highly efficient and sporty in performance, bringing more consumers to choose sustainable solutions.

Mechanical Properties of Nanocrystal Superlattices
Ricardo Komai
Mentor: Paul Ashby

Nanocrystals, with different compositions and sizes, produce various unique electrical, magnetic, and optical properties. When these nanocrystals are then organized into superlattices, a periodic array, the unique properties are modified. This material structure offers a multitude of possibilities, since the inorganic crystals and even the ligands that hold these nanocrystals together can be changed to produce different properties. While electrical, magnetic, and optical properties are being developed, the mechanical properties of this type of material have yet to be fully explored. Due to the small sample size of nanocrystal superlattices, nanoindentation is an excellent technique to determine mechanical properties, since it requires a very small amount of surface to examine the material. A nanoindenter attachment of an Atomic Force Microscope is used to examine nanocrystal superlattices composed of Lead Sulfide capped with Oleic Acid. With the nanoindentation data, information such as hardness and modulus of elasticity can be determined. Using a Scanning Electron Microscope, the fracture toughness can be determined by measuring the size of the indentations and the resultant fractures of the material surface. Experimentation has revealed that nanocrystal superlattices of these types have a modulus and hardness similar to soft polymers, whereas the fracture toughness reveals that the material is very brittle. Understanding the mechanical properties of this material will guide the creation of nanocrystal superlattices with specific mechanical properties to support many applications.

Study of Oral Hydration Using Quantitative Diffuse Optical Near-Infrared Spectroscopy
Clement Kondru
Mentor: Anthony Durkin

The objective of this study is to determine whether we can use quantitative diffuse near-infrared spectroscopic methods to assess changes in oral hydration in a group of subjects that suffer from dry mouth. A superficial diffusing probe with a 3 mm source-detector separation was specifically designed to be used in combination with diffuse optical spectroscopy to noninvasively determine full spectrum optical properties of superficial in-vivo tissues in the wavelength range of 650 to 1000 nm. The technique is capable of determining broadband absorption and reduced scattering coefficients, in addition to oxygenated and deoxygenated-hemoglobin concentration, lipid fraction and water fraction. Three measurements were taken on a number of patients, using the diffusing probe at three different locations within the mouth (the cheek, lip, and tongue). Subjects came in for base measurements using the diffusing probe and were given either a placebo or an FDA-approved product for dry mouth in a blind study; they then returned for four follow-up measurements over a period of 16 days. After 16 days, patients were given the placebo or the product according to what they had not used before and the same measurements were repeated over another 16-day span. After taking measurements, we were able to see changes in oral tissue chromophores with visits over a period of time, and to produce quantitative optical properties for oral tissue.
Possible Applications of eCryo for Wound Healing and Skin Grafts in Pigs
Alisa Krichevsky
Mentor: Gregory Evans

Split thickness skin grafts (STSG) are often used for patients who have extensive wounds and burns. graft survival is dependent on nutrients and blood supply being able access the graft. graft failure occurs in the presence of hematoma, seroma, poor adherence, shear forces, and infection. Blood products containing bovine thrombin, such as fibrin glue, have shown increased STSG take but may trigger an autoimmune response. Autologous cryoprecipitate containing high concentrations of sodium citrate is believed to improve wound healing in STSGs in recipient sites in pigs in terms of adherence and vascularization without the risk for an autoimmune response. Thirty-six skin grafts (5x5 cm) were used to analyze the efficacy of enhanced Cryoprecipitate (eCryo) to improve graft take, survival and wound healing in a porcine skin model. The grafts were then evaluated at 7, 14, 21, and 28 days on macroscopic and histological assessments, cellular composition, and flap survival. There were no statistical differences between histological assessments, color or adherence. Flaps treated with eCryo demonstrated decreased pliability and flap survival, but resulted in significantly higher numbers of fibroblast and macrophages in the histology. However, flap survival decreased in the flaps treated with eCryo. We demonstrated that this animal model using pig skin is much more accurate and reliable, as it more closely resembles human skin than the rat model used in previous studies.

Jester in the Kings Court: The Role of Political Satire in 21st Century American Politics
James Kuo
Mentor: Alison Brysk

In the 21st century, political satire has established a place in the American political landscape. Through the medium of television, Jon Stewart and Stephen Colbert have elevated the relevance of satire through sharp satirical analysis. By using the tools of rhetorical analysis, I examine how rhetorical critique breaks down political language and news media bias. Stewart and Colbert’s role as comedians often discredits their political commentary, but consistent satirical critique means that they have gradually created a credibility not previously enjoyed by satirists. They have used the blurring of news media and entertainment boundaries to produce a new form of investigative journalism—making them unlikely representatives of traditional investigative journalism. Using Jon Stewart and Stephen Colbert as the contemporary continuation of political satire in 21st century American politics, my research explores political satire in a political and media landscape in which the traditional boundaries between the two are increasingly blurred.

Stewart and Colbert have used these blurred boundaries to create a hybrid variation of political satire that establishes them as formidable political commentators and comedians. Their firm commitment to their role as comedians gives them the freedom to be satirical journalists who use their comedy as a sharp rhetorical weapon.

Criseyde and Her Reader
Raquel Laguna
Mentor: Elizabeth Allen

Geoffrey Chaucer’s adaptation of Boccacio’s Il Filostrato cannot undo Criseyde’s reputation as a betrayer, but it complicates his reader’s ability to believe her unfaithful act to be intentional. Given the narrator’s express purpose—“The double sorrow of Troilus to tell”—versus his moments of apparent sympathy for Criseyde, radically different critical interpretations of the text are expected. My research carefully inspects the spectrum of scholarship on Chaucer’s Troilus and Criseyde. One end of the spectrum presumes a stable identification between Troilus and the reader, consequently reading the poem as an allegory of sensuous trespass. The other end of the spectrum analyzes the psychological mystery surrounding Chaucer’s Criseyde, embracing textual ambiguity as evidence for Chaucer’s sensitivity towards complicated gender issues. The moralistic critics associate truth in love only with Troilus, and even those more sympathetic with Criseyde emphasize the reasons for her betrayal more than her aspirations to fidelity and permanence in love. My essay, on the contrary, explores the structures of permanence that Criseyde creates, emphasizing the depth and complexity of her desire for stability. This desire reflects and encourages an analogous desire on the part of readers. By analyzing Criseyde’s use of cyclical, seasonal language and her elaborate vows to Troilus, I elucidate the poem’s insistence on the hope for constancy. Criseyde’s aspirations mirror those of the reader: interpretively, we hope for clarity and philosophically, for stability in life—even as we realize the sheer impossibility of such permanence in the mortal world.

Comparison Studies of a β-sheet Mimic Analogue
Andrew Lam
Mentor: James Nowick

A β-sheet is a protein motif in which amino acids are laterally hydrogen bonded to form a sheet-like structure. This is a common motif throughout several proteins and is a key structural feature in the formation of amyloid fibrils. Previous work has led to the development of a large macrocyclic system that forms well-folded β-sheets. Although the system was able to fold well with some sequences, it did not fold well for every sequence. A new analogue of the large macrocyclic β-sheet where the Hao unit is moved to a different position has been developed and tested to study its folding capabilities for different sequences. The folding
capabilities of these macrocyclic peptides will be investigated primarily by NMR and will be compared with the original system to deduce the macrocycle analogue’s higher ability to fold.

**China Land Requisition**

Yu Lam  
*Mentor:* Thomas Douglas

According to the Constitution of the People’s Republic of China (PRC), revised in 2004, all the nation-state’s agricultural land belongs to the collective. Therefore, the most common character of property rights in China is actually usufructuary right, or the legal right of using something belonging to another. One of the biggest concerns with this system of land use is that usufructuary right, by law, expires, as there are set numbers of allotted years granted for land use (usually 70 years for residential purposes and 50 years for industrial purposes). However, China’s 2007 Property Law has actually changed the way land is viewed, as it is offered some type of protection. The purpose of the study is to explore some of the social tensions produced by new forms of land requisition enacted by the Chinese government, whether or not the usufructuary right has actually expired. Through this study I seek to understand China’s 2007 Property Law better, along with the reason that people’s property is often violated by local government. I will examine some case studies of eminent domain from the United States in comparison with China’s new system of land requisition. Also, I will address the fact that Non-Governmental Organizations (NGOs) are playing a significant role in educating the status quo on how to address property disputes through the use of China’s judicial system and, furthermore, they are providing a growing awareness of the problem to Beijing.

**The Beauty of Self Discovery**

Madeline Lamond  
*Mentor:* Loretta Livingston

This piece is a compilation of movement inspired by the dancers in the work as well as my own movement research dancing last summer at Alonzo King Lines Ballet School and The San Francisco Conservatory of Dance. My exposure last summer has inspired me to become more active in the university atmosphere by taking advantage of the talent within the dance department. I believe that performance experience should not just be limited to the university. I am interested in unconventional dance environments and creating original movement using different improvisation techniques. Inspired and determined to push myself to take risks, I began dancing in my house garage and playing around with different images to evoke original movement. This nightly ritual began to hold a therapeutic effect and I began inviting friends to come and dance with me in my garage. My combined experiences have led me in creating my own improv group called, “the MadCat factory”, it evolved from a simple purpose—to encourage self-exploration and creativity by applying my summer research, my own point of view, and a sense of humor. My work is fueled by a fiery passion to create dance that pulls the audience in and invites them on the dancers’ journey. “The MadCat factory” is a direct reflection of myself as an individual: a work in progress.

**Effects of Conspicuous Recycling Receptacles on Recycling Behavior at UC Irvine**

Elizabeth Landeros  
*Mentor:* Kristen Day

The purpose of this study is to investigate factors that may reduce the amount of recyclable materials improperly disposed of in trashcans by examining the relationship between decorated recycling cans and traditional recycling cans on a university campus. The study hypothesized that the mean of the recycling contents in decorated recycling cans would be greater than that of the traditional recycling cans. To test the hypothesis the contents of nineteen recycling receptacles, divided into site 1 and site 2, were collected and weighed over a six-week period. During the first three weeks, the traditional appearance recycling receptacles were collected and measured as the base measurement. For the last three weeks of the study, brightly colored new signs were added to the receptacles as the intervention. Contents were collected and measured from the renovated recycling receptacles in the same manner. Statistical analysis was conducted using a t-test with alpha level (α=.05). Findings suggest that there was a significant increase in the contents of the recycling receptacles with the intervention at site 2. Site 1 did not prove to have a significant increase. Conclusions identify strategies for increasing recycling collections on college campuses.

**May Bukas Pa: The Resurrection of the Pasyon and the Effects of National Sentimentality as Seen in Filipino Melodrama**

Matthew Charles Lapid  
*Mentor:* Christine Balance

In the chapter titled, “Poor Eliza,” from her novel *The Female Complaint: The Unfinished Business of Sentimentality in American Culture*, Lauren Berlant critiques the use of national sentimentality in classic narratives such as *Uncle Tom’s Cabin*. She asserts that the heroic narratives of individual characters, who rise out of oppression in vivid aesthetic works, merely cloud readers with overwhelming sentiment that centralizes the social issues between the individual and the ‘universal’ condition of struggle. As a result, the nation’s duty to the collective people falls into the background while readers feel sympathy towards the individual struggle, which is viewed as a product of mere misfortune. Following Berlant’s critique on national senti-
mentality, audiences can see how sentimentality works in a similar oppressive nature in the modern day Filipino tele-
serye, May Bukas Pa, a Filipino melodrama that echoes the narrative of Jesus Christ. Rooted in the value of struggle and themes of hope, the plots and motifs of early Philippine drama, from the Spanish colonial period, are exploited by contemporary Philippine mass media to subjugate the minds of mass audiences and solidify the social hierarchy of a strict social pyramid. While the Filipino television drama, May Bukas Pa, is widely acclaimed as an inspira-
tional television program that embodies hope for a better future by mainstream culture, Berlant’s critique of national sentimentality, as seen in aesthetic works, reveals that the hope fueled by excessive sentimentality merely perpetuates structural issues in the Philippines and fails to call the nation and social elite to action.

Net Energy Intake, Metabolic Rate, and Growth Rate of the American Alligator (Alligator mississippiensis) in Response to Atmospheric Oxygen Levels

Anthony Larios

Mentors: James Hicks & Tomasz Owerkowicz

The amount of atmospheric oxygen present affects energy intake, metabolism and growth rate in American alligators (Alligator mississippiensis). Even though previous studies have shown that alligators under chronic hypoxia (12% oxygen) show a slower growth rate and hyperoxic alligators (30% oxygen) show the most amount of oxygen consumed during the absorption of food, other oxygen levels have not been considered. Pre- and post-hatchling alligators were incubated under fixed oxygen levels (16, 21, 26, 31, and 36 percent), fed and measured for over six months. To determine growth rate, I measured their weight, total and snout-to-vent length, and their head length and width on a weekly basis. Data on growth rate, as well as net energy intake and metabolic rate, is still being collected, and trials are still in progress. Net energy intake will be determined by feeding the alligators a fixed amount of food and measuring the energy content of their feces with a calorimeter. Metabolic rates will be determined by measuring the amount of oxygen consumed in a closed chamber. I expect the alligators under the 16, 21, 26 and 31 percent incuba-
tors to show a trend similar to previous studies. Alligators under 36 percent oxygen levels may show both lower or higher growth rates and oxygen consumption than lower oxygen levels.

The Development of Vocal Artistry: Italy and Music

Belinda Lau

Mentor: Darryl Taylor

Italy is the birthplace of the Renaissance, pasta and, most importantly, opera. Surrounded by this affluence of cul-
tural history at The Amalfi Coast Music Festival and Institute in Vietri sul Mare, Italy, I was fortunate enough to study op-
era and the classical vocal repertoire in an atmosphere of architectural brilliance, regional art, and talented musicians. Teachers, conductors, directors, collaborative pianists, and professional experts staffed the program, coming from distinguished schools such as the Julliard School of Music and Johns Hopkins, as well as prominent opera companies such as Virginia Opera and The Rome Opera Theater. On top of voice lessons, coachings, and rehearsals, I participated in numerous recitals and opera scenes concerts, and was privileged to be an understudy in the Mozart opera Le nozze di Figaro, which was staged and performed with orchestra. The program also included Italian language les-
sions, cooking classes, and excursions to Pompeii, Capri, and Ravello. Being completely immersed in the Italian cul-
ture, I experienced a deeper understanding of the music and opera’s roots. But by far, the most rewarding aspect of the program was the opportunity to learn from seasoned professionals and professors, and the boosted motivation and drive garnered from working with so many gifted and experienced peers. The Amalfi Coast Music Festival and Institute offered me a glimpse into a competitive career, and through its ruthlessness, I discovered my true desire and passion to sing and perform, and the tools necessary for me to succeed in such an industry.

Synthesis and Characterization of Electronic Variants of the 4-Ureido-2-Pyrimidone (UPy) Motif

Bryan Le

Mentor: Zhibin Guan

The development of synthetic polymers that possess a combination of high modulus, high tensile strength, and high extensibility has potentially significant consequences on the technological advances of engineering materials. Biomimetic concepts have proven successful in improving mechanical properties in network polymers with these goals in mind. In particular, the integration of the titin-mimicking 4-ureido-2-pyrimidone (UPy) motif into poly-
mer modules has shown to produce a stiff elastomer with self-healing character. Previous studies have shown that these properties arise from the quadruple hydrogen-bond system as a result of interactions between UPy module pairs. However, the effect of modulating the hydrogen-bond strength on the macro-mechanical properties of the material is not well understood. I am investigating these effects by synthesizing variants of the UPy motif contain-
ing various electron donating and withdrawing groups para to the hydrogen-bearing nitrogen at position 3 of the pyrimidone core. I have progressed towards the full syn-
thesis and characterizations of the nitro, methyl ester, and methyl substituent variants. Current research goals include full synthesis and characterizations of the methoxy and hydrogen variants, double-loop closing of the module pairs, polymerization of the coupled modules, and atomic force microscopy (AFM) studies on the polymer product.
to investigate the single molecule mechanical properties of each module. The study may shed light on the relationship between molecular interactions and macro-mechanical properties of biomimetic elastomers and provide insights for improvements in future biomimetic designs.

**Animation: A Novel**

Daphne Le  
*Mentor: Ron Carlson*

*Animation* is a novel of literary fiction, historical fiction, and magical realism about an artist's relationship to his work, as well being a story about the romantic love between two men. Set during the 1930s, in a setting based off of Walt Disney's animation studio during production on *Snow White*, the focus of the novel is on developing a compelling story that focuses on the everyday lives of two artists of the fictional Hyperion Animation Studio. At the same time, it integrates fantastical elements to provide a contrast and comparison between the art and style that epitomizes a studio to the realities of its artists' own personal characters and desires. Research was done on the historical period, the field of animation, and there was also general research done on topics such as German expressionist film, Russian immigration to the United States, Renaissance art, and other subjects involving aspects of U.S. history and history of art in order to develop a strong and realistic context for the fictional characters. Development of the novel under Professor Carlson's guidance also focused on building a cohesive structure for the novel, as well as on writing well-developed scenes built on credible detail and which focused on the exploration of the characters as complex human beings.

**The Impact of Rhodiola rosea and its Active Putative Compounds during Oxidative Stress in Drosophila melanogaster**

Tracey Le  
*Mentor: Mahtab Jafari*

In recent years, an interest in elongating life has grown throughout the research community and the general population. People want to live not only longer, but also healthier. It is important to address aging as a disease, because it is caused by the degeneration and loss of stem cells, in addition to cellular oxidative stress. One of the natural compounds studied to increase longevity and enhance health span is *Rhodiola rosea*. *R. rosea* is a botanical found in cold regions and high altitudes of Europe and Asia, and extends lifespan in *Drosophila melanogaster*, protects *D. melanogaster* and human cells against oxidative stress, and decreases superoxide levels in *D. melanogaster* mitochondria. *R. rosea* extract at a dose of 25 mg/mL and its active putative compounds, 0.425 mg/mL Compound A and 1.125 mg/mL Compound B, were fed to *D. melanogaster* for two weeks, after which they were exposed to oxidative challenge of 12 mM paraquat in a 5% glucose solution on filter paper. After two weeks of feeding, it was observed that *D. melanogaster* that were fed with *R. rosea* and Compound A lived longer than the control flies. There was no difference in lifespan in those fed Compound B. Therefore, *R. rosea* and Compound A protects *D. melanogaster* against paraquat, an O₂ -creator, thus increasing its lifespan. The results of this experiment help decipher the mechanism of *R. rosea* extract and its active putative compounds. Further experiments will consist of increasing the feeding period prior to paraquat exposure.

**Developing a Model for TNF-Mediated Apoptosis in LNCaPs**

Eunice Lee  
*Mentor: John Krolewski*

Prostate cancer derives from prostate epithelial cells, which are normally under strict growth regulation that includes the activation of apoptosis (programmed cell death) to terminate abnormal cells. One of three identified signaling molecules associated with apoptosis in prostate epithelial cells is TNF (Tumor Necrosis Factor). However, what makes TNF unique is its ability to promote cell survival as well as activate cell death. Its regulation of anti-apoptotic protein FLIP (FLICE-like inhibitory protein) supports its involvement in two seemingly contradictory effects, though the exact circumstances determining which pathway is activated are still unknown. I studied TNF's effects on the levels of FLIP in LNCaPs, androgen sensitive prostate cancer cells, treating cells with varied concentrations of TNF for different periods of time. At the same time, I evaluated whether the cells were undergoing TNF-mediated apoptosis. Addition of TNF to LNCaPs (prostate cancer cells) indicates a time and dose dependence to the regulation of FLIP in LNCaPs, with FLIP levels increasing with increased concentrations after short treatments but decreasing with increased concentrations after extended periods of time. However, lowered levels of FLIP are not an indication of TNF-mediated apoptosis. The results suggest that TNF alone cannot induce apoptosis but requires other, more specific conditions, though it slows or inhibits cellular proliferation.

**Global Cardiovascular Disease Risk in U.S. Adults by Severity and Presence of Chronic Obstructive Pulmonary Disease**

Janet Lee  
*Mentors: Hwa Mu Lee & Nathan Wong*

Chronic Obstructive Pulmonary Disease (COPD) is the fifth leading cause of mortality and is associated with various medical comorbidities. Global risk estimates for cardiovascular disease (CVD) are used to determine the intensity of treatment needed. Not described, however, is the distribution of global CVD risk in persons with
COPD. I examined how global CVD risk compares by presence and extent of COPD. The study included 8,735 adults aged 18 and over from the Third National Health and Nutrition Examination Survey with spirometric data and CVD risk factor values. COPD was defined as present if the ratio of 1 second of forced expiratory volume over forced vital capacity (FEV1/FVC) < 70%, and of those, severity was classified as mild (FEV1≥80%), moderate (50%≤FEV1<80%) or severe (FEV1<50%). I examined presence and severity of COPD in relation to estimated 10-year risk of CVD by Framingham Risk Scoring (FRS): low (<10%), intermediate (10%–20%), high (>20%), and pre-existing CVD. The results showed an increasing proportion of persons at greater levels of global risk and pre-existing CVD with increasing COPD severity. The results reveal that many persons with COPD, and with greater severities of COPD, are at elevated CVD risk and may be candidates for more intensified CVD risk reduction aimed at treating and reducing future CVD comorbidities. In particular, the mild and moderate COPD patient groups have the greatest potential for risk reduction by treatment, including medications.

Investigating Microbial Diversity Trends in the Coastal Waters of the Newport Pier
Jiae Lee
Mentor: Adam Martiny

Marine microorganisms make up the base of the complex marine biota, and are responsible for regenerating and fixing nutrients, processing marine primary productivity, and driving biogeochemical cycles. Given their crucial role in the marine ecosystem, it is expected that a change in marine microbial diversity will inevitably designate a dramatic change in the surrounding biological and ecological organization of the environment. However, the 'great plate count anomaly' of the 1990s has demonstrated most species of bacteria to be essentially un-culturable, as classic microbiological techniques lose or alter much of in vivo bacterial diversity. Therefore, this project focused on the establishment of culture-independent techniques in determining the microbial trends in the waters of the Newport Pier. The investigation targeted the 16S rRNA gene, which contains both highly conserved regions and diagnostic variable regions unique to an organism and is an excellent biological marker of microorganisms. The project involved development and optimization in the filtration of seawater, extraction of prokaryotic DNA, quantification of DNA, and PCR amplification of the 16s rRNA gene. Results have shown SYBR green dye to be effective in DNA quantification at low concentrations and that inhibition of PCR amplification occurs in concentrations of DNA above 2ng per 25µl sample. Environmental samples from Newport Pier were successfully amplified via qPCR using bacterial prim-

Fault-Tolerant Distributed Transactional Memory
Jihoon Lee
Mentor: Brian Demsky

Fault-tolerance is the property that ensures a system will complete operations properly in the event of a component failure. Distributed transactional memory is a promising technique to provide fault-tolerance for distributed systems. However, current practices for developing distributed systems using transactional memory require manual development of complex protocols to detect and recover from machine failures; these protocols are often challenging and error prone to develop. The goal of this research was to build a new fault-tolerant distributed transactional memory system designed to simplify the development of distributed applications by hiding fault recovery protocols behind a distributed transactional memory programming pattern. To achieve this goal, I extended an existing distributed transactional memory system to be fault-tolerant by recovering from machine failures. I have used the system to develop five fault-tolerant applications: a distributed spam filter, a distributed Web crawler, a distributed file system, a distributed multi-player game and a distributed computational kernel. The results show that each application recovered safely from machine failures and completed its operations properly.

Influence of Thrombospondin-4 and Calcium Channel Alpha-2-Delta-1 Subunit in the Development of Hyperalgesia
Joshua Lee
Mentor: Z. David Luo

Neuropathic pain developed after peripheral or spinal nerve injury is significantly burdening the daily functions and quality of life in up to 7% of people in the United States and countries in Europe. Although pharmaceutical and therapeutic treatments exist, they are often limited and inefficient due to inadequate understanding of the molecular mechanisms of neuropathic pain. Recent studies by our lab suggest that up regulation of thrombospondin-4 (TSP4), a synaptogen, in L5/6 of dorsal spinal cord (DSC) correlates with the development of neuropathic pain in spinal nerve ligated (SNL) rats. In this project, ten TSP4 knock-out and ten TSP4 wild-type mice were tested at baseline for Paw Withdrawal Threshold using hargreaves test, conventional hot plate and conventional cold plate before being ligated in L5/6 of dorsal spinal cord. Over four weeks the mice were tested in conjugation with allodynia testing by a trained lab technician and were found to develop allodynia, suggesting a successful operation. When tested for hyperalgesia, our experiments suggest that there is no significant difference between wild-type and knock-
Well-Being among Korean American Undergraduates
Kristal Lee
*Mentor: Jeanett Castellanos*

Current literature reveals that Asian American students have disproportionately high rates of mental health issues such as depression, anxiety and suicide. The congruity of these independent findings is a marked indication that the integrity of Asian American students’ well-being is being compromised by a combination of factors. However, far less research has been done on Asian Americans as a non-aggregated population. In response, this study is interested in looking at the challenges that face Korean American students, specifically, as this population’s experiences are markedly distinct from other Asian subgroups. Further, no research exists that examines the well-being of Korean American students from an empowerment model; one that focuses on observing and analyzing the buffering effects of psychological, social and cultural actions and beliefs that protect students from ill experiences. This study will answer two fundamental questions; the first being whether demographic variables are related to well-being in Korean American undergraduates; and the second being whether psychological (coping, academic self-efficacy, internalization of model minority), social (perceived social support from family and friends, perceived barriers), and cultural (perception of university environment, cultural congruity, acculturative values, acculturation and ethnic identity) constructs have a significant influence on Korean American undergraduates’ well-being. It is expected that the psychological, social, and cultural factors will individually and collectively influence students’ well-being. Findings will provide researchers directives to better understand the factors that contribute to Korean well-being and will advise university counseling centers on what services to provide to assist these students throughout their educational experiences.

Affine/Non-Affine Transition of Cross-Linked Actin-Monolayer Networks
Paul Lee
*Mentor: Michael Dennin*

Under stress, actin filaments in eukaryotic cells have been known to translocate to the nucleus and decrease proliferation. Current simulation models have predicted that cross-linked actin networks can behave linearly or nonlinearly, depending on the cross-link concentrations, but the physical properties of this behavior remain elusive. As such, the goal of this experiment was to compress a cross-linked actin-monolayer in a Langmuir trough and quantify its transition from affine to non-affine deformation. To do this, a 2:1 ratio of skeletal muscle actin to biotinyl actin was polymerized on top of a tris solution and cross-linked with streptavadin. We observed small increases in pressure proportional to the concentration of actin. At large quantities, a threshold concentration of actin to tris was observed resulting in a zero change in pressure. On another occasion, we observed possible folds or clumps of actin with a solution sonicated in a 1 in 1000 carboxylate bead solution. Future efforts in this experiment will involve using higher concentrations of beads and tuning our programs to pinpoint the threshold area during affine to non-affine behavior.

Role of a TGF-ß Ligand in Metamorphosis
Kavita Arora
*Mentor: Tiffany Leung*

The process of molting in *Drosophila melanogaster* is dependent on Ecdysone signaling, which regulates and synchronizes many biological changes during larval development and metamorphosis. The signaling molecule, a steroid hormone called hydroxyecdysone, is secreted by the prothoracic gland. Response to the signal is mediated by receptors such as EcR-B1 that are expressed throughout the larvae in specific tissues and stages of development. For example, in the late third instar stage, EcR-B1 is expressed...
in the fat body, testes, ovaries and central nervous system. Here we show that EcR-B1 expression in the brain is regulated by Myoglianin (Myg), a TGF-ß/Activin family ligand, that is homologous to vertebrate Myostatin. Mutations in the fly myg gene result in lower levels of ecdysone receptor expression. This phenotype is also encountered when Follistatin, a potent inhibitor of Activin ligands, is over expressed in the brain. This ligand causes activin signaling and is related to Myostatin in vertebrates. These results demonstrate that TGF-ß signaling, more specifically, the ligand Myg, is involved in stage progression and metamorphosis.

The Anatomy of Structurelessness: How Leaderless Organizations Make Decisions
Cari Levay
Mentor: Francesca Polletta

In her article, “The Tyranny of Structurelessness,” Jo Freeman, drawing examples from the 1960s women’s liberation movement, argues that democratic organizations lacking formal structure invariably become governed by friendship cliques. This research seeks to understand the dynamics of decision-making authority in democratic social movement organizations today through a case study of the Climate Justice Now! network, a transnational democratic network involved in the UNFCCC negotiations. It finds, contrary to Freeman’s analysis, six operative, hierarchically-organized bases for decision-making authority: expertise, length of involvement in global justice struggles, indigenousness, size of group/constituency, radicalism, and southern-ness. The implications of this structure are then discussed, focusing specifically on how tensions between authority sources play out and what this may mean for democratic social movement organizations operating today.

Developing into a Professional Artist: Methods of Becoming a Well-Rounded Performer
Connie Li
Mentor: Darryl Taylor

On the first day that I met Jonathan Eaten, a well-known and prestigious director in the field, he told us that all the audience and he cared about was the finished product. I was shocked that an artist would say something so blunt and harsh. Didn’t he, as a stage director, appreciate the art and work that went into it? The greatest irony of that statement was that I was attending a two-week workshop where we worked specifically on techniques. We took ballet, staging and movement, studied works and participated in private voice lessons and breathing-alignment classes. There was not a moment when technique was neglected or I had any free time. Even when we were just speaking lines we breathed and spoke as if we were singing them. We completed the program with a fully-staged performance of Henry Purcell’s Dido and Aeneas and Puccini’s Gianni Schicchi. I had the honor of playing the role of the Sorceress in Dido and Aeneas. It was a well-polished and wonderfully fun performance. What astounded me was that while I was on stage, I did not think about any of the things I had learned before. Suddenly the words that had astounded me in the beginning had become so true. As a performer, all of the hard work was really done before so that we could focus on performing. The program changed my perspective on being a performer. By the end of the performance all I cared about was the finished product, because all of the hard work had become a part of me. It was a wonderful beginning to becoming a better performer.

Effects of Motility and Contact Inhibition on Tumor Viability: A Discrete Simulation Using the Cellular Potts Model
Jonathan Li
Mentor: John Lowengrub

The effect of cell migration on tumor growth was analyzed using the Cellular Potts Model. Motility, Cell-to-cell adhesion, contact inhibition, and cell compressibility are incorporated into the model. We find that increased motility has a direct effect on the growth rate of a tumor. Cell lines with greater motility overcome the attractive forces of cell-to-cell adhesion and have more space to proliferate. In addition, contact inhibition amplifies the effect of motility. Strict contact inhibition penalizes clumped cells by halting their growth, giving motile cells a greater advantage. These results confirm that migration correlates with tumor viability. The model also shows that cells with less response to contact inhibition are more invasive. This raises questions on the effectiveness of some chemotherapy treatments, which may actually select for these more invasive cells.

Electromechanical Reshaping-Induced Young’s Modulus Reduction in Rabbit Elastic and Hyaline Cartilage
Amanda Lim
Mentor: Brian Wong

As surgical technologies trend toward minimally invasive techniques, there has evolved an increased demand for methods to reshape the cartilaginous structures of the head and neck. Whereas traditional procedures damage cartilage to alter shape, electromechanical reshaping (EMR) involves the molding of intact cartilage into a new shape, followed by voltage application initiating chemical reactions that produce sustained shape change. EMR is a relative newcomer to the field of innovative cartilage reshaping techniques, such as those implemented using laser or radiofrequency devices. Although the ability of EMR to produce long-term shape change has been demonstrated, other aspects of the technique, such as its exact mechanism or effects on tissue properties, are less concretely under-
stood. To investigate the basic effects of increasing EMR voltage on cartilage mechanical properties, tensile stress and strain were measured using a precision mechanical testing platform in order to calculate Young’s modulus for 15mm x 5mm cartilage samples following voltage application. Two types of cartilage were used: rabbit septa (hyaline) and auricles (elastic). Samples were taken in pairs from each specimen to match each EMR-treated sample with a control. Platinum electrodes were used to apply voltage at parameters including those effective in reshaping: 2–8V at 2 min (septal) and 3 min (auricular). However, samples were not reshaped in order to maintain uniform specimens for ideal mechanical analysis. A comparison of control and EMR-treated Young’s moduli indicated an EMR-induced reduction in stiffness increasing with voltage magnitude up to a 46.5% and 33.3% decrease from control for septal and auricular, respectively.

Searching and Characterizing Functional Genomic Sassanfar Aptamers

Dana Lin
Mentor: Andrej Luptak

Metabolite-sensing regulatory RNAs, riboswitches, are common in bacteria and plants for control of gene expression; however, they have never been discovered in eukaryotes. In this study, we use secondary structure-based bioinformatics searches and in vitro selections to identify strong specific RNA binders called aptamers. We tested the hypothesis that aptamers are widely among genomes of not only bacteria but also eukaryotes, and that aptamers regulate gene expression, therefore, acting as riboswitches. We searched genomes for sequences that can fold to form into the secondary structure of metabolite RNA aptamers and found that our adenosine aptamers were in vertebrates; interestingly, one confirmed conserved aptamer in human Rab3c, the first to be discovered in primates. This recent result leads us to believe that aptamers are more widespread in the genomes of eukaryotes than previously thought.

The Moderating Effect of Hardiness on College Students during a Recession

Dennis Lin
Mentor: Salvatore Maddi

The purpose of this study is to understand how college students react to the stress perceived from an economic downturn. Past research has established hardiness as a buffering factor against stress and as a moderator between positive outcomes and stressful circumstances. The study examines how hardiness moderates the relationship between stressful circumstances of the current economic downturn and academic achievement motivation among college students. Survey data was collected from 487 college students who were enrolled at a university in Southern California. The findings of the study convey that perception of current economic stress has a negative effect on perception of future economic stress. The study also conveys future economic stress has a negative effect on academic achievement motivation. Hardiness was not found to be a moderator between the relationship of economic stress and academic achievement motivation, which conveys the absence of a buffering effect. It was initially predicted that hardiness can buffer the stress perceived from the current economic downturn and enhance positive outcomes towards academics, but the results did not support the predictions. Further research must be done using different measures and collecting more data on diverse samples of the college student population.

Peroxisome Proliferator Activated Receptors (PPARs) Expressions Profiling in Mouse Meibomian Gland

Gloria Lin
Mentor: James Jester

Peroxisome proliferator activated receptors (PPARs) are nuclear hormone receptors that regulate genes involved in lipid metabolism and adipocyte differentiation. The purpose of this study was to identify the expression profiles of PPARs (α, δ, γ) in mouse meibomian gland, a lipid excreting gland of the eyelid, compared to that of skin sebaceous gland. Eyelids, skin, adipose tissues and various organs from young mice were immunofluorescently stained and Western-blotted with specific antibodies against PPAR-α, -δ, and -γ. White and brown adipose tissues were used as controls. The results showed positive PPARα staining in mouse skin and muscle, positive PPARδ staining in skin, white adipose tissue and brown adipose tissue, and positive PPARγ staining in meibomian gland, skin, white adipose tissue and brown adipose tissue. Western blotting analysis showed PPARγ expression in meibomian gland, white adipose tissue and brown adipose tissue. These findings suggest that PPARs are present in multiple organs, with PPARγ showing specificity in the meibomian gland.

Technology Transfer for the Rising Giant: Brazil and France Defense Relations

Tammy Lin
Mentor: Caesar Sereseres

Brazil is the largest country in Latin America and has the tenth largest economy in the world, with a Gross Domestic Product of $2.025 trillion and a population of 199 million. Brazil, the regional power of South America, seeks global status and revised its defense strategy to match its international ambitions. Brazil aims to have an autonomous defense industry and mandates complete technology transfer for every arms deal. France is a global power willing to be a strategic partner for Brazil, providing technology transfer and producing its Rafale fighter jets in Brazil. This study looks at the strategic partnership between Brazil and...
France and the implications of this alliance on the global status of Brazil. Opinions of Brazilian and French experts were collected via informal discussions and panels held in Washington, D.C. Reports and speeches by Brazilian officials, written sources by international observers such as Bruno Muxagato’s article, “President Lula’s International Ambitions and the Franco-Brazilian Strategic Partnership,” and Portuguese and French news and magazines were gathered through Internet database research. The central research hypothesis is that the strategic partnership moves Brazil a step closer to attaining global status, but at the cost of losing flexibility in a long term commitment. Brazil and France share many international values given their long historical ties; however, the two countries do not always share the same stand on global issues. Though both countries state that differences will be respected, France could possibly use Brazil as leverage in future issues to promote its own interests.

Biofilm as a Nutrient Source
Matthew Linder
Mentor: Sunny Jiang

Biofouling due to marine bacteria is a major problem plaguing the desalination industry by decreasing the overall plant productivity and increasing expenditures. The biofilm itself is composed of both live and dead cells as well as a wide array of nutrients including nucleic acids, protein, and polysaccharides. In this experiment I tested the hypothesis that biofilm producing bacteria can use an existing biofilm as a source of carbon when placed in a carbon limited medium. Bacterial isolate B4 was used to grow the biofilm as a source of carbon when placed in a carbon limited medium that biofilm producing bacteria can use an existing biofilm polysaccharides. In this experiment I tested the hypothesis that biofilm producing bacteria can use an existing biofilm as a source of carbon when placed in a carbon limited medium. Bacterial isolate B4 was used to grow the biofilm while placed in a carbon rich medium; after 48 hours the carbon source was removed and bacterial isolate B2 was introduced to the existing biofilm, and it was incubated for an additional 48 hours. Cell density, biofilm production, total CFU, and enzyme activity were monitored in 24 hour intervals; however, enzyme activity was only monitored after the addition of B2. I found that cell density, biofilm production, and total CFU had very little change after the addition of B2. Enzyme activity displayed an up-regulation of enzymes, particularly β-Glucosidase (BG) and β-N-acetylglucosaminidase (NAG), which are both glucose related enzymes. However, we cannot confirm our hypothesis, even though we witnessed an increase in enzyme activity. We are unable to tell if the increase in activity is attributed to B2 colonizing the existing biofilm or another unknown variable. Still, this experiment does contribute to our understanding of biofilm producing bacteria and the role of the biofilm.

The Effects of the Neurotoxin, β-N-methylamino-β-N-methylamino-
Image-alanine (BMAA) and its Role on Amyotrophic Lateral Sclerosis
Joseph Liu
Mentor: John Weiss

Amyotrophic Lateral Sclerosis (ALS) is a devastating neurodegenerative disease with an unknown cause affecting thousands of people each year. The amino acid beta-methylamino-L-alanine (BMAA), a neurotoxin produced in Cycad seeds, has been proposed as a possible cause for the high rate of Amyotrophic Lateral Sclerosis/Parkinsonism Dementia Complex (ALS-PDC) in the indigenous population of Guam. We implanted osmotic BMAA pumps attached to intrathecal catheters in pure wild type, wild type litter mates with some SOD1 (due to genetic drift), and transgenic G93A rats (SOD1) to study the effects of BMAA on motor neurons. It is known that superoxide dismutase is an enzyme that is primarily responsible in destroying free radicals; previous studies have shown that mutant superoxide dismutase (SOD1) has been linked to familial ALS. After four weeks of BMAA treatment, animals were perfused and tissue was processed through cryostat and imaging analysis. Although previous studies on BMAA’s role in neurodegenerative diseases have been controversial, we found that motor neurons exposed to BMAA in wild type animals over a four week period expressed major signs of cellular death. This suggests that BMAA indeed enhances neurodegenerative injury in wild type rats. We did not find a compelling difference between G93A control and G93A BMAA rats. This brings up a few questions that we can study in the future based off of our results: 1) How selective is BMAA to specific motor neurons? 2) Is there synergism between BMAA and mutant SOD1?

Method Development for the Investigation of Photochemical Reactivity of Dissolved Organic Matter and its Dependency on Oxygen
Christy Loo
Mentors: William Cooper & Michael Gonsior

Dissolved organic matter (DOM) is a key component in the carbon cycle because DOM accounts for 680–700Pg carbon—nearly the same amount of carbon present in atmospheric carbon dioxide (CO2). The cycles and processes of freshwater and ocean DOM are thus important for the Earth’s carbon reservoir, but on a molecular level, DOM cycling remains unknown. To evaluate the dependency of oxygen during the photochemical degradation of riverine/estuarine DOM, an analytical technique was developed to monitor the decrease in chromophoric DOM (CDOM) absorbance during long-term solar simulated irradiation. This technique has allowed for analysis of different levels of oxygen and different parameters such as the salinity and pH. The data gathered thus far indicates that the photo-
A Whisper to a Roar: Social Networking Websites and 21st-Century “Revolutions”  
Elizabeth Lopez  
*Mentor:* Lynn Mally

On April 12, 2009, in the small Eastern European country Moldova, political activist Natalia Morar used social networking websites Twitter and LiveJournal to organize peaceful protests in the wake of the Communists’ victory in parliamentary elections. This “Twitter Revolution” was the first political uprising in which protesters fully integrated social networking websites in their communications with each other and the outside world. The purpose of this paper is to use Moldova’s protest as a case study in two contexts. First, the paper questions if the Moldova case should be placed in the larger framework of the “Colored Revolutions” that have been challenging authoritarian regimes in the past ten years. This involves studying other technology-driven democratic revolutions and linking common themes and events. Second, this study investigates the role of social media in foreign policy relations between the United States and autocratic governments challenged by new forms of protest. By studying the U.S. government’s reaction to these uprisings, this paper explores how America’s expressed goal to spread democracy has come to include social networking technologies. The results are clear: the evolution of technology, especially in politically repressive countries, has made it much easier for protesters to organize and publicize their cause to a global audience. However, it is not yet certain if the challenged governments will find a way to limit the power of social networking technology.

A New Front in the Drug War: West Africa  
Juan Lopez  
*Mentor:* Caesar Sereseres

The United States is known to be selective in the areas where it intervenes. U.S. Foreign policy is steered toward those areas where our security is threatened or our national interests are challenged. In terms of U.S. national security interests, the continent of Africa has been near the bottom of the list. The failed attempt by Umar Farouk, a Nigerian citizen, to blow up a transcontinental airliner over Detroit on Christmas Day, 2009, has underscored the dangers of ignoring threats from Africa to the security of the United States. These terrorist incidents emerging from West Africa come after multiple warnings by Princeton N. Lyman and Stephen Morrison cautioned the Bush administration that ignoring, “…less-visible terrorist threats elsewhere on the [African] continent, such as Islamist extremism in Nigeria and Criminal syndicates in West Africa’s failed states…could be costly—for Africans and Americans both.” This paper will serve as a healthy reminder of how complex and dangerous a world we live in by providing a glimpse into West Africa’s international cocaine trade and emerging terror-drug nexus. This assessment will offer a conceptual pathway for U.S. policymakers to begin recalibrating America’s role in preventing future threats emerging from West Africa. Today, U.S. national security and global security is complex and uncertain; however, these reasons should not be an excuse for ignoring clear, urgent and obvious dangers.

Analysis of Nanocrystalline Titanium Powder Produced by Cryomilling for Biomedical Applications  
Sapphire Lopez  
*Mentor:* Farghali Mohamed

Titanium and its alloys are used in the production of medical and dental implants because of their outstanding biocompatibility and corrosion resistance. For load-bearing implant applications, there is currently great interest in increasing the strength of commercially pure (CP) Ti to replace Ti alloys, which are stronger, but may have toxic effects on the body because of their alloying elements. The strength of a material, such as CP Ti, can be increased by refining the grain structure within the material (the Hall-Petch relationship). Cryomilling followed by consolidation is a grain refinement technique that can produce materials of a large variety of dimensions and has potential for economical large-scale production. Cryomilling involves milling powder of material in a cryogenic medium. In this investigation, the evolution of the particle morphology (size and shape) and the grain size within the particles were determined. Samples of powder were removed at intervals and the powder particles were analyzed using X-ray diffraction (XRD), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). It was found that as milling time progressed, the shape of the particles changed from varying to flakes to almost spherical, and the average particle size decreased from ~44 μm to ~25 μm after 10 hrs of milling. In addition, as milling time progressed, the grain size within the initially coarse-grained powder particles decreased to ~19 nm after cryomilling for 8 hrs and to ~17 nm after 10 hrs.

Khartoum’s Use of Violence  
Ronald Lopez Ramirez  
*Mentor:* Leo Chavez

The Government of Sudan (GoS) has been accused of committing mass acts of crime against humanity on its southern populace. The GoS has been charged with murder, extermination, forcible transfer, torture, rape, attacks on civilians and pillaging towns and villages. More than 35,000 civilians have been killed, more than 4 million civil-
Presented.

In the undoped monazite, the volume percent of the liquid phase was 15% compared to 10% for the strontium doped monazite (50 micron grain size after 3 hour dwell). However, despite the excess liquid phase, the grain size after sintering at 1300 ºC for 3 hours was only 5 μm. When the excess phosphorous was removed prior to sintering, the grain size for the undoped sample was reduced to 1 μm after sintering. The conductivity of 0, 5, and 10% strontium doped monazite, with and without excess phosphorous, as measured by Impedance spectroscopy (IS) will be presented.

**Proton Conductivity in Strontium-Doped Monazite**

Juan Lucio-Vega  
*Mentor:* Martha Mecartney

With the current drive to encourage and improve alternative energies, renewed efforts have been focused on candidates such as hydrogen fuel cells. Although the typical solid oxide fuel cell (SOFC) efficiency relies on multiple components working together, the electrolyte material itself governs much of energy yield. In this study, strontium-doped monazite, LaPO₄, was investigated as a possible electrolyte material for SOFCs. Previous studies have indicated that strontium-doped monazite (La₁₋ₓSrₓPO₄) has a high protonic conductivity, especially in a wet atmosphere. Understanding the parameters affecting proton conductivity of monazite is crucial for producing efficient SOFCs. In this study the effect of strontium doping on proton conductivity was examined. Monazite powders were synthesized via solution precipitation and compositions with up to 10% of the lanthanum sites were substituted with strontium. Powders and sintered samples were characterized with SEM and EDS. Excess phosphorous in the powders led to the formation of a liquid phase at sintering temperatures of 1300 ºC that promoted grain growth in the undoped monazite (50 micron grain size after 3 hour dwell). In the undoped monazite, the volume percent of the liquid phase was 15% compared to 10% for the strontium doped monazite (5% Sr). However, despite the excess liquid phase in the strontium doped samples, the grain size after sintering at 1300 ºC for 3 hours was only 5 μm. When the excess phosphorous was removed prior to sintering, the grain size for the undoped sample was reduced to 1 μm after sintering. The conductivity of 0, 5, and 10% strontium doped monazite, with and without excess phosphorous, as measured by Impedance spectroscopy (IS) will be presented.

**Academic Success Scale of Racially Ethnic Minority Students**

Vanessa Luna  
*Mentor:* Caesar Serereses

University officials have often associated racial ethnic minority (REM) students’ academic success with non-cognitive factors by assessing student progress through GPA or graduation. Minimal work has examined the processes of REM academic success and the intermediate stages that lead to the outcome. Specifically, current literature examines REM academic success primarily through cognitive variables such as intelligence and specific subject academic skill tests. Falling short of the overall understanding of educational processes, these studies do not examine what contributes to academic success and how success is achieved or maintained. Building from the Psychosociocultural framework, this study incorporates personal, social, and cultural factors in the context of REM undergraduates’ persistence. The purpose of the study is twofold: to examine racial ethnic minority (REM) micro-successes, and to develop a micro-success scale.

**Electronic Structures, Singlet-Triplet Gaps, and Mechanism of Cycloaddition of 1,3-Dihydro-2H-1,3-diphosphol-2-ylidene to Alkenes**

Tiffany Ma  
*Mentor:* Fillmore Freeman

The singlet-triplet gaps (ΔEST) and electronic structures of the six isomers of 1,3-dihydro-2H-1,3-diphosphol-2-ylidene have been studied using the hybrid density functionals B3LYP and PBE1PBE, along with the Møller-Plessett second-order perturbation theory (MP2) with the 6-311+G(d,p) basis set. B3LYP, PBE1PBE, and MP2 predict the ΔEST for *trans*-1,3-dihydro-2H-1,3-diphosphol-2-ylidene to be 19.278, 18.322, and 24.120 kcal/mol, respectively, and for *cis*-1,3-dihydro-2H-1,3-diphosphol-2-ylidene to be 17.866, 16.506, and 21.532 kcal/mol, respectively. The effects of electron releasing groups and electron withdrawing groups on the mechanism of 1,2-cycloaddition of the most stable singlet isomer of *trans*-1,3-dihydro-2H-1,3-diphosphol-2-ylidene (S-I) to ethene, (E)-2-butene, (Z)-2-butene, 2,3-dimethyl-2-butene, 2,2,5,5-tetramethyl-3-hexene, (Z)-2,2,5,5-tetramethyl-3-hexene, (E)-1,2-difluoroethene, (Z)-1,2-difluoroethene, 1,1,2,2-tetrafluoroethene, (E)-1,2-dicyanoethene, (Z)-1,2-dicyanoethene, and (Z)-1,1,2,2-tetracyanoethene to form derivatives of hetero spirocyclopropanes have also been studied. The predicted cycloaddition mechanism may be described as concerted with asynchronous bond formation to the sp² carbons leading to a nonsymmetrical polar cyclic three-center transition state.
The Auditioning Actor: Research in New York City
Lauren Mack
Mentor: Don Hill
The purpose of my presentation is to inform an otherwise uninformed audience about how an actor gets a job. An audition is usually a one or two minute “handshake” to initially introduce an actor’s talents to a creative staff casting a theatrical or film production. Without it, the creative staff has no idea who or what they are working with. It also can serve as a litmus test to see if the actor is really worth working with (whether or not they’re a diva, etc.). In this presentation, I will demonstrate a musical theater audition, which is usually 16 to 32 bars of music. For this, I will have an accompanist. I will first outline the elements of a good audition, and then demonstrate by re-entering the room (an important element I will cover), discussing the music with the accompanist, a “slate” (statement of my name), and a 16-bar musical theater audition, a “thank you,” and an exit (very important), after which I will take questions. I hope that my audience will have a greater understanding of how difficult and wonderful it is to be an actor. The most important thing I have learned from this experience is that it is important to show the people behind the table who you are—the very best “you.”

Image Processing
Isaac Mahgrefteh
Mentor: Sharad Mehrotra
The rapid deployment of cameras and a variety of other sensors in smart buildings opens the door to a new age of application programming. These applications include Fraud detection, crime prevention, power use, occupancy monitoring, and social network analysis. At UCI, many campus buildings, such as CALIT2 and Donald Bren Hall, are equipped with a variety of sensors, such as video, audio, RFID, people-counters and environmental sensors. The instrumentation of UCI with sensors is part of the “Responsphere” project, in which the sensor information is collected into a multimedia database to be analyzed for different applications, some of which are mentioned above. The goal my project is to detect key identities automatically in a multimedia database created from the Responsphere video cameras. I will present the overall system architecture and concentrate on the feature extraction part of it. Specifically, I will concentrate on the first level of extraction: the detection of motion in a camera’s field of view.

Tissue-Specific Gene Expression in the Salivary Glands of the Dengue Vector Mosquito, Aedes aegypti
Asif Majid
Mentor: Anthony James
Promoters of genes expressed specifically in the salivary glands of the vector mosquito, Aedes aegypti, can be used to drive the expression of effector molecules that interfere with viral replication. I am using hybridizations in situ to identify genes whose transcripts are expressed in the distal-lateral, proximal-lateral, or medial lobes of the adult female salivary glands. Oligonucleotide primers complementary to specific genes were used to amplify probes from mosquito RNA. Amplified fragments were cloned into TOPO-plasmids, the plasmids transformed into bacteria, and the plasmids isolated. RNA probes were then created to be used in in situ hybridizations. The hybridizations in situ allow the determination of where the genes are expressed in the salivary glands. I have made RNA probes and am in the process of starting the hybridizations. The results that I have from the sequencing of approximately 17 gene inserts, each having four clones, show that almost all of them have at least one clone that had the correct sequence inside the plasmid. For two of my gene inserts, all of the clones were either the incorrect one or there was an error in the sequencing process. It can be concluded that the hybridizations in situ are a worthwhile endeavor.

Measuring the Effects of Rhodiola rosea on the Sirtuin Pathway and Aging in Drosophila melanogaster
Steven Maler
Mentor: Mahtab Jafari
Studies have found that the botanical Rhodiola rosea is able to increase mean and maximum lifespan in Drosophila melanogaster populations with minimal side-effects in the organism. Currently, there is no strong evidence for the mode of action or metabolic pathway that the compound acts on, which is necessary when considering applying the botanical to mammalian and human studies. One possibility is that it acts as a caloric restriction mimetic by up-regulating proteins to create downstream signaling effects that lead to lifespan extension. One protein of interest is the SIR protein, a nicotinamide adenine dinucleotide (NAD+)-dependent enzyme that has been found in all eukaryotes examined. Activating this protein in vivo promotes histone deacetylation and repression of gene signaling, such as in glycolysis, that can affect proteins involved in modulating cellular activities and lifespan. It was hypothesized that R. rosea acts by up-regulating SIR protein expression or activity in fruit flies. A lifespan assay with SirI null mutant flies exhibited sirtuin-independent lifespan extension with the R. rosea treatment. It was also found that NAD+ levels were not significantly different with botanical treatment in either male or female flies. NADH levels, which can inhibit SIR proteins, were not changed in males, but were lowered in supplemented females. The expression of the dSir2 gene was not increased in either sex, and even decreased in females. Expression of glycolytic enzymes were unchanged in males, but were decreased in R. rosea-supplemented females. These current
findings suggest that *R. rosea* does not act through a sirtuin-dependent mechanism in males, but may act in a sirtuin-dependent manner in females.

**Background of U.S. Policies Toward Armenia and U.S. Involvement in Current Armenian-Turkish Negotiations**

Erna Mamikonyan  
*Mentors: Levon Marashlian & Caesar Seregesrs*

The interactions between the Armenian people and the United States can be traced from American missionaries working in the Ottoman Empire, to the generous humanitarian aid relief to Armenian refugees after WWI, to the significant role the American government plays in Armenia and Armenian issues today. The importance of this relationship is that, in addition to being home to the largest Armenian community in the Diaspora, the U.S. has cooperated with the Armenian government to promote democracy, a stable government, and a healthy economy over the past two decades. However, this cooperation has met its challenges. Through an analysis of historical sources, articles on recent events, and interviews with prominent activists, this thesis explores the reasons behind these challenges and how American interests in Turkey, a key U.S. NATO ally and major trading partner, have sometimes jeopardized Armenia’s interests. In addition, Armenia’s landlocked location, the legacy of the Soviet system, and the Armenian government’s own shortcomings have hindered Armenia’s development. While the U.S. has focused on safeguarding its relationship with Turkey, the controversy over the recognition of the 1915 massacres of approximately 1.5 million Armenians as a genocide still remains unsettled, and Armenian-Turkish relations have yet to be normalized. Previously, the United States has encouraged friendly Armenian-Turkish relations, but has been more supportive of Turkey’s position. Now, the Obama administration has been pushing Armenia and Turkey to normalize their relations based on the recently signed Armenian-Turkish Protocols, which include preconditions that could impede Armenia’s efforts to achieve long-term prosperity and national security.

**Virtual Gender: How Gender Shapes Virtual Worlds—A Study on Californian LAN Centers and their People**  
Kimberly-Ann Maniego  
*Mentor: Tom Boelstorff*

Cross-culturally, every aspect of human life in the physical-world is gendered. These gendered identity stereotypes usually stem from sexual stereotyping. Yet, distinct from the physical-world, a virtual world—similar to Second Life and Massive Multi-Player Online Role-Playing Games (MMORPGs) like World of Warcraft—is an Internet-based, persistent, synchronous computer-simulated environment wherein a network of users interact with each other and the three-dimensional environment through the use of avatars—a computer user’s representation of himself/herself or an alter ego. Many academic (*i.e.* theory testing) and commercial (recruitment; relationship formation) activities assume that physical-world personality is representative of virtual world personality. However, not much research exists on whether virtual worlds are gendered. The goal of this study was to examine the ways in which virtual worlds are gendered by observing how traditional hegemonic domains of gender and identity transcend through to the virtual world by studying regulars at LAN centers in Southern and Northern California and their activities in cyberspace. By comparing and contrasting the regulars’ physical-world interactions with their virtual world interactions, results show that virtual worlds are gendered. Therefore, gender and identity do transcend through to the virtual world because virtual world users respond to social norms and cues through avatars and reveal gendered stereotypes and racial biases the same way that humans do in the physical-world. However, due to the level of anonymity and freedom within the social structure of virtual worlds, representation of gender and identity has led to an overstatement of gendered stereotypes and gender-bending.

**HIV/AIDS and South Africa: How Cultural Norms Have Turned HIV/AIDS into a Gendered Disease against Women**  
Michelle Mar  
*Mentor: Wayne Sandholtz*

South Africa contains the second-highest number of HIV/AIDS patients in the world. According to the UNAIDS 2008 report, 5.7 million South Africans are living with HIV; of these, 3.2 million are women. Cultural norms that disadvantage women have turned the HIV/AIDS epidemic in South Africa into a gendered disease, with women suffering disproportionately on many different levels. By comparing, contrasting and analyzing past studies on cultural norms in South Africa, this study analyzes how the high prevalence and acceptance of sexual violence and rape against women, the high social status of males, the low status of women, and other cultural ideologies surrounding both women and their sexuality are all putting women at higher risk for HIV infection and are preventing women from gaining access to accurate and safe information, resources, and treatment. In addition, my study also analyzes how cultural factors have forced women to cope with other consequences of the epidemic in ways not needed by men. Cultural norms regarding women and their sexuality need to be taken into account; the South African government, as well as donors, must recognize, understand and overcome the obstacles that these cultural norms have created in order to effectively combat the epidemic.
The Effects of Temperature on the Dynamics of Soil Organic Matter Decomposition

Kathleen Rae Marcelo
Mentor: Steven Allison

Microorganisms produce extracellular enzymes, which digest complex organic matter (SOM) into simpler forms. Ultimately, SOM is metabolized into carbon dioxide (CO\textsubscript{2}) and released into the atmosphere. Many mathematical models predict that SOM decomposition and CO\textsubscript{2} production will accelerate as the climate warms. Therefore, increased CO\textsubscript{2} production may cause a positive feedback that enhances climate change. The goal of this project was to test how microbial enzymes produced at different latitudes function in relation to temperature, and whether these enzymes, under different temperature regimes, respond differently to rising temperatures. Soils were gathered across latitudes ranging from 8–63 °N, and the biochemical activity levels of microbial extracellular enzymes were measured at temperatures ranging from 4–40 °C. Nonlinear regression analysis was used to determine the Michaelis-Menten constants (K\textsubscript{m}), and maximum activity (V\textsubscript{max}) for each of six enzymes. The K\textsubscript{m} is important because enzymatic substrate concentrations are naturally low in many soils, closer to K\textsubscript{m} concentrations than to those that would elicit V\textsubscript{max}. Our data reveals that microbial enzymes functioning at lower temperatures will be more efficient than enzymes functioning at higher temperatures, especially at higher latitudes (>45 °N). Although models predict that microbial respiration will increase with warming, our data suggests that the efficiency of respiration may be compromised at higher temperatures. Therefore, CO\textsubscript{2} production may not increase rapidly because changes in K\textsubscript{m} may outweigh changes in V\textsubscript{max}. By studying K\textsubscript{m}, we may be able to better predict the relationships between SOM degradation and soil respiration with changes in climate.

Regulation of PKA Activity in Response to Repeated P9 Shocks

Andreea Marina
Mentor: Thomas Carew

The aim of this project was to investigate the underlying molecular mechanism of memory formation, using a simple animal model, Aplysia californica. Aplysia exhibits memory for sensitization, which is a form of fear memory, described as an enhanced response to tactile stimuli, following noxious stimuli, such as tail shocks. PKA activity is critical for the formation of long-term memory for sensitization. However, how tail shocks change PKA activity is still unclear. Previous results indicated that PKA is differentially activated in the SN soma and SN-MN synapse following repeated tail nerve shocks (5xP9). Immediately following 5xP9 PKA activity was increased at the synapse, but not in the soma. At one hour, it increased at both the synapse and the soma. The focus of my project was to examine if these changes are due to up-regulation in the total amount of PKA. To test this, 1 performed PKA assays with 8-Br-cAMP to activate all the PKA in the samples and measured its ability to phosphorylate a PKA substrate; and Western Blots with a PKA catalytic subunit antibody. Preliminary results showed that there was no significant change in the amount of total PKA immediately following 5xP9, whereas it was increased at the synapse by 1hr, and in the soma by 2hrs. Our data suggests that the increase in active PKA at the synapse immediately following 5xP9 is due to activation of PKA, whereas increase in the amount of total PKA contributes to persistent increase in PKA activity.

Investigation of Grain Boundary Sliding during Deformation of Nanocrystalline Metals

Andrew Marquez
Mentor: Farghalli Mohamed

Nanocrystalline (nc) materials are novel materials whose grain size is in the range of 1–100 nanometers. These materials have unique features that differ from their conventional grain-sized counterparts. It is important to investigate the mechanical properties of nc-materials because they can be used as coatings or as high-strength structural elements. Before these materials can be put into service, it is important to understand their properties to prevent future problems during their use. Research on nc-materials using computer simulations has shown the occurrence of boundary sliding. Given this evidence, boundary sliding has not yet been experimentally observed in nc-materials. The occurrence of boundary sliding often has a negative effect in metals since it leads to the formation of cavities and voids, which in turn cause premature failure. To examine experimentally the occurrence of sliding, we used the techniques of Atomic Force Microscopy (AFM) and Electron Back-Scattering Diffraction (EBSD) to visually observe the formation of voids and cavities in nc-nickel. Although there was much difficulty finding the best sample preparation process, pre-deformation and post-deformation images were obtained from tensile tests. These images demonstrate that grain boundary sliding is actually occurring in nanocrystalline nickel.

HDAC Inhibition Facilitates Extinction of Drug-Seeking Behavior

Luis Martinez
Mentor: Marcelo Wood

Exposure to cocaine triggers molecular events that lead to long lasting changes in brain structure and function. These changes can lead to the development of persistent and robust behavioral adaptations that characterize addiction. Recent evidence suggests that epigenetic mechanisms have an important role in the development of addictive behavior. However, little is known about the role of epigenetic
mechanisms in the extinction of drug-induced behavioral changes. To investigate the role of epigenetic mechanisms in extinction of context-drug associated memories we used a cocaine-induced conditioned place preference paradigm, in which mice learn to associate a context with cocaine and later show a preference for that context. We demonstrate that increasing histone acetylation via administration of a histone deacetylase (HDAC) inhibitor following a non-reinforced exposure to the previously cocaine-paired environment significantly decreases expression of robust cocaine-induced conditioned place preference. These findings provide a potential novel approach to the development of treatments that facilitate extinction of drug-seeking behavior.

**Constitutional Rights Adjudication in South Africa**  
Isabel Masanque  
*Mentor:* Diana Kapiszewski

As courts have become more important political actors around the world, scholars have developed several explanations of judicial decision making. The legal model lost dominance years ago with the emergence of the attitudinal, institutional and strategic models. This thesis revisits the relevance of law and doctrine emphasized in the legal model, arguing that judicial behavior is shaped by guiding principles courts themselves develop. Evidence from the South African Constitutional Court shows that there is a strong correlation between guiding principles and the amount of policymaking and rights protection engaged in by the Constitutional Court. This suggests that courts have developed a standard by which to protect rights.

**Studies in Effective Peptide Folding**  
Roxanne Massoumi  
*Mentor:* James Nowick

Proper peptide folding is a crucial aspect of almost all biological and chemical systems. Peptides that are incorrectly folded often have an impaired function, which can lead to very negative defects. Incorrect folding in the brain, for example, is often linked to neurodegenerative diseases such as Alzheimer’s and Bovine spongiform encephalopathy (also known as mad cow disease). The basic elements that allow for proper protein structure are rarely studied on their own. Often, these experiments are merely part of a larger project. This project, however, is studying the absolute basics in protein folding with the aim of highlighting specific interactions that either do or do not help in folding. Peptides that are 5 amino acids in length have been synthesized and tested for folding ability. The amino acid sequences among the different peptides vary in order to generate different combinations of salt bridges and disulfide interactions. These different peptides will be compared to one another to judge which peptide is more effectively folded. This project has applications in almost all peptide chemistry and biology.

**Exam’ine Yourself: An Investigation of the Effects of Expressive Writing on Exam Performance**  
Sarah Mattison  
*Mentor:* Joanne Frattaroli

Individuals preparing to take graduate school entrance exams often feel a great deal of anxiety about their upcoming exams, which may negatively affect their scores. This study examined whether writing expressively about upcoming exams may help bolster scores on high-stakes graduate school entrance exams. Students preparing to take the MCAT, LSAT, or PCAT were randomly assigned to write about their deepest thoughts and feelings about their upcoming exam (expressive writing group) or to unemotionally write about what they had done in the last 24 hours (neutral writing group). The exam scores for individuals from the expressive writing group and neutral writing group were compared and possible mediators of working memory capacity, depressive symptoms, study habits, and test anxiety were examined. Due to a small sample size of 18 participants who completed the study, no significant differences were found between the two writing groups on test performance, working memory capacity, depressive symptoms, study habits, or test anxiety; data collection is still ongoing. Exploratory analyses revealed that individuals preparing to take the MCAT studied for significantly more hours, procrastinated significantly less, and were able to concentrate significantly better while preparing to take their exam compared to individuals preparing to take the LSAT.

**Economic Cost of Dengue Infections in Mexico**  
Heather Maynard  
*Mentor:* Anthony James

Dengue is a major global health concern, and the incidence of dengue infections is increasing. In 2009, the Pan American Health Organization reported more than 130,000 suspected cases in Mexico. There are various types of vector control efforts in place to reduce dengue transmission, and new strategies are being developed. Implementing the most effective strategy requires an understanding of the economic costs associated with the disease. This study estimates the economic cost of dengue infections in Mexico in 2009. Variables were obtained from databases of the World Health Organization, the Pan American Health Organization, the Center for Disease Control, the World Bank and others. A sensitivity analysis was applied to account for variation in the data. Costs are in 2009 US$. Public health costs were estimated to be $176.3 million, and health care costs were estimated to be $12.7 million. Additionally, unreported cases cost an estimated $166.6 million.
Students are interested in a wide variety of food issues, and interest in food-related issues. Our results indicate that survey about food preferences, purchasing behaviors, and participants answered twenty-eight questions in a Web-based conducted at other UC campuses. Nine hundred six par-
ticipants at UC Irvine and compare these results to surveys dents’ attitudes and behaviors around sustainable food op-
study, which was modeled after studies conducted at UC examined the college market for sustainable food. This of their consumers. Unfortunately, very few studies have implement programs to offer more local, sustainable, for social and environmental stewardship, the effectiveness and socially responsible food in campus dining outlets. Throughout the United States, colleges and universities are implementing programs to offer more local, sustainable, and socially responsible food in campus dining outlets. While these farm-to-college programs hold great potential for social and environmental stewardship, the effectiveness of these programs depends on the ability of universities to balance social and environmental concerns with the needs of their consumers. Unfortunately, very few studies have examined the college market for sustainable food. This study, which was modeled after studies conducted at UC Santa Cruz and UC San Diego, sought to understand students’ attitudes and behaviors around sustainable food op-
tions at UC Irvine and compare these results to surveys conducted at other UC campuses. Nine hundred six partic-
pants answered twenty-eight questions in a Web-based survey about food preferences, purchasing behaviors, and interest in food-related issues. Our results indicate that students are interested in a wide variety of food issues, and they care most about issues related to personal consumption (nutrition, safety, and affordability). Our results also suggest a need for increased education about the social and environmental implications of our food system, and they demonstrate that students would prefer to learn more about their food at the point of purchase. The results of this survey will allow campus administrators and faculty to make strategic decisions about educational programs and policies around sustainable food.

How Do Countries Evade Economic Sanctions?
Nilofar Mehdizadeh Saraj
Mentor: Caesar Sereseres

The study defines economic sanctions as economic penal-
ties imposed upon a country for its political wrongdoings and policies. It briefly touches upon broader subject areas in relation to economic sanctions, such as the reasons behind sanctions and the overall effectiveness of them so far. I will present three case study countries; Iran, Iraq and Cuba, which have been under prolonged economic sanctions and have diverted them on numerous occasion. In case of Iraq, billions of dollars disappeared from the UN’s oil-for-food program of 1998 through the actions of Sad-
dam’s regime. In Cuba, the proximity of the country to the United States, its prime sanction-imposer, made it difficult to evade the sanctions directly, but the circumstances of the Cold War era catered to Cuba’s needs to seek refuge with the Soviet Union. Iran is a very sensitive case, as it faces chances of greater sanctions in the current time. More studies have been conducted to analyze these sanctions, but few have examined the criminal behavior of the Iranian state or people involved. A special interview conducted with Iranian political scholar, Reza Aslan, reveals much that has not been recorded by scholars. This study seeks to demonstrate the lack of effective accountability and enforcement that exists in the international commu-
nity. Its goal is to contribute to finding better and more effective ways to punish unruly states with lesser con-
sequences on their civilians.

Adolescent Alcohol Self-Administration Leads to Increased Alcohol Consumption Later in Life
Maria Menchaca
Mentor: Frances Leslie

Adolescence is a period that is often accompanied by the initiation of alcohol use. Furthermore, people who report alcohol use before the age of 15 are four times more likely to experience alcohol dependence later in life. We hy-
pothesized that alcohol initiation at a young age leads to increased alcohol consumption at an older age. To test this, we allowed adolescent and adult Sprague-Dawley rats to intravenously self-administer (IVSA) escalating amounts of ethanol over 10 consecutive days, for 2 hours. Three days prior to initiating the experiment, rats were surgically

Student Attitudes and Behaviors around Sustainable Food Options at UC Irvine
Kelsey Meagher
Mentor: Richard Matthew

Throughout the United States, colleges and universities are implementing programs to offer more local, sustainable, and socially responsible food in campus dining outlets. This project follows the careers of three artists including Rembrandt van Rijn, the usual representative of the urban Dutch, Peter Paul Rubens, the token representative of the southern states and Spanish court, and Samuel van Hoogstraten, an international figure who defies categorization. The main focus, however, is these artists’ studios. These studios saw different artists and artworks traveling through, provided channels between the artists and their patrons, and were the suppliers of works for the far reaching and encompassing art market. They acted as sites of exchange between the northern and southern artists, pa-
trons, and markets.

Artist’s Studio: How the Studio Bridges the Divide Between the Northern and Southern Netherlands
Elizabeth McDuffee
Mentor: Amy Powell

This project is a study of the artistic connections between the politically divided Northern and Southern Netherlands, focusing from the 1560s to 1660s. During this period, the Dutch rebelled against the Spanish crown and created the separated Dutch Republic in the North. This republic is frequently considered a more urban and Protestant state, in comparison to the monopolical and Catholic Spanish Netherlands. Artists or artworks are frequently colored by these areas’ political and religious traits by art historians or literature. However, there were multiple channels of ex-
change between these two domains, showing that the art of this period cannot be as easily divided as its politics. This project follows the careers of three artists including Rembrandt van Rijn, the usual representative of the urban Dutch, Peter Paul Rubens, the token representative of the southern states and Spanish court, and Samuel van Hoogstraten, an international figure who defies categorization. The main focus, however, is these artists’ studios. These studios saw different artists and artworks traveling through, provided channels between the artists and their patrons, and were the suppliers of works for the far reaching and encompassing art market. They acted as sites of exchange between the northern and southern artists, pa-
trons, and markets.

Undergraduate Research: Launching the Future
Weekend Warriors: The Effects of Deployment Stress on Medical Air Force Reservists
Erik Menjivar
*Mentor:* Raymond Novaco

Medical corps reservists in the U.S. military are exposed to high levels of casualty evacuations in support of combat troops in the Iraq and Afghanistan wars. Current research on war related stress has focused on combat deployed soldiers and Marines deployed to Iraq and Afghanistan. This study concerns Air Force medical corps reservists and examines the association of deployment stressors with mental health concerns. Survey data were obtained from over 60 participants, 26 males and 35 females, regarding symptoms of posttraumatic stress, depression, anger disposition, alcohol abuse, and attrition. There were no gender differences for either the deployment or the distress variables. Deployment stressors (*e.g.*, deployment concerns and post-deployment life events) were significantly related to psychological distress. Time-in-service and deployment exposure did not significantly account for psychological distress. The results are compared to research findings from large scale studies with active duty military personnel.

The Structural and Binding Properties of Human γS-crystallin Aggregates and the Expression of Ubiquitin
Mark Meronek
*Mentor:* Rachel Martin

Human γS-crystallins are essential in maintaining the high refractive index and transparency of the eye lens. Mutations in γS have been strongly linked to cataract formation. While structures of many eye crystallin proteins have been solved previously through solution-state NMR spectroscopy, γS-crystallin aggregates found in cataracts can only be studied using alternative methods, such as solid-state NMR spectroscopy, due to their insoluble and non-crystalline properties. To use solid-state NMR spectroscopy, reference compounds must first be made for calibration prior to analyzing target samples. In this project, ubiquitin, a regulatory protein found in eukaryotes, whose structure is well-known, was expressed in *E. coli*, purified using FPLC, and crystallized successfully to allow for future solid-state NMR standardization and γS-crystallin aggregate analysis. Additionally, similarities have been observed between cataract aggregates and amyloid fibers, which are widely believed to be the cause of Alzheimer’s. γS aggregates treated with antibodies found to bind to various amyloid fiber structures could lead to information regarding aggregate structure, and both wild-type and mutated γS-crystallins are being expressed for this purpose. Determining the structure of γS-crystallin aggregates is crucial for understanding cataract formation, possibly leading to new measures of cataract treatment and prevention.

Real-Time Interpretation of Musical Gesture in Performance Data
David Merten-Jones
*Mentor:* Christopher Dobrian

Musical gesture is the quality of motion inherent in music, which manifests itself in the way performers and listeners move along with music, and more subtly in the way that listeners imagine music to move. There is no single indicator of musical gesture; it is the synthesis of several discrete musical elements, including rhythm, dynamics, harmonic changes, and intervals between notes. Gestures do not fit easily into traditional categories of musical segmentation such as motives and phrases, and defining what exactly constitutes a gesture is no easy task. One way of approaching a more specific definition of musical gesture is to eliminate subjective description by expressing musical information as hard data. Toward this end, I have attempted to extract gestural information from MIDI data and create software that interprets and responds to musical gestures in kind. By teaching a computer to recognize gestures in music, I hope to discover more about what cues humans use to apprehend musical gestures. While working on this project, I have found that the task of translating music to raw data and back is immensely complex. Seemingly simple features of music (*e.g.* what key a piece of music is in and where the key changes) are extremely difficult to parse in numerical terms. Because of such logistical constraints, the results of my work thus far are somewhat rudimentary, but I have been able to create a program that extracts simple information from a MIDI source and responds to a human performer.
To Determine the CCL2 Effect on the Migration of Neural Stem-Like Cells in Glioma
Shadi Milani
Mentor: Yi-hong Zhou

The objective of this experiment is to do an in vitro Boyden chamber analysis to determine the CCL2 effect on the migration of neural stem-like-cell (NSLC) of glioma. CCL2 (also called MCP-1) is consistently overexpressed in a number of glioma cell lines and in some high grade gliomas in association with microglia infiltration. CCL2 overexpression by glioma cells has been shown to cause inflammation-induced angiogenesis and consequently tumor progression. CCL2 has been demonstrated to attract neural precursor cell (NPC) migration using both in vitro Boyden chamber analysis and in vivo models. In knock-out mice, CCL2 was shown to be the key factor secreted at sites of neuroinflammation, in the attraction and migration of NPC. Based on the similarities between NPC and glioma NSLC, we hypothesize that, in glioma, NSLC may be attracted by CCL2 expressed by glioma mass cells, leading to infiltration, which could promote both tumor progression and therapeutic resistance and recurrence led by NSLC. Evidence confirming overexpression of the CCL2 receptor (CCR2) in GBM supports this hypothesis. We will test this hypothesis by direct disruption of CCL2 function in glioma cells by overexpression of PAX6. The Zhou lab found that PAX6 suppresses expression of CCL2 and, therefore, has low levels of CCL2 secretion into condition medium.

Barriers to Seeking Health Information
James Milewski
Mentor: Yunan Chen

While healthcare information plays an essential role in the process of disease management, previous studies have shown that many patients may be unaware of the availability of certain healthcare information, thus leading to the progression of their diseases and deterioration of their health. This study explores information seeking behaviors among patients with type-2 diabetes and explores the barriers that hinder effective healthcare information usages. Nineteen semi-structured interviews were carried out with patients and caregivers in various stages of diabetes disease management. Data analysis identified five major barriers to seeking health information: lack of motivation, passiveness, inconsistency of information, generality of information, and loss of information. These findings call for the designing of active and personalized information delivery mechanisms.

Characterization of Human Mitochondrial Poly(A) Polymerase
Aram Modrek
Mentor: Wen-Hwa Lee

Mammalian mitochondrial mRNA Poly(A) tails are thought to play a role in determining the stability of the transcripts. Previous studies have shown human mitochondrial Poly(A) Polymerase (hmtPAP) to take part in the lengthening of Poly(A) tails of mitochondrial RNA transcripts in an ATP dependent manner. However no biochemical characterization of the enzyme has been published to date. In this in vitro study, we characterized the nucleotidyl substrate preference and optimal reaction conditions for purified hmtPAP to polyadenylate RNA oligos. PAP exhibits a preference for ATP over other nucleotide triphosphates and uses magnesium as a cofactor. Orthologous sequence alignment of the nucleotidyl transferase (NT) domain of hmtPAP revealed two highly conserved aspartic acid residues. Mutating the aspartic acid residues to alanines severely reduces the polyadenylation activity. This study demonstrates that hmtPAP has increased processivity and strong substrate preference in the presence of ATP.

An Investigation of the Impact of Health Insurance Status on Breast Cancer Outcomes in Adolescents and Young Adults (AYAs)
Marym Mohammady
Mentor: Hoda Anton-Culver & Erin Kent

Aside from non-melanoma skin cancer, breast cancer is the most common cancer among women of all races in the U.S. Of those women who are affected, adolescents and young adults (AYAs) (individuals between the ages of 15 and 39 years at diagnosis), when compared to younger and older age groups, have seen the least amount of improvement in cancer survival rates over the last two decades. To investigate the extent to which health insurance impacts breast cancer survival in AYA females, data from the California Cancer Registry was analyzed. Life table survival estimates and Kaplan-Meier survival curves were generated using SAS PROC LIFETEST, and multivariate hazard analysis was performed using Cox proportional hazards regression. The data illustrate that compared to individuals having private insurance, breast cancer patients covered by government-assisted insurance had worse five-year relative percent survival rates. The hazard ratios also show that compared to individuals with private insurance, mortality was higher for individuals with no insurance, but, after adjustment, survival was significantly shorter for only those individuals with government-assisted insurance. These findings raise important questions about the quality of government-assisted health insurance and whether or not it provides adequate treatment plans to protect cancer patients. AYAs need access to adequate insurance coverage.
to take advantage of early detection and screening benefits, especially considering this age group is more likely to have advanced staging at diagnosis and more aggressive tumors.

**Viability Assessment of Escherichia coli Aerosols for Inhalation Studies**
Amina Moheyuddin  
*Mentors: Loyda Mendez & Robert Phalen*

Inhalation is considered the most relevant route to induce respiratory tract infection in experimental animals, as it mimics human exposure to airborne pathogens. However, the generation and sampling of aerosols in delivery systems can have lethal effects on microorganisms. Therefore, the main objective of this project was to assess the viability of aerosolized *E. coli* JM105. Different factors, including growth conditions, aerosolization media and air sampling media, were tested for their capacity to improve bacterial viability. The addition of non-reducing sugars to the aerosolization media drastically improved the survival of *E. coli* when compared to distilled water. This might be due to its capacity to stabilize cell membranes and proteins undergoing dehydration. Overall, these experiments will be useful for generating and delivering a precise dose of viable microorganisms into the respiratory tracts of experimental animals.

**Historical Transformation: The Chinese Social Development**
Hastie Moini  
*Mentor: Su Yang*

While the Chinese economy has grown in the 8–10 percent range consistently for the past two decades, exclusive attention on the population’s labor power results are of interest. To investigate the potential Chinese labor power differences, we collected data on the relevant household income levels between the urban and rural class distinctions. The historical information indicates that economic reform—foreign direct investments, management style differences, and domestic policies—have influenced the social development of Chinese income levels. In the same period of China’s steady GDP growth, rural and urban household incomes have changed in work unit types of earnings and risen in overall pay. Furthermore, household incomes have increased more commonly in areas that have a larger presence of private firms and companies. This signifies the role of enterprises in progressively shaping the rural and urban economic environment.

**ACTion: Ecuador**
Katherine Montoya  
*Mentor: Keith Fowler*

Theater has its own spirit in every corner of the world. By studying the dynamics of new cultures and new theater arts, I can inform the art I create with new ideas. This project was undertaken with the assumption that it would widen my perspective and enhance my artistic capabilities in respect to theater through travel in the South American country of Ecuador. During this trip, I traveled with a cast of seven other actors and one director through the nation’s capitol of Quito, the cold Andes Mountains, the humid Amazon jungle, and the serene town of Mindo. In each location, we tried something new and adventurous; we did service projects for some communities, and we took in all of the sights and sounds around us. While working with children, we also got to teach theater games, playwriting skills, and small amounts of English. All the while, we took time to reflect on our experiences and organize our thoughts into a completely original piece of theater, which incorporated local performers and was presented to approximately 150 people, many of them new theater-goers. What I found was a new interest in writing, new explorations in movement, and a completely new experience in building a play from the ground up. The new methods in writing helped me find my artistic voice and taught me how to translate my feelings and reactions into a theatrical language. New artistic techniques I encountered included writing monologues based on visual art, songwriting, and Andean folk dance. Never before have I been able to express my thoughts and experiences so well. This experience changed the way I think about theater and about how theater can affect people around the world. I have a whole new respect for the power of art, especially when it is combined with the power of travel.

**Effect of Varied Electrospray Capillary Distance on NaCl/SDS Nanoparticle Composition**
John Morrison  
*Mentor: Sergey Nizkorodov*

An electrospray generates nanoparticles by creating a charged droplet from a solution; as the droplet travels from the capillary to the neutralizer, it divides into smaller and smaller particles due to the excess charge. Although previous studies have used this setup to generate and study nanoparticles, they did not investigate the effect the distance the particles travel before being neutralized may have on the particle composition. To address this question, I used the following setup: an electrospray and neutralizer to generate the particles from a sodium chloride and sodium dodecyl sulfate (SDS) solution; a tandem differential mobility analyzer (DMA) setup to first select for a dry particle size, then scan for the deliquesced particle size after the particles had been exposed to a high level of relative humidity (~90%); and a condensation particle counter to measure the number of particles at a given size. Using this setup allowed me to measure the growth of the particles created with the electrospray capillary at different distances, while keeping other variables, such as humidity, unchanged. I found that when the capillary is farther away,
the particles grew less, leading to the conclusion that they had become enhanced in SDS. The main result of this work is that the composition of nanoparticles generated by electrospray aerosol sources does not always reflect the composition of the solution from which the particles are prepared. This has implications for the technological and scientific applications of electrospray aerosol sources.

**The Evolution of Persian Language, Literature and Culture in the 18th and 19th Centuries**

Niloufar Moslehi  
*Mentor: Nasrin Rahimieh*

To understand the developments in Persian language in the modern era, it is necessary to have a broad overview of the history of Iran in the eighteenth and nineteenth centuries. The historical and social movements in these centuries form the focus of my study, which aims to reveal the changes that affected Persian language and culture. I first provide a brief historical sketch whose primary focus is Iran’s cultural setting, and then I delve into some aspects of prose and poetry as they emerged and changed throughout different moments in Iranian history. The secondary focus of my historical overview will be the centers of cultural development: the cities of Shiraz and Isfahan. The historical and social movements in these centuries were pivotal to the poetic and literary production of these centuries. My study draws on Persian literature, journal articles both in print and online, and website information on the nature of the linguistic and literary changes. I use the example of the famous poet, Hafiz of Shiraz, through a comparison with modern Persian poetry to decipher how radical the changes in the style of poetry have been. With Hafiz’s contribution, Persian poetry became known for its mystical dimensions, and through its vast quantity and quality, was soon recognized as the epitome of Persian literature. Based on these samples I draw some conclusions about the evolution of Persian as a language.

**Validation of the Quality of Life Questionnaire and the IBM Functional Rating Scale in VCP Associated Inclusion Body Myopathy, Paget Disease of Bone and Frontotemporal Dementia**

Mariam Mostamand  
*Mentor: Virginia Kimonis*

Inclusion Body Myopathy associated with Paget’s disease of bone (PDB) and Frontotemporal dementia (FD), or IBMPFD, is an autosomal dominant disorder caused by mutations in the VCP (Vacuole Causing Protein) gene located on chromosome 9. The disorder results in progressive proximal muscle weakness in approximately 90% of individuals, painful bone disease in 50% of individuals, typically in their 50s, and progressive frontotemporal dementia in approximately 30% of individuals in their 50s. The Quality of Life questionnaire (QoL) looks into how those with symptoms of IBMPFD are affected by analyzing how diet and exercise affect the symptoms, and how these symptoms affect each person’s quality of life. The IBM Functional Rating Scale was developed for Inclusion Body Myositis patients and has questions based on swallowing, handwriting, handling utensils, motor tasks and other physical abilities. The overall purpose of this study is to validate the QoL as a comprehensive disease-specific rating scale for patients with IBMPFD. This study as two aims: to compare the QoL responses in affected, asymptomatic gene carriers and unaffected individuals, and validation of the QoL using the previously validated IBMRS. The QoL was distributed through mailers, and the IBMFRS was conducted via SurveyMonkey. I hypothesize that unaffected patients will have a better quality of life than affected patients, and that the presymptomatic gene carriers will also have a reduced quality of life. The results of both the Quality of Life questionnaire and the IBMFRS will be analyzed for validation of the QoL, and the results will be compared in the three groups of individuals.

**A Comparative Evaluation of Sensys Technology Versus Existing ILD Technology**

Justin Moy  
*Mentor: Andre Tok*

This study provides a comparison of traffic performance measures from two traffic detection technologies: Inductive Loop Detectors and Sensys wireless magnetometers. Sensys is considered in this study, as it is an emerging sensor technology that addresses some limitations of ILDs. Sensys wireless sensor technology could be an alternative technology for providing accurate measurements of traffic volume, speed, occupancy, vehicle length, and presence. According to Sensys literature, the Sensys Wireless Vehicle Detection System has proven to be equally accurate as well-maintained ILDs—the level of measurement is comparable to the ground truth, because level of traffic or weather conditions have no effect on the performance. The purpose of this study is to evaluate the similarity of traffic measures obtained from ILD and Sensys in order to find out if Sensys is a viable substitute for existing ILDs. An analysis of data for comparative measures was collected from sources PeMS (ILDs) and Sensys sensors, on the I-405 test bin site of Sand Canyon. Comparisons made over volume, occupancy and aggregate speed measures determined disparities in measurements between the two sensor technologies under various traffic conditions and time of day. The importance of the analysis of the Sensys detection system will help in determining the adequacy and readiness of Sensys as a potential replacement of ILDs.
A Psychosociocultural (PSC) Analysis of Latino Queer Undergraduates and their Coping Strategies
Melissa Munoz
Mentor: Jeanett Castellanos

Latino queer undergraduates are a double minority within the university system in that they must balance their Latina/o culture in an environment that is centered on White beliefs and practices, and which values heterosexism. This double minority identity can lead to numerous challenges (e.g., discrimination, prejudice, marginalization) for students navigating their educational processes. Given the stigma and limited expression of homosexuality within the Latina/o culture, limited studies have focused their attention on these processes. To understand the unique personal and educational challenges encountered by this group, the Psychosociocultural (PSC) framework was implemented to explain the behavior and ideology of a Latino queer undergraduate experiences. Through interviews, this qualitative study explores the experiences and the coping mechanisms that Latino queers face within a four-year university. A convenience sample was taken from eight Latino queer, gay, homosexual, and bisexual undergraduates attending a four-year university. Projected findings lead us to believe that individuals involved with on-campus organizations and support groups will report more positive coping strategies in comparison to students who are less integrated.

The Bournonville Technique: Obsolete or Underrated?
Laura Muscianese
Mentor: Lisa Naugle

The Bournonville technique is a method of ballet training and a choreographic style that is exclusively taught at the Royal Danish Ballet School in Copenhagen, Denmark. The technique embraces Danish culture by creating a masterful hybrid of French and Italian training methods that most reflect the Danish values of vigor and strength. Although many international dancers are recruited to join the ranks of the Royal Danish Ballet Company, few Bournonville-trained dancers are exported to the United States, and the Royal Danish Ballet tours infrequently. Thus, few American dancers have had exposure to the Bournonville technique in performance and even fewer have been privileged to study under the Bournonville system. This project was conducted to identify why the technique flourishes in Denmark but not in the United States. After spending one month in Copenhagen, I found that an integral reason why the Bournonville technique flourishes there is because of the enormous national funding for the arts and that this facilitates accessibility to performances, which can be seen in arenas ranging from Tivoli Gardens to the Royal Danish Theater. This vast exposure to Bournonville choreography has provided an origin for a national community, which grew into national pride that sustains the Bournonville heritage. While the Bournonville method flourishes in Denmark it is under-appreciated on the international stage due to a limited embrace of the culture that nourishes the technique. This presentation will include demonstration of the technique.

Methods for Converting Vehicular Inertia into Storage and Reusable Medium
Robert Nakamura
Mentor: Michael McCarthy

With higher energy costs throughout the world, energy consumption has become a major focus for all vehicle design. With the advent of emphasis on energy consumption, internal combustion and electric hybrids have become one of the ways to maximize the efficiency of the vehicular drive train. The main goal of our project was to design, test, and implement a circuit and setup that would maximize energy regeneration for use in a hybrid vehicle. To do this, we first ran our motor in regeneration setup, to make sure that the motor would function as expected. We then connected the motor to the target accumulator, which was a 165 farad ultra capacitor, and examined the behavior of the system. Finally, we gathered data on our implementation of coasting regeneration when placed on a car. We determined that, depending on the application, motor-driven regeneration can be an efficient way to capture energy that would otherwise be wasted as heat.

High Performance Electric/CNG (Compressed Natural Gas) Hybrid Architecture
Robert Nakamura
Mentor: Michael McCarthy

With the prevalence of automobiles, the need for fast, clean running, efficient, and high performance automobiles will continue to be necessary. An internal combustion engine is efficient for a constant load, whereas an electric system is efficient for applications that require instantaneous torque and instant application of power. This indicates that different drive power plants are efficient under different conditions. By applying our engineering knowledge, we attempted to research and engineer an efficient, high performance drivetrain for our hybrid vehicle. To accomplish this, we characterized our electric motor by putting it on a dynometer. We then put an electric motor on a car and measured the amount of energy that the system would use in more realistic conditions. Finally, we ran a motor cooling test to determine an effective way to cool the motor under race conditions. Our project group found that the electrical system is not only a performance enhancing complement to the internal combustion engine, it is also a viable alternative to an internal combustion engine depending upon the expected application and performance.
Newport Pier Enzyme Activity: A Time Series Analysis
Valerie Neino
Mentor: Steven Allison

Nutrients play a vital role in the balance of marine ecosystems. Across different seasons, nutrients vary in abundance in seawater due to changes in ocean upwelling, runoff, and biological activity. By measuring the enzymatic activity within the seawater, the fluctuations of nutrients can effectively be followed. In particular, alkaline phosphatase, β-glucosidase, β-N-acetylglucosaminidase, and leucine aminopeptidase can be assayed fluorimetrically to record the activities of microbes that digest nutrient substrates. We measured these enzyme activities in water samples collected three times per week off a pier, in three different filtered fractions: no filter, 2.7 micron and 0.2 micron filters. Observing the data reveals spikes in nutrient levels in both winter and spring. In winter, the rains lead to runoffs which increase nutrients. Spring has an increase in blooming flora and number of fauna, therefore increasing the nutrient levels. Looking on a larger scale, seawater enzyme activities may be used as indicators of overall nutrient levels and cycling potentially leading to the ability to predict the composition of microbes in the water.

Agrin-α3 Na,K-ATPase Interactions and Seizure Susceptibility in Mice
Marina Nemitalla
Mentor: Martin Smith

Neuronal activity depends on the presence of a large electrochemical gradient of Na+, and K+ ions across the cell membrane. Na+/K+ homeostasis, therefore, is critical for normal neuron function. The Na+/K+ gradient is maintained by the activity of the Na,K-ATPase (NKA) or sodium pump, which, using energy from the hydrolysis of ATP, pumps Na+ ions out of the cell and K+ ions in. Thus, changes in NKA activity are likely to have dramatic effects on neuron function. Previous studies in our laboratory have shown that a brain protein called agrin inhibits the 3 NKA, a neuron specific isoform of the pump, suggesting 3 NKA pathway in regulating neuron excitability. Consistent with this hypothesis, agrin haploinsufficient mice are less susceptible to chemoconvulsant-induced seizures. To 3 NKA pathway in regulating neuronal excitability I am using electrophysiology in mice to test the effect of 3 NKA on the response to graded electrical stimulation of the hippocampus. Consistent with our earlier findings, par-3 NKA expression significantly reduces seizure threshold, 3 NKA activity declines. Interestingly, preliminary results indicate that intracerebroventricular injection of agrin, to 3 NKA, decreases seizure threshold, whereas a small fragment of agrin that acts as an agrin antagonist increases it. 3 NKA pathway is an important regulator of neuronal excitability and highlight its potential as a therapeutic target for the treatment of epilepsy.

Assessing Prokineticin 2 Receptor Antagonist with Aequorin-Based Luminescence Calcium Mobilization Assay
Amy Ngo
Mentor: Qun-Yong Zhou

One type of signal transduction responsible for proper body function is via the integral membrane proteins called G protein coupled receptors (GPCRs). This mechanism is widely used throughout the body and is an important target for drug development. Prokineticin 2 receptors (PKR2) are a kind of GPCR that are active in endocrine and other tissues. The use of an antagonist to inhibit the PKR2 signal transduction pathway may affect how endocrine and gastrointestinal diseases are treated. In the experiment, I used aequorin-based luminescence calcium mobilization assay to assess the potency of PKR2 antagonists. Calcium mobilization was observed in recombinant Chinese hamster ovary (CHO) cells that were transfected with genes expressing PKR2 and a photoprotein called aequorin. Expression of both proteins in response to the presence of PK2 caused the cell to emit light. In the presence of PKR2 antagonist, little or no light was emitted. The assay results showed binding affinity Ki was different among antagonist compounds with variations on the carbon backbone as well as the side chains. These results support the use of aequorin-based calcium mobilization assay as an effective tool to measure the effectiveness of PKR2 antagonist.

Catalytic Nitrene Transfer onto Isocyanide by a Redox-Active Ligand Zirconium Complex
Andy Nguyen
Mentor: Alan Heyduk

In an effort to bridge the gap between late- and early-metal reactivity, we have used redox-active ligands that are capable of multielectron valence changes. These ligands on formally d0 metal centers have been shown to facilitate “oxidative addition” of halogens and reductive coupling of C-C and N=N bonds. Recently, we have used these ligands on tantalum(V) to generate imido complexes from organic azides(REF). This work reports the reactivity of a zirconium(IV) complex with the previously reported [NNNcat]3-(bis(2-isopropylamino-4-methoxyphenylamine))redox-active ligand. Successive oxidation of [NNNcat]ZrCl(thf)2 by chlorine establishes the availability of one- and two-electron oxidative states. The complex [NNNcat]ZrCl(CN)2, formed by ligand exchange of tetrahydrofuran with tert-butyl isocyanide, is able to catalyze the oxidative C=N coupling of isocyanide and azide via a transient zirconium imido species.
Levels of Inbreeding Depression in Autogamous and Outcrossing Families of *Oxalis alpina*

Annie Nguyen
Mentors: Ann Sakai & Stephen Weller

Plant breeding systems vary in levels of self-pollination and inbreeding depression. In *Oxalis alpina*, self-incompatibility promotes outcrossing, but an increase in self-compatibility (SC) of the mid-styled morph has evolved in some populations. Self-compatibility may increase the frequency of the mid-styled morph, but only if inbreeding depression levels are not high. Through time, if SC is a heritable trait, families with greater SC may purge recessive deleterious alleles and show lower levels of inbreeding depression. I compared plants with different levels of self-compatibility for their levels of inbreeding depression in one population of *O. alpina*. Plants that produced selfed and autogamous progeny (from seeds produced without biotic or artificial pollination) had similar levels of seed germination, numbers of flowers, and biomass as expected if self-compatibility was present. Families differed in their levels of inbreeding depression (measured by percent germination and number of flowers), consistent with the hypothesis that families also vary in levels of SC. Inbreeding depression was evident in plant biomass, but there were no differences among maternal families. Using a measure of cumulative inbreeding depression (based on the multiplicative relative fitness of percent germination, number of flowers, and biomass), families that had greater self-compatibility also had less inbreeding depression, suggesting that inbreeding depression levels have declined with the evolution of self-compatibility, as predicted. Understanding how differences in levels of self-compatibility and inbreeding depression arise is critical to determining how changes in the ratios of different floral morphs and in the breeding system of the population occur.

Colorectal Polyps: Is Less Invasive Treatment Better?

Brian Nguyen
Mentors: Steven Mills & Michael Stamos

A majority of colorectal polyps may be treated endoscopically. However, some are difficult to remove and require surgical resection. This study was performed to illustrate a single institution’s experience with management of colorectal polyps referred for surgical excision. Surgical referrals for colon and rectal polyps from January 2005 until July 2009 were identified. All patients underwent a repeat colonoscopy to determine if the polyp could be managed endoscopically, and to localize the polyp. Patients were categorized according to last treatment (endoscopy vs. surgery). A total of 23 patients were referred for surgery for a colonic polyp. Overall, polyps ranged in size from 1.5 cm to 10 cm (median 3.0cm) with endoscopic and surgical group ranges from 1.5 cm to 5.0 cm (median 3.0cm) and 2.0 cm to 10 cm (median 2.5cm), respectively. All patients were treated successfully with no mortality, and only one major complication (post-operative bleeding). Endoscopic techniques were used to treat 15 cases initially. Surgical treatment was ultimately used for 11 cases (8/11 treated laparoscopically; 0% conversion rate); five due to polyp size or shape, three due to invasive cancer discovered after polypectomy, two due to location at the appendiceal orifice, and one for severe dysplasia and high suspicion for invasive cancer. Twenty-one patients were available for at least one follow-up colonoscopy. A majority of colon polyps referred for surgical resection can be successfully managed endoscopically. For those requiring surgical treatment, laparoscopic colectomy is a technically feasible, safe, and effective method for the removal of colonic polyps.

Biochemical Characterization and Structure-Function Analysis of the Thermophilic Cytochrome P450 CYP 119 of *Sulfolobus acidocaldarius*

Brian Nguyen
Mentors: Thomas Poulos

The Poulos group is interested in Cytochrome P450 CYP119, a thermostable enzyme from *Sulfolobus acidocaldarius*. Cyp119 is one of the two known thermostable P450s. Its crystal structure was solved in 1998 by the Poulos group. The goal of our work with CYP119 is to identify its redox partner or partners, which are hypothesized to be ferredoxin(s), and make a tentative assignment of its substrate, which is currently unknown. A “proof-of-concept” experiment was performed, and it was found that the ferredoxin of *Sulfolobus acidocaldarius* reduces CYP119. In the future, the ferredoxin concentration will be varied to quantitatively measure the kinetics of electron transfer between the two proteins. Experimental conditions will be varied (increased salt, temperature, etc.) to understand the structural and energetic bases of their interaction.

Synthesis and Characterization of Prokineticin 2 Antagonists

Dewey Nguyen
Mentor: Qun-Yong Zhou

Prokineticins are a group of newly identified regulatory peptides in the gastrointestinal, central nervous system, and many other physiological processes. Dr. Zhou’s laboratory has designed a family of prokineticins 2 (PK2) receptor antagonists based on the conserved peptide sequence (AVITGA) found in prokineticins. This project involved one part of the structure-activity relationship studies. By using a three-step reaction of amide bond formation, deprotection reaction, and reductive amination, about two dozen compounds had been synthesized. The potency of these compounds was measured using *in vitro* Ca$^{2+}$ mobilization assay. Compounds that contained part of the conserved peptide sequence showed to be more...
metabolic changes associated with focal cerebral ischemia.

**In vivo Optical Imaging of the Hemodynamic and Metabolic Changes Associated with Focal Cerebral Ischemia**

Elaine Nguyen  
**Mentor:** Bernard Choi

The intent of the research was to investigate and optimize Rose Bengal photodynamic therapy (PDT) as a reproducible method for inducing localized cerebral ischemia in mice as well as to measure the hemodynamic (blood flow dynamics) and metabolic changes associated with the induced photo-coagulation (light-induced clotting) event caused by photo-activation of Rose Bengal. Non-invasive in vivo optical imaging of the mouse brain cortex through a moistened, intact skull was used. Laser-speckle imaging (LSI) of blood flow reveals that Rose Bengal PDT appears to significantly reduce blood flow in the micro-vasculature of the target irradiated region for at least 30 minutes after the photo-activation. Flow indices extracted from fast, repeated optical Doppler tomography (ODT) data across vessels of interest showed higher flow resistive indices indicative of higher resistance states corresponding to the vascular resistance caused by the localized ischemic stroke. Estimation of selected physiological parameters in preliminary studies using spatial domain frequency imaging (SFDI) shows a possible trend in hemoglobin levels where there is an initial increase in oxyhemoglobin, followed by an increase in deoxyhemoglobin and slight decrease in oxyhemoglobin, and finally a decrease in deoxyhemoglobin such that total hemoglobin fluctuations seem to have been compensated through a return to baseline levels. This study helps develop an appropriate animal model for understanding the relationship between cerebral vascular and functional remodeling and the vascular dynamics associated with focal ischemic stroke.

**Phenological Complementarity Increases the Fitness of Annual Grass Populations**

John Nguyen  
**Mentors:** Kailen Mooney & Katharine Suding

The object of our study was to examine the effect of genetic diversity and phenotypic variation in flowering time on the population performance and resource use of annual grass populations. The genetic diversity of a population has been shown to have important positive effects on the performance and fitness of populations, but the mechanisms that drive this relationship are poorly understood. To examine these mechanisms we manipulated the genetic diversity and the phenotypic variation in flowering time of population of the annual grass, *Avena barbata*. We found that genetically diverse *Avena* populations had increased performance due to phenological complementarity through the resource partitioning of ammonium by plants with differing flowering times. We found no evidence that plants partitioned their use of nitrate or water. Through phenological complementarity, *Avena* fitness increased in a magnitude comparable to the effects of species diversity found in other studies. This suggests genetic diversity may be able to replace the function of species diversity, especially in species poor systems.

**The Anti-Proliferative Effects of Novel Cyclooxygenase-2 (COX-2) Inhibitor, Vioxx, Analogues on Prostate Cancer Cells**

Linda Nguyen  
**Mentor:** Xiaolin Zi

Vioxx, an FDA approved drug, has been demonstrated as a lead compound for its anti-proliferative effect against many cancers, including prostate cancer. However, there have been concerns that the clinically relevant dose and duration of Vioxx required to produce notable anticancer effects significantly increased risk of heart attack and stroke. In addition, the anti-proliferative effect of Vioxx was shown to be both independent and dependent of its COX-2 inhibitory activity. Therefore, it is possible to design novel COX-2 inhibitor analogues that have more potent anti-proliferative effects against cancer cells but may produce no or less cardiovascular and cerebral vascular side effects. Based on this rationale, we tested the effects of 55 Vioxx analogues on the growth of prostate cancer cell line PC3 that was derived from a bone-metastasis prostate cancer specimen. PC3 cells were treated with a control medium or different concentrations of Vioxx analogues for 72 hours. After treatment, cell viability was measured by MTT assay. The results showed that the analogues Vioxx DJ, L-DJ, F-DJ, F-DQ, F-IJ, F-N, L-BT, L-DA, L-DQ, L-IJ, and L-XC significantly inhibited PC3 cell growth with their IC50 less than 50 μM, while Vioxx at a concentration of 50 μM only decreased the growth of PC3 cells by about 8%. Of these, Vioxx L-DJ has a similar selective COX-2 inhibitory effect as Vioxx, but the growth inhibitory effect of Vioxx L-DJ on PC3 cells was markedly increased with an IC50 of about 5 μM. This result suggests that the Vioxx L-DJ analogue that contains a diol substituent deserves further studies to determine the mechanism of its action and its in vivo anti-tumor efficacy in animal models, as well as its potential cardiotoxicity.
The Effects of Asymmetric Incompatibility on Morph Segregation Patterns in Progeny of the Mid-styled Morph in Three Tristylos Populations of Oxalis alpina
Long-Quan Nguyen
Mentors: Ann Sakai & Stephen Weller

The expected transition from tristyly to distyly via genic selection in Oxalis alpina may be delayed by asymmetric crosses involving the mid-styled morph. In a tristylist population, in which three style morphs occur, only crosses between anthers and stigmas at the same positions can produce viable seeds. With modification of incompatibility of the short- (S) and long-styled (L) morphs, genic selection may act against the mid-styled morph and eventually lead to the evolution of a distylist breeding system, in which the mid-styled morph disappears altogether. Comparison of three populations, varying in the degree of modification of incompatibility and the fecundity of the M×S and M×L crosses, indicates that the two crosses affected the segregations of the progeny of the mid-styled morphs. In the Morse Canyon population, the mid-styled morph produced a lower ratio of short-styled to non-short-styled progeny because of the low fecundity of the M×S cross. The frequencies of all three style morphs remained unchanged within one generation. Mid excesses may counter genic selection, thereby maintaining the mid-styled morph in the population.

Synthesis and Characterization of Alkyl Nitrates
Lucas Nguyen
Mentor: Sergey Nizkorodov

Nitrogen oxides (NOx) produced from tailpipes of vehicles continue to plague the air quality of industrialized areas by participating in complex reactions with volatile organic compounds (VOC). These reactions lead to photochemical smog formation, reduce visibility, and adversely affect human health. Further research into the chemical properties of the products of NOx+VOC reactions, such as alkyl nitrates, can provide more insight into the nature and implications of this chemistry for the air quality. The goal of this project is to synthesize and characterize several alkyl nitrates that are produced by atmospheric oxidation of smog-forming VOC. Alkyl nitrates are synthesized by a traditional synthetic approach by an epoxide ring-opening attack by bismuth nitrates, a nucleophile. The reaction products are characterized with NMR and FTIR, and their properties are subsequently studied using ESI-MS and UV-VIS spectroscopy. We show that the epoxide ring-opening is a suitable method of synthesizing atmospherically relevant alkyl nitrates. Our observations reveal that alkyl nitrates do not undergo efficient ionization in electrospray ionization sources, which makes their detection by ESI-MS methods quite challenging. Presence of a hydroxyl group on the carbon atom adjacent to the nitro group appears to affect the optical properties of alkyl nitrates. This has implications for the photochemical stability of these molecules in the atmosphere.

The Effects of Residential Placement on Rates of Treatment Compliance, Therapeutic Error, and Efficacy of Treatment
Melissa Nguyen
Mentor: Christy Hom

The residential placement (group home, supported living, or with family) of consumers who are developmentally disabled in Orange County, CA was researched to answer the questions of whether the placement has a significant difference on effects of compliance with treatment recommendations, rates of therapeutic error, and frequency of psychiatric hospitalizations, elopement, severe aggression, and property destruction. To find an answer, two databases (RCOC database and UCIMC Neurodevelopmental and Behavioral clinic database) were used to collect information, and a NOVA test was used to compare and find statistics on the data. This study shows that there was a significant difference in the psychological hospitalization, missed medications, wrong medications, wrong dosages of medications, aggression against others, property destruction, use of restraint and elopement. By looking at these factors, this research provides important information regarding the effects of the environment on the consumer.

Seasonal Dynamics of Bacteria and Viruses in the Coastal Pacific Ocean and their Relationship to Harmful Algal Blooms
Natalie Nguyen
Mentor: Sunny Jiang

This research seeks to address the relationship between marine bacteria, viruses, and harmful algal blooms (HABs) in coastal water. HABS caused by eukaryotic algae, such as dinoflagellates (Alexandrium spp.) and diatoms (Pseudo-nitzschia spp.), significantly impact marine animals, seabirds, and human health in coastal areas. Although several physical aspects relating to HABs have been studied, little is known about the influence of bacteria and viruses on their dynamics. To address this issue, water samples were taken from Newport Pier, Newport Beach, California, three times per week from October 2008 until August 2009. The bacterial and viral densities in the water were estimated by filtering water onto 0.2 µm-pore-sized Anodisc filters via vacuum filtration, and the picophytoplankton densities were measured by filtering the water samples onto 0.2 µm-pore-sized black nuclear pore filters. Total bacteria and viruses were enumerated using an epifluorescent microscope after staining with SYBR Green dye. The results showed that the concentration of bacteria ranged from 1.0E6 to 1.0E7 cells per mL, while viruses ranged from 1.0E6 to 1.0E8 cells per mL. Picophytoplankton...
Serotonin 5HT1A receptors are implicated in several neurological disorders. Therefore, development of imaging agents to study these receptors using positron emission tomography (PET) is being pursued by us and others. Our goal has been to develop antagonist and agonist imaging agents for this receptor. Mefway, an antagonist, has been developed successfully in our lab as a tool for investigation of serotonin 5HT1A-related neurological disorders. In attempts to develop a PET imaging agent, we designed a potential analog, 8-OH-FPPAT. The synthesis involved addition of a propionyl group to the nitrogen in tetrahydropyranyltetralin, which would be used to radio-label with fluorine-18. Preliminary radiolabeling experiments have not provided sufficient product necessary to optimize binding studies. Evaluation of the purity of the material is currently underway. Additional studies with Mefway competition with 8-OH-DPAT are underway to confirm similar binding sites for the antagonist and agonist. These comparisons will aid in further research towards treatment for serotonin 5HT1A-related neurological disorders.

**Tributyltin Induces Adipogenesis by Specifically Activating PPARγ in RXR-PPARγ Heterodimer**

Nina Nguyen  
*Mentor:* Bruce Blumberg

The purpose of this study is to determine whether the orphan receptor, tributyltin, induces adipogenesis in cells by activating the nuclear receptor PPARγ, the RXR half of the RXR-PPARγ heterodimer, or through some other mechanism. Tributyltin is a known endocrine disruptor (EDC)—a chemical that disrupts the endocrine system—that is released into the environment as a result of human activity. Studies have shown that exposure to tributyltin leads to formation of adipocytes and lipid accumulation in these fat cells. To test whether tributyltin causes adipocyte formation through PPARγ or RXR, mouse 3T3-L1 fibroblast cells were treated with tributyltin in the presence of a PPARγ inhibitor, GW9662. Results showed that when PPARγ is inhibited, tributyltin was unable to produce its effect. This indicates that tributyltin induces adipogenesis by binding to the PPARγ receptor of the RXR-PPARγ heterodimer.

**Imaging Agents of Serotonin Receptors**

Sarah Nguyen  
*Mentor:* Jogesh Mukherjee

Serotonin 5HT1A receptors are implicated in several neurological disorders. Therefore, development of imaging agents to study these receptors using positron emission tomography (PET) is being pursued by us and others. Our goal has been to develop antagonist and agonist imaging agents for this receptor. Mefway, an antagonist, has been developed successfully in our lab as a tool for investigation of serotonin receptors in different regions of the brain, displaying specific bindings in the hippocampus, cortex, and other brain areas rich in these receptors. Little is known about the changes and availability of these receptors under different affinity states (high and low). For further insight into the role of 5HT1A receptors in neurological disorders, analogs of the 5HT1A agonist 8-OH-DPAT are being developed in the lab. The agonist will allow the exclusive study of the high-affinity state of the receptor. In attempts to develop a PET imaging agent, we designed a potential analog, 8-OH-FPPAT. The synthesis involved addition of a propionyl group to the nitrogen in 8-methoxy-2-aminotetralin-HCl. The amide product underwent an overnight reduction to give 8-methoxy-2-propylaminotetralin. This intermediate was converted in three steps to 2-(N-propyl-N-5'-bromovaleryl)amino-8-tetrahydropyranyltetralin, which would be used to radio-label with fluorine-18. Preliminary radiolabeling experiments have not provided sufficient product necessary to optimize binding studies. Evaluation of the purity of the material is currently underway. Additional studies with Mefway competition with 8-OH-DPAT are underway to confirm similar binding sites for the antagonist and agonist. These comparisons will aid in further research towards treatment for serotonin 5HT1A-related neurological disorders.

**Electromechanical Reshaping Effects on Stiffness Behavior of Bovine Tendon**

Tony Nguyen  
*Mentor:* Brian Wong

Tendons and ligaments are connective tissues that provide the human body with mechanical stability and joint movement. They routinely undergo massive stress and strain that can result in injury. Overuse of these connective tissues can cause a loosening of the tissue structure and lead to pain and dysfunction of the tissue. Other cases involve the stiffening and shortening of connective tissues, such as in Dupuytren’s contracture of the palmar fascia of the hand.
A recent technique known as electromechanical re-shaping (EMR) was applied in this study to investigate the feasibility of stiffening or softening tendon in an ex vivo bovine tissue model. EMR uses milliamp DC currents in the form of platinum electrode needles that produce an electrochemical reaction within the tendon. During EMR, redox chemistry driven changes in the structure of matrix molecules, as well as transient localized changes in tissue pH at the electrodes alter the tendon’s mechanical behavior. After applying EMR, the tendon’s Young’s modulus, a measure of stiffness and tensile elasticity, was determined using a precision mechanical testing platform. Since the mechanical changes in the tissue correlate with the spatial location of electrode needle placement, the geometry of the electrode needles was also analyzed to determine what role location plays in steady state mechanical behavior. The use of EMR to alter the mechanical properties of bovine tendon offers several advantages in non-invasive and non-destructive methods to loosen or stiffen connective tissues.

In the Face of Architecture: A Look at Andalusia
Madelyne Oliver
Mentor: Alka Patel

Structures are often perceived to be static, due to their immobility, or assumed to undergo fewer physical changes when compared to mobile objects. My project counters this assumption by demonstrating that architecture is, in fact, subject to numerous physical changes—modification, elimination, expansion, adaptation, and evolution. Looking at Andalusia, Spain, I focused on the city of Granada, where I saw the impact of changes instigated by political and cultural institutions in power. In turn, an intricate visible layering of Spain’s histories emerged. From my experience studying abroad in Granada, my interviews with professors, and the data I researched at UGR’s libraries, my instinct was to categorize these buildings. Through anthropological and art historical methods, I found that a structure could not be limited to just representing categories of education, tourism, religion, or domestic architecture. To confine the structure to a single function would be to deny its original function, which had played a crucial role in the structure’s result today. What we can take from this is that a lot more than pleasing esthetics goes into the construction of a building. Architecture is subject to the same rapid changes we see occurring in our societies—political, economical, and cultural. It is not static or remote but acts as key player in communicating to a city’s inhabitants the institutions in power, the dominating interests; finally, it reflects how we arrived at our new position in history.

Modeling the Displacement Gradient of the Twistometer 9000 in Linearly Elastic and Viscoelastic Gels
Breanna Padilla
Mentor: Elliot Botvinick

Cell differentiation relies on physical and chemical stimulus from its environment to determine phenotype. In mechanotransduction, physical stimuli are converted into chemical stimuli, which dictate phenotypic properties so profoundly that cell lineage specification can be changed. Currently, cell traction force microscopy is used to characterize changes in phenotypic properties on a pre-stressed gel. Instead of using a pre-stressed gel, the Twistometer 9000 allows force to be loaded onto neutral gel in 3D. The Twistometer allows users to choose the amount of strain applied within a gel and also creates a gradient that allows for comparison of cells under different strains rather than working under the constraints of uniform gels. The displacement gradient within both a linearly elastic and viscoelastic gel need to be characterized before cells could be subject to physical stimulus. By tracking bead displacement in polyacrylamide and gelatin gels, patterns of displacement and a model of force gradient can be determined. Once the gradient is characterized, we hope to begin looking at phenotypic patterns along the displacement gradient.

Drinking and Driving: Perceived Stigma and Help Seeking Behaviors
Khrystyn Pamintuan
Mentor: Roxane Cohen Silver

Individuals perceived to have a stigmatizing condition may be ostracized from others and may lack the support needed to cope with their circumstance. Female undergraduates (N=152) from the University of California, Irvine participated in a study to determine if differences in the severity of the consequences of a DUI offense influence social distancing. Participants were randomly assigned to meet with a confederate who disclosed either being arrested for driving under the influence of alcohol, arrested for driving under the influence of alcohol and injuring someone, or provided no information (the control condition). Participants were interviewed about their life events, listened to an interview recording of the confederate, completed pre- and post-measure surveys, and took part in a video-recorded interaction with the confederate. The results demonstrate how the amount of alcohol-related behaviors to which the participant is exposed or in which she takes part affects the extent of social distancing towards the confederate’s varying conditions, and her likelihood of seeking professional help for heavy alcohol consumption.
The Linkage Between Fourteen Acacia Species’ Native Habitat and their Water Use Efficiency

Boyang Pan
Mentor: Diane Pataki

When leaf stomates are open, CO₂ is taken up for photosynthesis and water is lost through transpiration. The amount of CO₂ fixed in photosynthesis per unit water lost in transpiration is the plant Water Use Efficiency (WUE). WUE varies among species and is an important determinant for selecting plants that grow efficiently with minimal water inputs. We do not currently have a means of predicting WUE; however, it is generally assumed that species originating in more arid ecosystems will use less water and will have greater WUE. To test this hypothesis, we investigated the linkage between plant water use efficiency and native ecosystem in 14 common horticultural shrub and tree species within the genus *Acacia*. All species were grown in an irrigated common garden environment at the Los Angeles County Arboretum and Botanic Garden. Plant water use efficiency was determined through carbon isotope analysis of bulk leaves and leaf soluble sugars, and leaf transpiration was measured using a handheld porometer. Contrary to our hypothesis, *Acacia* species originating in more arid ecosystems used more water and had lower WUE than *Acacia* species originating in more temperate ecosystems. The results of this study indicate that under well-watered conditions arid species may use more water than temperate species. Given the growing importance of water conservation in southern California, an improved understanding of water use in horticultural plants will provide critical information for selecting water efficient plants and determining plant irrigation needs.

Measuring Adhesion Forces Between Notch and Delta

Andre Paredes
Mentor: Elliot Botvinick

Notch and Delta signaling is an instrumental developmental biology motif that provides the ability to differentiate cells such as stem and early embryonic cells. Currently, a vast amount of interest lies in their signaling ability to assist in drug therapy; however, not enough information exists. In particular, the interaction between DSL ligand and Notch receptor is puzzling, and theories have been proposed, implying that a cellular force, through endocytosis imposes a conformational change to assist in its signaling cascade. This research project analyzes the adhesion force between Notch and Delta and explores the possibility of cellular mechanistic forces and manipulations. The goal is to determine if a physical parameter of tension exists as a major regulator for the dissociation and nuclear translocation of the Notch receptor intracellular domain. Through polystyrene beads, optical tweezers, and a position diode, we propose the ability to determine if a force exists. While currently in the process of collecting data, if a physical parameter does exist, we further wish to investigate the extremities of the force and determine if the Delta ligand is causing dissociation via forces of pulling and twisting. A successful generic approach to assess the interaction between adhesion forces through optical tweezers will create a new perspective within the field of biology.

Structural Analysis of Aedes Proboscis

Anish Parmar
Mentor: Eric Potma

This project was designed to investigate the biological structures found in the proboscis of the mosquito species *Aedes aegypti*. To accomplish this, multi-photon microscopy was used to gain a better understanding of the proboscis for potential disease control and biomedical application. In the future, this data can possibly help to prevent the spread of malaria by improving the current understanding of how the critical mechanism of malaria transmission is structured. By gaining a deeper understanding of the proboscis, scientists may one day be able to degrade its function and prevent the mosquito from spreading disease by inducing a superficial change in the proboscis to make it unable to transmit malaria, which currently takes over one million lives a year. Another application of this data can possibly be used to help design biomedical devices such as a needle that can be used to administer vaccinations and vital fluids painlessly. For this project, the endogenous proboscises were bleached using hydrogen peroxide and were imaged using non-linear optical microscopy, specifically Raman and CARS imaging techniques. The data was imputed into ImageJ software to create renderings of the mosquito proboscis and allow for structural analysis and image processing. While data has been collected, the actual structural analysis phase of this project has yet to be completed. Therefore the results and conclusions are yet to be determined.

Surfactant Induced Neuroprotection following Mechanical Injury during Cryopreservation

Shaudee Parvinjah
Mentor: Jorge Busciglio

Primary neuronal tissue is a valuable tool in the study of neurodegenerative disorders. However, supply of suitable tissue is limited and laboratories can only maintain a limited amount of cultures at a time. Cryopreservation is a means to generate stocks of valuable tissue or cells for later use. This technique is not yet perfect since several factors, including extracellular ice formed during the freezing process, can reduce post-thawing cellular viability. Surfactants—amphiphilic organic compounds—are used as therapeutic agents that can reseal disrupted membranes produced by mechanical trauma. Used commonly in soaps and detergents, surfactants are commercially available and
nontoxic bioactive agents that can intercalate into damaged cell membranes and preserve cellular integrity. In this study, we investigated the potential of poloxamer 188 (P188) as a neuroprotective agent to prevent post-freezing injury. Fresh brain tissue blocks were treated with various concentrations of P188 (100uM, 500uM) pre-freezing and post-thawing to determine the effect of P188 in both short- and long-term treatments. Morphological development and process expansion of cultures was monitored for 10 days post-thawing. Immunofluorescence with the astrocytic marker GFAP and the neuronal marker beta-tubulin class III were used to assess cell survival and differentiation of astrocytes and neurons. Preliminary results indicate that the addition of P188 to our established cryopreservation protocols has the potential to significantly increase cell survival and the overall quality of primary neuronal cultures.

Understanding an Unexpected Outcome: A Look at the Democrats’ 2008 Presidential Nomination
Kianna Parviz
Mentor: Mark Petracca
Informal requirements for presidential nominations have developed over time and are a result of the qualities voters seek in their presidents. Typically, voters want a well-known individual, with a great deal of experience and strong funding to be president. These qualities assure voters that the candidate is capable of handling the enormous responsibilities that come with the presidency. These traditional qualities can be used to make predictions about who is the strongest candidate and most likely to win. Based on these indicators, one would have expected Hillary Clinton to win the Democratic Nomination: the former first lady was well known, had a great deal of experience as Senator, and was able to raise a significant amount of funds in the invisible primary. However, this was not enough to secure the nomination; surprisingly, Barack Obama—the unknown, inexperienced, underfunded, African American candidate—emerged as the Democrats’ nominee. I will attempt to understand this unexpected outcome to determine if traditional requirements no longer hold, or if new dynamics have emerged in the process that allow a candidate to compensate for lacking traditional qualities. This will allow us to understand if and how the nomination process has changed, which will be beneficial for predicting future nominations.

Effects of FTY720 on Over-Expressing Rheb Cells
Pinal Patel
Mentor: Aimee Edinger
The Edinger Lab hypothesizes that the drug 2-amino-2-[2-(4-octylphenyl)ethyl]-1,3-propanediolhydrochloride (FTY720) induces death in cancer cells by down-regulating nutrient transporters and starving cells. Target of Rapamy-cin in mammals (mTOR) positively regulates nutrient transporters expression. If FTY720 induces cell death by down-regulating nutrient transporters, then maintaining mTOR activity in the presence of the drug will prevent nutrient transport loss and cell death. The small GTPase rheb is an upstream activator of mTOR; thus, cells that over-express rheb should have high mTOR activity. Rheb expression was coupled to the protein huCD4 using Internal Ribosomal Entry Site; thus, high and low rheb-expressing murine hematopoietic FL5.12 cells were selected by measuring levels of the huCD4 protein using flow cytometry. MTOR is a key regulator of cell size; therefore, cell size of growth factor-withdrawn cells in G1 phase was measured to test whether over-expressing rheb increases mTOR activity. Over-expressing rheb cells were treated with different concentrations of FTY720, and cells’ viabilities and levels of a surface nutrient transporter were measured. Rheb over-expression did not block nutrient down regulation or increase survival of cells in presence of FTY720. In the near future, mTOR activity of over-expressing rheb cells in presence of FTY720 will be measured by a Western blot. This will help determine whether cell death and nutrient transporter loss were results of mTOR activity’s not being maintained in the presence of the drug or because increased mTOR activity in the presence of the drug does not protect the cells from death and nutrient transporter loss.

Which Political Events Had the Greatest Impact on the Great Depression?
Reena Patel
Mentor: Gary Richardson
The Great Depression is considered the worst financial collapse in history. As with any event of significance, the causes of the Great Depression are debated. One approach of investigating the Great Depression is to consider how government policies and political events impacted the economy. This study investigates which political events had the greatest impact on the Great Depression. A multiple unknown structural breaks test identifies shifts in several time series data sets, which are then compared to significant political events. The results suggest that several political events precede structural breaks in the data. Such events include Hoover’s election in 1928 and England’s choice to abandon the gold standard in 1930. While not all breaks in the data can be explained by political events, many breaks in the data can be explained by policy changes or bank failures. This study provides insight into which events may have contributed to the Great Depression.
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Temporal Lobe Epilepsy (TLE), is associated with significa-
cant morbidity in cognitive and psychosocial dysfunction.
TLE has long been correlated with a history of childhood
febrile seizures; hence, understanding the consequences of
febrile seizures on TLE is of considerable clinical signifi-
cance. The Baram laboratory has consistently observed
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that are responsible for mediating hyperpolarization-
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and synchronized neuronal activity, and regulate the tem-
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we have demonstrated a possible cause of such reduced
expression by targeting the factors responsible for regulat-
ing the transcription of the hcn1 gene. Using Chromatin
Immunoprecipitation, Polymerase Chain Reaction, and
DNA electrophoresis, we showed that the Neuron Restrict-
tive Silencer Factor (NRSF) binds to the NRSE region in
the first intron of the hcn1 gene. NRSF, in conjunction
with its cofactors, deacetylates and methylates the chroma-
tin, preventing transcription of the hcn1 gene. Such bio-
chemical change may, in turn, produce neuronal injury to
the developing brain, promoting the onset of epilepsy.
However, in order to infer the relationship of our findings
to epileptogenesis, it is necessary to observe the persistence
of the downregulation of HCN1 levels and upregulation
of NRSF levels in the hippocampus at different time points
following the febrile seizure.

The Efficacy of Outpatient Psychiatric Services in the
Treatment of Developmentally Disabled Patients with
Psychiatric Disorders
Christopher Pham
Mentor: Ira Lott
Clarification to the effectiveness of treatment recommenda-
tions provided by the Neurodevelopmental and Behavioral
clinic for developmentally disabled patients is limited.
Specifically, there exists limited knowledge on treatment
recommendation outcomes and the reasons for recom-
mandation non-compliance if it occurred. Thus, follow-up
meetings were conducted with several patients to examine
the efficacy of treatment recommendations, recommen-
dation compliance rates among different psychiatric disor-
ders, and to observe current rates of psychiatric disorders
in the developmentally disabled population. Follow-up
meetings consisted of reviewing the recommendations
with primary caretakers, specifically the outcome of follow-
ing the treatment; also, the reasons for recommendation
non-compliance were recorded. The Stress Survey Inven-
tory and Aberrant Behavior Checklist were administered to
determine the patient’s current condition relative to previ-
ous records. The majority of cases revealed that recom-
mandations concerning the reduction of psychotropic
medications were followed with a positive outcome (i.e.
addressing the issue of polypharmacy). Reasons for non-
compliance, on the other hand, varied extensively from
patient to patient. However, the most prominent reason
was based on insurance complications, financial issues, and
physician disagreement with recommendations. In addi-
tion, many recommendations were “pending,” such that
more time was required to pursue the recommendation or
to see the outcomes of the treatment.

Tobacco Smoke Constituent Norharmane
Mentor: Frances Leslie
Smokers, on average, die more than ten years younger than
non-smokers. Even though the adverse effects of cigarette
smoking are known, quitting is extremely difficult. Nicoti-
ne replacement therapies are the main cessation aids used
to help with the quitting process but, as shown by the low
cessation rates, they are not very effective. This could be
because nicotine, the main psychoactive constituent in to-
bacco smoke, is a weak reinforcer. There are 4,000 other
constituents in tobacco smoke, including those that inhibit
the enzyme monoamine oxidase (MAO), which may con-
tribute to nicotine’s reinforcing effects. Norharmane, an
MAO inhibitor found in tobacco smoke, also causes the
acute release of monoamines in brain regions associated
with reward. Therefore, it was hypothesized that the acute
effects of norharmane would be reinforcing in both ado-
lescent and adult male rats. To determine the reinforcing
properties of norharmane across age, adolescent and adult
male rats were allowed to self-administer saline or norhar-
mane (0.25 or 2.5 g/kg/inj) intravenously for five days at
an FR1 reinforcement schedule. Days six and seven were
set at FR2, days eight and nine at FR3, and day ten was at a
progressive reinforcement schedule. Our results show that
adolescent and adult male rats acquire and maintain nor-
harmane self-administration at a fixed ratio schedule of
reinforcement. These findings show that a tobacco smoke
constituent other than nicotine has reinforcing properties.
Future studies may include the analysis of the reinforcing
mechanisms underlying norharmane’s role in influencing
tobacco dependence.

Persistence of the Repression of the hcn1 Gene by
NRSF after Seizures
Romela Petrosyan
Mentor: Tallie Z. Baram
Epilepsy is a devastating disorder that affects countless
people worldwide. The most common type of epilepsy,
Temporal Lobe Epilepsy (TLE), is associated with signifi-
cant morbidity in cognitive and psychosocial dysfunction.
TLE has long been correlated with a history of childhood
febrile seizures; hence, understanding the consequences of
febrile seizures on TLE is of considerable clinical signifi-
cance. The Baram laboratory has consistently observed
downregulation, after seizures, of the Hyperpolarization
Activated Cyclic-Nucleotide Gated 1 (HCN1) channels
that are responsible for mediating hyperpolarization-
activated (Ih) currents. In the hippocampus, these currents
regulate the resting membrane potential, shape rhythmic
and synchronized neuronal activity, and regulate the tem-
poral summation of dendritic depolarization. Previously,
we have demonstrated a possible cause of such reduced
Study of Neurotrophic Signaling Using Unsupervised Learning Paradigm  
Danielle Pham  
Mentor: Christine Gall  
Brain-derived neurotrophic factor (BDNF) is essential for neuronal survival, synaptic plasticity, and memory. Previous studies have demonstrated that BDNF knock-out mice have learning deficits, that mouse models of Alzheimer’s disease (AD) have low levels of BDNF, and that high levels of mental activity may increase BDNF levels; therefore, increasing BDNF signaling via learning may slow the progression of AD. However, currently there is no direct evidence that learning triggers neurotrophic signaling. Critically, before we aim to provide this evidence, we must first develop a low-stress learning task, as previous studies have shown that stress decreases BDNF levels, which can be caused by common learning tasks (e.g., Morris water maze, shock conditioning, etc.). We designed a subtle learning paradigm for which adult rats were placed into a novel, enriched environment and allowed to explore freely. A scoring system based on the stress responses recorded during the eight days of handling and four of sham injections prior to the test day, with statistical analysis, was used to select the animals to undergo the learning task. The results from this study show that stress inputs were minimized on the test day by first handling and administering sham injections, and by using a stress-free unsupervised learning paradigm. We will confirm that the task itself does not upregulate BDNF or the stress response gene in future experiments. With positive results we will use these techniques to address whether learning induces neurotrophic signaling.

Forming Research Partnerships Between Faith Communities and the University: A Qualitative Study of Faith Leader Perspectives  
Jennifer Pham  
Mentor: Kimberley Lakes  
Little is known about the perspectives of religious faiths regarding health studies conducted by an institution of higher learning, while such a connection is crucial to the recruitment of participants in a representative sampling that requires representatives of all faith groups. We conducted interviews with seven leaders of various faith communities (Muslim, Jewish, Episcopalian, Christian Evangelical, African Methodist Episcopalian, Korean Baptist, and Catholic) in Orange County. Results indicate that a prerequisite for a university-faith community partnership is a trusting relationship between the investigator and faith leader. Some leaders described trust as the result of a personal relationship with the investigator, built over time. This trust could be enhanced if leaders perceived the study as being led with transparency and integrity; in addition, the investigators would need to demonstrate that they were conducting the study to improve children’s health and not for self-serving motives. Faith leaders identified additional elements of a successful partnership, which included clearly identified roles and responsibilities for both parties, consistency between the faith communities’ and study’s priorities, ongoing open and honest communication between faith leaders and study investigators, faith community access to information, and ongoing maintenance of the relationship. Faith leaders noted that different faith communities have different levels of openness to science, which could impact willingness to develop partnerships. With a better understanding of various faith leaders’ opinions on health studies, universities can better conduct studies with results that can be applied to members of all faith groups.

Is Parental Mental State Language Associated with Theory of Mind Development in Children with Autism Spectrum Disorder?  
Kim Pham Vu  
Mentor: Wendy Goldberg  
Theory of mind, or the ability to understand the mental states of the self and others, develops between the ages of three and five years in typically developing children. However, previous studies indicate that children with autism seem to lack this ability, which is assessed using several behavioral tasks. Some research has demonstrated an association between maternal behaviors during educational exchanges with children and the age of theory of mind acquisition in typically developing children. The primary objective of this study was to examine the correlation between theory of mind performance in children with autism and parental use of mental state language during shared book readings. It was hypothesized that parental use of mental state language would be positively correlated to children’s performance. Fifteen children previously diagnosed with ASD between the ages of 4 and 12 were administered a battery of theory of mind tasks. Also, one parent read to the children from a wordless picture book. Preliminary analysis will include bivariate correlations between parental mental state language and an aggregate theory of mind score. Further analyses may include separate ANOVAS examining group differences between children whose parents demonstrate low and high mental state language use on both a composite measure of theory of mind and scores on each individual task. It is necessary to determine the most effective parenting practices in order to help children with autism develop more typically.
**Hardiness as a Predictor of Academic Success Based on Birth Order**

*Jacqueline Phan*  
*Mentor: Salvatore Maddi*

The notion that birth order determines one’s capacity for academic success has been researched for years and, as a result, many theories have been developed to explain this phenomenon. The goal of this study is to examine whether Hardiness can be used as a predictor of academic success based on an individual’s birth order. Using previously collected survey data from undergraduate students at the University of California, Irvine from 2004–2006, the study consisted of three key variables: Hardiness, birth order, and academic success. Academic success has commonly been measured by how effectively one studies, among other factors. Implications from this study could bring about a new emphasis on the ability to cope with stress as a major factor in collegiate success. Previous research suggests that Hardiness and academic success positively correlate with one another and that birth order and academic success have a similar correlation. This study examines whether the data collected supports these findings, as well as whether a significant relationship exists between Hardiness and birth order. It also examines whether Hardiness can be used as a predictor of academic success based on birth order. It was found that although the study showed that Hardiness has a significant positive correlation with academic success, the findings were inconclusive as to whether birth order influences hardiness’ effect on academic success.

**A System to Study Neurogenesis and Development: Comparison of Gene Expression in Human Embryonic Stem Cells to Human Embryonic Stem Cell Derived Motor Neuron Progenitors and Adult Human Spinal Cord**

*Kevin Phan*  
*Mentor: Hans Keirstead*

Cell therapies for degenerative motor neuron diseases and spinal cord injury can be achieved by generating human embryonic stem cell-derived motor neuron progenitors (MNP) from human embryonic stem cells (hESC). Understanding the etiology of MNP development would facilitate progress towards clinical success. Gene expression was compared in hESC and MNP using RT PCR, with particular focus on genes important for neurogenesis. Some genes are essentially undetectable in hESC, but abundant during MNP differentiation (or vice versa). These changes reflect neural lineage commitment and a progression resembling embryonic neurogenesis. Expression of some of these neurogenesis genes was studied in a detailed time course from a specific stem cell line. The timing of these expression patterns is related to specific events in neural induction and development. Expression levels of some genes of interest were also compared to normal, adult spinal cord (hSC). This work leads directly to the longer-term goals of comparing native motor neurons (MN) to hESC-derived MN and understanding the underlying mechanisms of MN development.

**Inconsistencies in Alien Tort Statute Jurisprudence**

*Nicholas Plassaras*  
*Mentor: Wayne Sandholtz*

Over the last five years, application of the Alien Tort Statute by U.S. courts has become inconsistent. The Second Circuit’s recent decision in *Abdulahi v. Pfizer* represents an unwarranted departure from the evolving standards used to govern application of the Alien Tort Statute. Disagreement over what sufficiently establishes international legal norms is partly to blame for the inconsistencies. Sources of international law, which only a few years ago were deemed insufficient to establish an international legal norm, are being used by federal courts today to do just that. The precedent set by the U.S. Supreme Court’s decision in *Sosa v. Alvarez-Machain* is also responsible. *Sosa* has left the lower courts with a standard for applying the Alien Tort Statute that is overly restrictive at best, and almost impossible to apply at worst. When taken together, disagreement over what constitutes international law, and the standards set by *Sosa* has created confusion among the lower courts. This leads to inconsistent jurisprudence that threatens the institutional legitimacy of the courts and the practice of applying international law in our legal system.

**Correlation and Analysis of Lip Dimensions and Facial Beauty**

*Natalia Popenko*  
*Mentor: Brian Wong*

Historically, facial beauty has been defined and quantitatively measured by correlating discrete anthropometric measurements with subjective facial attractiveness scores, identifying the parameters that create the “ideal” facial model. This study pioneers a computer-based approach that progressively modifies facial features along a continuum to determine the effects of changing lip proportion on facial attractiveness. The study attempts to develop a continuum of synthetic images with modified lip proportions; determine the absolute lip adjustments based on attractiveness ratings; and identify the most significant lip dimensions to idealize facial attractiveness. Using a facial alteration program, lip dimensions in twenty female portraits were scaled in continuous vertical increments of 50%, altering the lip size from 150% to 250% of the original. All adjusted and original portraits were rated for attractiveness by both focus groups and online-networking groups. The collaboration of 100 modified facial photos resulted in a series of idealized lip proportions. The most significantly attractive lip dimensions were measured and...
analyzed to determine the overall principle proportions. Analysis demonstrated that most frequently, only minimal enhancement to the original lips increases overall attractiveness scores. This study concluded with the significance of the idealized lip dimensions and its implication for the general population. The clinical significance of this project was to generate a model through which facial plastic and reconstructive surgeons could evaluate whether enhancing or reducing lip proportions could be favorable for a patient and would increase their overall facial attractiveness.

The Neuronal Light Photosensitivity of CRYPTOCHRONE in Drosophila Large Lateral Ventral Circadian Neurons (l-LNvs)

Grant Porter  
Mentor: Todd Holmes

The 24-hour cycle of biological events present in most organisms is controlled by the circadian molecular clock. The clock is composed of a series of interacting negative transcriptional feedback loops that can be recalibrated daily by light exposure. In Drosophila, this clock consists of transcriptional repressors PERIOD and TIMELESS, which inhibit the transcriptional activators CLOCK and CYCLE. CRYPTOCHROME (dCRY) degrades TIMLESS upon blue light exposure, thus resetting the clock. Recently, the Holmes lab discovered that the electrophysiological activity of large lateral ventral circadian neurons (l-LNvs) is acutely light responsive, which increases their firing frequency when they are exposed to blue/ultraviolet light. This “light-on” response immediately reverses with lights off. However, flies with a null mutation for dCRY (cry01 and cry02) no longer exhibit acute light sensitivity of the l-LNvs. Following the expression of dCRY in the LNvs for null flies, the lights on/off effect is restored, indicating CRYPTOCHRONE is responsible. We used two functionally CRY family members of the monarch butterfly (Danaus plexippus, dpCRY1 and dpCRY2) to determine which molecular properties of CRY are responsible for conferring neuronal light sensitivity. We hypothesized that due to dCRY and dpCRY1 similarity, the CRY null flies could be rescued, while dpCRY2 could not due to lack of light sensitivity. We found that the light-sensitive dpCRY1 can indeed rescue the light response of cry01 flies, while dpCRY2 cannot, indicating that dpCRY1’s photosensitivity is mechanistically necessary for acute light response of the LNvs. Thus, blue light-activated insect CRY proteins are capable of conferring cell autonomous neurophysiological photosensitivity.

Investigation of the Role of Hedgehog Signaling in Rodent Incisor Stem Cell Regulation

Stephanie Purnomo  
Mentor: Taosheng Huang

Self-renewing stem cells cause rodent incisors to grow continually throughout the life of the animal. Previous studies have revealed that a population of cells in the cervical loop region of the adult mouse incisor is regulated by the sonic hedgehog (SHH) signaling pathway. Furthermore, lineage tracing studies suggest that the stem cell niche resides in this region. Our aim was to determine by further lineage tracing experiments whether Shh-expressing cells are stem cells and to study the consequences of genetically inhibiting SHH signaling in the adult mouse incisor. We show that mice with a conditional knockout of Smo/ed3 have alterations in the morphology of the incisor cervical loop region. These findings suggest an important role for HH signaling in regulation of stem-cell driven incisor growth.

The 9/11 Aftermath: A Comparative Legal Analysis of Detention Regimes in Britain, France, and the United States

Ahmad Qazi  
Mentor: Wayne Sandholtz

In their policies for detaining terrorism suspects, Britain, France, and the United States all undermine rights that lie at the core of democracy. While similarities and differences naturally stem from each country’s unique set of laws and procedures, U.S. detention legislation curtails legal rights of detainees to a much greater extent. The misapplication of the Material Witness Statute and the provisions of the PATRIOT Act provide for a potentially indefinite detention regime while concomitantly violating basic procedural rights and protections conventionally accorded to detainees. The enemy combatant status, an anomaly unparalleled to any legislative response pertaining to the detention of terrorist suspects in France and Britain, allowed the Bush Administration to detain U.S. citizens indefinitely without charging them, bringing them to trial, or giving them access to counsel. The enemy combatant designation by itself constructs a detention regime that fails to recognize the most basic human rights formally accepted by 194 states in the world. Abandoning the “9/11 aftermath” mindset, which was largely characterized by the misconstrued belief in a zero sum game between security and liberty, will provide the impetus to all three nations to remove ambiguities in both the substantive content and the implementation of existing legislation concerning the detention of suspected terrorists while tailoring prospective legislation to the long-standing ideals held by democracies.
Characterization of Hemodynamics in Human Skeletal Muscle in vivo Using Diffuse Optical Spectroscopy
Timothy Quang
Mentors: Albert Cerussi & Bruce Tromberg
Diagnostic measurements of tissue hemodynamics had been neither precisely nor easily quantified in vivo until the development of optical methods. Since muscle is so dependent on the mechanics of oxidative metabolism, studying skeletal muscle can provide valuable insight into vascular function, especially that of the microvasculature. This is especially important when considering various conditions that affect tissue oxygenation such as Diabetes mellitus or mitochondrial myopathy. Diffuse Optical Spectroscopy (DOS) is a novel method based on near-infrared spectroscopy (NIRS) that is capable of measuring tissue oxygenation by measuring the concentration of molecules such as oxygenated and deoxygenated hemoglobin ([O2Hb] and [HHb]). The main advantage of DOS over other techniques is that it is sensitive to changes in the microvasculature, accounts for confounding factors that distort quantitative accuracy, and can measure muscle hemodynamics dynamically. The goal of this study is first to characterize the hemodynamics of patients with Diabe-
etes mellitus, cardiovascular disease, and mitochondrial myopathy, compare them with healthy subjects with no known history of any of these diseases, and then determine if there are any significant differences between them. The hemodynamics of these populations will be determined by performing DOS measurements on the patient’s forearm during an arterial occlusion in the same arm. From these measurements, we can determine indicators of oxidative metabolism and vascular reactivity and compare these parameters between populations. Currently, our results suggest that DOS does quantify significant differences between diseased and normal populations that can be attributed to altered metabolic states.

The Author(ity) of Code-Switching: Reclaiming Space and the Self in Julia Alvarez’s and Judith Ortiz Cofer’s Writing
Nancy Quintanilla
Mentor: Rodrigo Lazo
The literature of many bilingual U.S. Latino/a writers presents the unconventional relationship of two different languages as they interact on an interchangeable level. This form of code-switching thus has become the topic of various scholarly studies. For some critics, the act of inserting Spanish words into a primarily English-written text illustrates the political and national conflicts that Latino/a migrants experience when they relocate from Spanish speaking nations to the United States. My research project responds to such critical discourses by arguing, instead, that the technique of code-switching challenges various notions that separate the Spanish language from U.S. subjectivity. By focusing on the literature of two Caribbean American authors, Julia Alvarez and Judith Ortiz Cofer, I argue that the migrant should not be seen as a “displaced” presence fixed between two different cultures and languages, but rather as a presence that transgresses and self-invents within new spaces that bring together different cultures. Through a close reading of the authors’ texts, I maintain that reading code-switched words as a mechanism that “interpenetrates differences” and defies the “negation” of one language over the other establishes a better understanding of the migrant condition. This rereading of the relationship between language and identity then suggests that writing becomes a space of its own where the writers’ voices flourish and develop outside of national limitations.

Representing 1930s Los Angeles: The Confluence of Capital, Media and City in Hard-Boiled Fiction
Jonathan Radocay
Mentor: Richard Godden
With a focus on representations of urban space, the Los Angeles of three 1930s novels—Horace McCoy’s They Shoot Horses, Don’t They? (1935), Raymond Chandler’s The Big Sleep (1939), and Nathanael West’s The Day of the Locust (1939)—are compared in order to consider what shaped the Los Angeles urban landscape in the midst of economic depression, the development of the film industry, and mass immigration from the Midwest. A look into how these novels spatially represent the crisis of capital that has become manifest by the 1930s reveals the significant fact that while Angelenos do actually experience the city’s buildings, streets, and public parks, the capital that has become fixed in these places comes not from native industrial production, but from the oil and land speculation of two decades earlier. The production and experience of films reinforces the realization that speculative capital built Los Angeles. The silver screen onto which a film is projected resembles a building façade: although the surface gives the illusion of substantiality (of reality), nothing substantial lies behind either. In the place of such building materials as stone and iron are only the artifices of stucco, plaster and wood. The authors of these novels emphasize the confluence (and often conflict) of spaces of lived experience (e.g. the build-ings, streets and parks that Angelenos encounter) with spaces that contribute to the city’s imagination (e.g. from films, magazines and newspapers), in representing a Los Angeles that is neither simply coherent nor hopelessly fragmented.
The Effectiveness of Gang Injunctions in Latino Communities: A Reasonable Answer?
Victoria Ramirez
*Mentor: Ana Rosas*

Gang injunctions are restrictions that prohibit gang members from certain activities and are intended to break a gang’s common routines in a neighborhood. There have been studies on both sides of the spectrum, those allegedly against gang injunctions and those in favor of placing them. This study measures the effectiveness of gang injunctions through the use of surveys and interviews in which I compare the responses of residents living outside the gang injunction area to those living within the gang injunction area in the city of Compton, California. This study evaluates the way a gang injunction is introduced, implemented, and its results from a Latino resident’s point of view, focusing on neighborhood safety, police involvement in the community, and community involvement by residents. This study shows that reduction in crime is in no way linked to the implementation of a gang injunction, as the relationships between residents and the police have decreased. According to the responses, residents are reluctant to call the police, not due to fear, but because the police do not provide the safety residents are looking for; therefore, the removal of gang injunctions will eliminate the invisible barrier they create between residents and law enforcement.

Tracing the Origins of a Novel Wing Color in Mimetic Butterflies
Monica Ramstetter
*Mentors: Adriana Briscoe & Seth Bybee*

It has recently been found that some Heliconius butterfly wings express a unique yellow pigment containing an ultraviolet (UV) component not found in close relatives. This genus also has a duplicated UV opsin in the eyes that may permit them to better discriminate colors with a UV component compared to colors without. To test whether these two characteristics were complements of one another, wing colors of dried butterflies—at least three specimens per species of interest in an expanded taxon sampling of both Heliconius and outgroups—were measured. A total of 51 species and 185 specimens were used in our experiment. Through use of a spectrometer and fiber optic probe, raw wing color reflectance spectra on such butterflies were collected. Noise in the data was reduced by applying a Gaussian fit to the curve using MATLAB and averaging the data for each species. Data was analyzed by categorizing colors by peak percent reflectance and maximum positive and negative slope. After combining such data through charactering mapping with a species phylogeny, the origins of this unique UV-Yellow and other colors with an ultraviolet component were identified. A comparative test indicates that UV wing colors, which may serve as sexual signals to other butterflies, are more likely to occur in butterfly species with two UV opsins in the eyes than in species with only one.

Alignment of SLM for Use in Microscopy
Chasen Ranger
*Mentor: Eric Potma*

In an attempt to improve the spatial resolution of coherent anti-Stokes Raman scattering (CARS) microscopy, we incorporated a spatial light modulator (SLM) into the laser beam path. The SLM can apply phase patterns onto the laser beam used for CARS. However, because the SLM is not perfectly flat, significant diffraction occurred, which compromised the quality of the beam. I explored several approaches for reducing the effects of diffraction. To this end, I constructed a laser setup that projects the laser beam onto a CCD camera, which can visualize the phase pattern through interferometry. Using this approach, a feedback scheme can be set up to iteratively correct the curvature of the SLM, which renders the surface flat to within a fraction of an optical wavelength.

Extracellular Functional of EFMP in Suppressing Angiogenesis of Glioma
Pitcha Ratanawong
*Mentor: Yi-hong Zhou*

EFMP1 is a tumor suppressor protein in glioma cells. However, PAX6 is required to be intact with DNA-binding domain in order to regulate EFMP1. EFMP1 has a significant effect on tumor suppression; however, it is unclear that secreted EFMP1 or intracellular EFMP1 play the role of tumor suppressor and angiogenesis induction. The EFMP1 protein is produced in small scale using transformation technique on E. coli with pGEX-4T-2 and the ERMP1-CF (c-terimal FLAG)/pGEX-4T-2 plasmid DNA. The bacteria are tested using small-scale sonication and Western blotting. The production is successful; therefore, the protein is produced in large quantity using the Glutathione S-transferase (GST) Gene fusion System. The cells are then purified and refolded. The complete protein is introduced to the tumor cell. If the angiogenesis of glioma is suppressed by extracellular introduction of EFMP1, it can be concluded that the EFMP1 is extracellular protein; new drug therapies can be developed and angiogenesis of glioma can be stopped on time. However, the Western blot’s result shows that the purification is not successful. The EFMP1 purification is undergoing troubleshooting before proceeding to further steps.

Effects of Knockout of Antioxidant Genes on Spermatogenesis
Bogdan Rau
*Mentor: Ulrike Luderer*

Glutathione (GSH) is a tripeptide that functions as an antioxidant, helping protect cells from reactive oxygen spe-
cies. Glutamate cysteine ligase modulatory subunit (GCLM) is a subunit of Glutamate Cysteine Ligase (GCL), the rate limiting enzyme in GSH synthesis. Down-regulation of GCLM mRNA has been shown to cause decreased levels of GSH, and our preliminary results suggested that Gelm -/- mice might have decreased fertility compared to wild type mice. Mice that lack the transcription factor Nuclear Factor Erythroid-2-Related Factor 2 (Nrf2) have decreased expression of numerous antioxidant genes, including Gelc and Gelm, and previous work from our laboratory has shown that male Nyr2 -/- mice have an accelerated decline in sperm counts and fertility with age. Here, we tested 2 hypotheses: that vitamin E (a known antioxidant) will protect Nyr2 -/- males from testicular oxidative damage and prevent age-related declines in spermatogenesis, and that Gelm -/- males have altered sperm morphology and decreased testicular sperm counts compared to Gelm +/+ males. Knock-out mice (Nyr2) had statistically significantly decreased testicular and epididymidal sperm counts compared to wild type mice. There were no significant effects of genotype or diet on sperm morphology. Gelm -/- showed a higher percentage of immature sperm but, due to high variability within the knock-out group, there was no statistical significance. These data suggest that vitamin E alone is not a suitable antioxidant to protect Nyr2 -/- against declines in spermatogenesis. Furthermore, differences in Gelm genotypes do not seem to have an effect on sperm morphology.

Characterizing Dinitroaniline Resistance Mutations in Sensitive Tubulin
Tara Reed

Mentor: Naomi Morrisette

The protozoan Toxoplasma gondii is an obligate intracellular parasite and human pathogen. Infection is life-long and many therapies are poorly tolerated, creating a significant need for therapies with higher efficacy and lower toxicity. Dinitroaniline compounds inhibit parasite replication without obvious effects on vertebrate cells. Understanding the selective nature of these compounds is important for design of future antiparasitic drugs. Dinitroaniline binds to the alpha-tubulin subunit of the alpha-beta tubulin heterodimer and disrupt microtubule polymerization. Previous research has shown that T. gondii can become resistant to dinitroaniline compounds by mutation of the alpha1-tubulin gene. We wanted to understand how amino acid changes to alpha-tubulin confer dinitroaniline resistance. Since T. gondii does not have sufficient concentrations of tubulin for biochemical assays, we exploited the related non-pathogenic ciliate Tetrahymena thermophila. We created T. thermophila lines that express alpha-tubulin with either 136Phe or 252Leu substitutions as the sole source of alpha tubulin. We grew wild-type and mutant T. thermophila in media with the dinitroaniline oryzalin and demonstrated that although wild type cells are incapable of growth in oryzalin, either mutation is sufficient to confer resistance. Tubulin was extracted from all three lines and used in dinitroaniline binding and tubulin polymerization assays. Both 136Phe and 252Leu tubulins have reduced oryzalin binding relative to wild-type tubulin. Unlike wild type tubulin, both altered tubulins assemble into microtubules in the presence of oryzalin. We propose that the mutations reduce association of oryzalin with its binding site on tubulin to allow altered tubulin to assemble into microtubules.

Preparation of Nanocrystalline Nickel by Multi-Dimensional Pulsed Electrodeposition
Karina Reyes

Mentor: Farghalli Mohamed

Electrodeposition is the process of depositing a metal on a substrate in a solution that contains the ions of the metals being deposited. The electrodes, cathode and anode, are suspended in an electrolyte that acts as a medium to complete the electric circuits for electrodeposition. As the direct current passes through the solution, the ions begin to follow the current and stick to the cathode. This process deposits metal with large grains in the range of micrometer. The objective of this project is to use an alternative form of electrodeposition process that uses the electric current in a form of pulse to create nanocrystalline material. The process would be the same; however, a circuit would be added to convert the direct current into a pulse current (similar to alternative current). In order for the circuit to work, it will use opto-isolators that will transfer the electronic signal, that way the pulse is able to flow. Apart from the isolator, a NOP gate (inverter) is used to convert the DC (battery) to AC. This will facilitate optimizing the correct form of pulse current that will promote the formation of nanocrystalline material.

Effects of Early Nutritional Stress on Developmental Trajectories of Zebra Finches
Christina Riffle-Yokoi

Mentor: Nancy Burley

Life history theory predicts that species adapted to unpredictable environments may, when developing under unfavorable conditions, stress maturation of traits that enable them to reproduce quickly at the expense of traits that enhance survivorship. To examine this hypothesis, zebra finches were reared on one of two diets that varied in protein levels. Males were then measured as young adults (day 95) for development of two secondary sexual traits (beak color, cheek patch size) and body size (tarsus and wing length, skull width). Birds were also tested for immunocompetence (response to PHA challenge), with some birds challenged first at 95 days, and others challenged both at 55 days and 95 days to determine if they acquired immunity. This experiment remains in progress, but early trends
are reported here. Contrary to expectation, males reared on the low-protein diet did not achieve beaks as red and dark as those reared on the high-protein diet, although they did possess cheek patches of comparable size. Also contrary to expectation, most traits (cheek patch size and body size) were more influenced by the PHA injection treatment or the interaction between diet and injection treatment, than diet treatment alone. High-diet males showed a greater response following a second challenge, while low-diet subjects did not. Results suggest that early-life immune challenges may have substantial effects on the adult phenotype, but sample sizes must be bolstered before conclusions can be drawn regarding effects of early nutrition on the developmental strategies available to vertebrates.

Ice Particle Size and Temperature Dependence of Propane Clathrate Formation
Joel Rivera
Mentor: Kenneth Janda

Clathrate hydrates have been considered as a plausible medium for the commercial storage and transportation of combustible gasses, and could potentially play a major role in CO₂ sequestration. The effects of temperature and initial ice grain size on the formation rate of propane clathrate hydrates have been observed. The use of smaller ice grains resulted in higher rates of enclathration, presumably due to a larger effective surface area. The smallest ice grain size, 106 µm, had a maximum uptake rate of 1.4x10⁻⁵ mol/s while the largest ice grain size, 425 µm, had a maximum uptake of 5.5x10⁻⁶ mol/s. Smaller ice grains increased the exposed surface area of ice and reduced the amount of unexposed ice surrounded in a clathrate crust. Varying the temperature of the initial ice grains over a range of 263–273K had only slight effects on propane clathrate hydrate formation rates. Measured formation rates indicate an inverse relationship between the temperature of the initial ice grains and the propane clathrate hydrate formation rate. Existence of such a relationship suggests that the kinetic stability of the guest molecule in the clathrate cage has a greater effect on formation rates than the strength of the H₂O-H₂O hydrogen bonds that must be cleaved during formation of a clathrate hydrate. Experiments such as these help develop our understanding of clathrate hydrates and the complicated formation kinetics of these structures.

Conflict Resolution in West Africa: The Impact of Civil Society Groups and Regional Organizations in Ghana and Liberia
Maryam Rokhideh
Mentor: Cecelia Lynch

Internal wars have become a main feature of the international conflict environment. West Africa is among the world’s most unstable regions, with contemporary dispute in Nigeria, Sierra Leone, Guinea, Liberia, Côte d’Ivoire, Guinea-Bissau, Senegal, and Mali. Some West African nation-states, particularly Ghana and Liberia have resolved their civil conflicts through primarily homegrown strategies. Through conflict management techniques implemented by the cooperation of civil society and the government, Ghana resolved its Northern conflict of the 1990s and prevented it from spreading to the whole country, accounting for its current state of political and economic stability. Liberia was embroiled in civil war for fourteen years, and civil society groups and regional security arrangements like the Economic Community of West Africans States (ECOWAS) played a significant role in ending the war and in post-conflict reconstruction and reconciliation. I argue that the implementation of “African solutions to African problems” yields a more lasting and effective outcome in resolving civil conflicts since it includes the participation of the citizenry, political actors, warring parties, and regional players. Through extensive study of these two cases I conclude that African models of conflict resolution and contributions from civil society actors and regional security arrangements provide an opportunity for enduring peace and equitable prosperity in West Africa by strengthening the capacity for a society in which all factions are represented and the government heeds its citizenry.

The “National Question” and Early-Soviet Nationalities Policy
John Romero
Mentor: Lynn Mally

Bolshevik theory concerning ethnic and national minorities within the former Soviet Union was a key issue for both Lenin and Stalin in the years preceding and immediately following the Revolution of 1917. The “National Question,” or debate concerning Bolshevik policy towards the various nationalities, played a central role in the formation of the Soviet Union. To preserve the territorial integrity of the former Russian Empire, Lenin and Stalin advocated for the creation of individual nation-states within a greater political entity, which would both appease the nationalities and allow for a unified political structure. Some scholars maintain that the final national structure of the USSR in 1923, supervised by Stalin, was a significant departure from what Lenin had envisioned. However, analysis of the writings of both Lenin and Stalin, as well as those of several historians, reveals that the policies of Lenin and Stalin with regard to the “National Question” were very similar. More specifically, the disagreements between the two leaders in terms of the formal structure of the USSR were mainly aesthetic, since neither questioned the unitary, one-party state. Therefore, the lack of political autonomy for minorities within the Soviet Union was not a unique development of Stalin’s, but was instead a part of Lenin’s Bolshevik ideology, which, while espousing political rights and equality,
rigidly enforced the centralization of political power to the Communist Party.

**Nicotinic Acetylcholine Receptors and Pancreatic Cancer**

*Eric Romney*

*Mentor: Matthew Katz*

Pancreatic cancer is the fourth most deadly cause of cancer among adults in the United States. Cigarette smoking is a known risk factor for this disease. Recent data suggests nicotine induces lung cancer cell proliferation and tumor angiogenesis by binding to nicotinic acetylcholine receptors (nAChR). We hypothesized that pancreatic cancer progression is influenced by a similar mechanism. To establish whether nAChRs exist on pancreatic cancer cells, we extracted RNA from five different human pancreatic cancer cell lines. We performed reverse transcriptase PCR using primers to specific nAChR subunits. Resulting samples were run on a 2% agarose gel and positive PCR bands were sequenced to confirm their identity. We identified the presence of alpha-5, alpha-7, beta-1 and beta-2 transcripts in our five pancreatic cancer cell lines. The presence of the alpha-7 subunit suggests that nicotine may in fact affect pancreatic cancer cell activity because it has previously been shown to form a homopentamer of a complete nAChR. These results begin to support the concept that pancreatic cancer growth is influenced by nAChR binding and suggest a potential target for future therapy.

**Selling the Self: The Metaphor of Prostitution in The Glass Menagerie**

*Amy Rothermund*

*Mentor: Anthony Kubiak*

What are the consequences of selling one’s self? When an individual’s will is co-opted by a need for survival, often the only choice is to engage in prostitution of one kind or another, whether of the body, the mind, or the emotional soul. As seen in the desperate actions of the characters in Tennessee Williams’ *The Glass Menagerie*, this surrendering of the self is accompanied by an inability to provide for one’s own psychological needs, and an even stronger neglect for those of other people. This lack of ability to emotionally understand one another, even while providing physically, can be defined as an inability to love caused by the usurping of one’s self-determination. This consequence of prostitution is clearly played out on Menagerie’s stage: as Amanda struggles to connect with her children, Tom forces his way through a menial job, Laura retreats from the world, and Jim, the outsider and the punter, takes his fill from all of them and leaves satisfied, but without having delivered any help to the family. After selling themselves in a desperate attempt to improve their lives, the Wingfields are left to continue in their spiral of desperation, with no apparent means of escaping. This is the plight of the prostitute.

**Projections from Midbrain Ventrolateral Periaqueductal Gray to Medullary Nucleus Raphe Pallidus are Involved in EA-Like Inhibition of Sympathoexcitatory Cardiovascular Reflexes**

*Souvan Roy*

*Mentor: Stephanie Tjen-A-Looi*

It has been shown that electroacupuncture (EA) applied at Neiguan-Jiashi acupoints P5–6 (overlying median nerves) activates a long-loop pathway exciting arcuate nucleus (ARC) neurons, which in turn excite ventrolateral periaqueductal gray (vlPAG) neurons and inhibit cardiovascular sympahtoexcitatory neurons in the rostral ventrolateral medulla (rVLM) to attenuate induced cardiovascular sympathoexcitatory reflexes, producing high blood pressure. Neurons from the vlPAG also project to the medullary nucleus raphe pallidus (NRP), which contains neurons known to inhibit cardiovascular sympathoexcitatory neurons in the rVLM. Therefore, this study investigated if projections from the vlPAG to the NRP were involved in inhibition of induced cardiovascular sympathoexcitatory reflexes in the absence of EA. Cats were anesthetized and ventilated, and heart rate and mean blood pressure were monitored. Gall bladder stimulation every 10 min by bradykinin (BK, 10 ug/ml) induced consistent reflex increases in blood pressure via the splanchnic nerve. 50 nl bilateral microinjection of d,l-homeocysteic acid (DLH, 4 nM) into the vlPAG mimicked the effect of EA, reducing the induced reflex blood pressure responses from 63 ± 4 mmHg to 35 ± 5 mmHg, and was unaltered by microinjection of normal saline vehicular control into the NRP. Blockade of glutamate receptors in the NRP by microinjection of kynurenic acid (KYN, 100 nM) significantly reversed the EA-like inhibition of the reflex response from 35 ± 5 mmHg to 50 ± 8. We concluded that projections from the vlPAG to the NRP were involved in EA-like inhibition of induced cardiovascular sympathoexcitatory reflexes.

**Control of Colon Carcinoma Cells’ Growth and Soft Agar Colony Numbers by Resveratrol and Resveratrol-Derivatives**

*Jose Ruiz*

*Mentors: Randall Holcombe & Kestutis Planutis*

The Wnt pathway is not only implicated in 85% of sporadic colorectal cancer cases, it is also regarded as the initial event in tumor formation. Previous studies have shown that resveratrol inhibits throughput in the colon cancer cell line RKO. Various derivatives of resveratrol modified with methyl and borolane functional groups were tested using MTT and soft agar assays to quantitatively assess cell growth and colony formation ability. *In vitro* results indicate...
United States: Pharmaceutical Expenditures and the Controlling Party
Jiraporn Rungvivatjarus
Mentor: Amihai Glazer
In 2007, the United States spent approximately 12% of its total health expenditure on pharmaceuticals; although this number has fluctuated in the short run, it has increased in the long run. I investigated the political aspect of this matter by studying the relationship between the political party in power and the U.S. pharmaceutical expenditures from 1996–2007 in order to better understand the factors that cause this fluctuation and the increase in pharmaceutical expenditures. My approach was to gather data on total pharmaceutical expenditures, total health expenditures, and GDP per capita; I also gathered information about the political parties that controlled the Presidency, Senate, and the House of Representatives. After all the data was entered into an Excel spreadsheet, I completed statistical analysis of the data to examine the relationship between the mean value of pharmaceutical expenditures and other independent variables. With these results, I discovered that total pharmaceutical expenditure per capita is lower when the president is a Democrat and when the total health expenditure in percentage of GDP is high; on the other hand, total pharmaceutical expenditure is higher when GDP per capita is high and when the total health expenditure per capita is high. Furthermore, total pharmaceutical expenditure in percentage of total health expenditure is lower when Democrats control the House of Representatives, when GDP per capita is high, and when the total health expenditure in percentage of GDP is high; on the other hand, it is higher when Democrats control the Senate and when the total health expenditure per capita is high. In conclusion, there appears to be a relationship between the controlling party and pharmaceutical expenditures in the United States.

Judicial Interpretation of the California Public Records Act
Ali Saadi
Mentor: William Schonfeld
The California Public Records Act (CPRA) was enacted in 1968 to give the public broader access to records created and maintained by public agencies. The CPRA provides a critical right and one of the most important tools Californians have to check the government. However, the act stipulated some broad exceptions on which many agencies rely when denying disclosure. Two of the most important exceptions relate to personal files and the catchall clause (Cal. Gov’t Code § 6254(c) and 6255(a), respectively). The vagueness of these exemptions enables their abuse. Judicial interpretation of these exemptions delineates the boundary of their use. Through common law, California courts have construed a new exemption within the catchall clause, termed the deliberative process privilege, protecting agency deliberation and recommendation from disclosure. The newly grafted exemption is broad in nature, having been used to deny access to the Governor’s calendar and the phone records of city council members. In 2004, Californians approved Proposition 59, an amendment to the California Constitution that recognized access to public documents as a constitutional right. However, proposition 59 did not nullify statutory exemptions in place prior to its enactment. The aim of this study is to review case law and identify common interpretations of these exemptions, particularly in light of proposition 59, which, in principle, should broaden access.

Ethnicity and Democracy in Pakistan
Samier Saeed
Mentor: Bojan Petrovic
Contemporary studies of Pakistan center upon a single issue: terrorism. This is a West-centric approach that ignores some of the more pressing problems facing the Pakistani state. Pakistan is a multi-ethnic state, and its people are increasingly organizing politically along ethnic lines. Ethno-nationalists undermine the very existence of Pakistan by asking whether ethnically distinct regions of British India have necessarily been amalgamated into one state simply on the basis of their populations’ being mostly Muslim. This study examines Pakistan’s ethnic movements and compares Pakistan to other multi-national states, finding that it was not inevitable that ethnic cracks in Pakistan should grow into massive fissures, as detractors of Pakistan argue. Instead, mismanagement on the part of Pakistan’s leaders forced people to look away from the Pakistani state for help. In addition to analyzing the situation in Pakistan (by drawing upon academic works and journalism), the work delves into theories regarding nationalism and the practice of “plurinational democracy.” The study also suggests that Pakistan can learn from multi-national states such as Belgium and the United Kingdom. There is much talk of whether and how democracy might arise in the Muslim world, and the issue is the focus of intense interest in the academic community. Pakistan is among the top candidates for a lasting, and even liberal, Muslim democracy, but ethnic politics, which divide the population into ethnicities with competing interests, hinders the development of the same. The study, in summary, finds that ethnic politics have only arisen due to poor governance, that the Pakistani state is not legally capable of handling ethnicity properly, and that the rise of ethnic politics will impede Pakistan’s progress towards democracy.
Acute coronary syndrome is often the first indicator of underlying atherosclerotic disease. The ability to identify a risk-factor profile depends on the ability to localize unstable atherosclerotic lesions. Plaques vulnerable to rupture typically have a large necrotic core, thin attenuated fibrous cap, and significant infiltration of macrophages. It has been proposed that apoptosis of these macrophages occurs at the site of rupture and may contribute to the process of rupture. Therefore, identification of these structural changes in the vulnerable plaque and detection of apoptosis may help identify lesions prone to rupture. Previous studies have proven that the compound annexin V has a high affinity for the exposed phosphatidylserine group on apoptotic cells. In this study, we use fluorescent labeled annexin V to target apoptotic macrophages and use an intravascular probe for fluorescent detection at the site of the lesion. The fluorescence data will be combined with Optical Coherence Tomography (OCT) to determine structural characteristics of the atherosclerotic lesions and better identify plaques that are prone to rupture. The goal of this study is to evaluate the feasibility of intravascular detection of apoptosis using fluorescent labeled Annexin V combined with OCT imaging. The first phase of this project returned no discernable difference between the detection of fluorescently labeled atherosclerotic tissue and non fluorescently labeled detection. However, improvements to our overall system, including increased sensitivity with the use of a PMT detection system should allow detection from the baseline.

A Family Affair: Exploring Disney, Fantasyland, and the Ideology of the Family
Stephanie Sajor
Mentor: Kristen Hatch

The rides based off the Disney films Snow White and the Seven Dwarfs, Pinocchio, Alice in Wonderland, and Peter Pan are all situated within Disneyland, specifically the land of Fantasyland, an area that is noted for housing the rides for families, mostly directed towards children. These films and their rides will be analyzed to explore how their mise-en-scene, narratives, and physical manipulations influence the ideology of the family. Moreover, an exploration of these rides and their inevitable association to theories of nostalgia, as well as the susceptibility of the visitors to a "disciplined freedom" is required. Nostalgia is used within Disney on multiple levels, including the transference of the experience of the media from parent to child, as well as the adaptation of the stories from the original texts, to the Disney films, to the Fantasyland rides. Meanwhile, “disciplined freedom” is the concept in which Disney encour-
Changes in mtDNA A3243G Heteroplasmy Levels Result in Changes in the Nuclear Gene Expression and Protein Profiles

Natalie Sanace
Mentor: Douglas Wallace

The point mutation A3243G of the tRNA leucine gene in the mitochondrial DNA has been found to occur in patients with MELAS (Mitochondrial Encephalomyopathy, Lactic Acidosis and Stroke-like Episodes) and Maternally Inherited Diabetes and Deafness (MIDD) syndrome. Progression rate has also been found to be affected by heteroplasmy load of this mutation. Heteroplasmy in a single cell is a mixture of mitochondria containing both normal and mutated mtDNA causing a range of the mutation per cell. Our goal is to characterize the effect of 3243 mtDNA mutation on the nuclear gene expression pattern and on the cellular protein profiles in osteosarcoma cybrid (cytoplasmic hybrid) cell lines. We hypothesize that different levels of heteroplasmy will cause a change in regulation of certain genes resulting in the phenotype of either diabetes or MELAS. To test this hypothesis, heteroplasmy loads were chosen in cell lines ranging from 0–100% mutation. ATP, superoxide dismutase levels, histone acetylation and protein expression were then measured on each cell line. We found there is a possible correlation between heteroplasmy levels and these variables; however, further experiments are needed to support this assumption. This data can possibly aid in finding therapeutics for MELAS or MIDD.

The Musical and Interpretive Process of Working with a Live Composer

Jonathan Sandberg
Mentor: Joseph Huszti

Songfest is an Opera and Art Song Summer Intensive known in the classical music industry for granting exposure to young singers and pianists who want to refine their technique and network with professors and musicians from music schools and performing arts companies. Songfest also hosts a composer in residence to allow participants of the program to sing the composer’s works. Tom Cipullo, a composer residing in New York City, brought his song cycle A Visit with Emily to give young singers a chance to work with a living composer, rather than interpreting a dead composer’s works. A Visit with Emily is a collection of Emily Dickinson’s poems sung in a modern art style. My reason to participate in Songfest was to work with Tom Cipullo and experience working with a live composer. During rehearsal periods, Tom Cipullo allowed me to make my own interpretations of the colors of the music and the evocative text, while giving his input about his inspirations. Some advantages of working with a live composer include clearing up confusion in the interpretation of the music, immediate changes to the piece’s structure, motivating and portraying the piece with proper conviction and respect, and providing subtle and insightful wisdom that could not be obtained otherwise. The process of making music is intensified and more meaningful when working with a live composer.

Electrochemical Etching: Preparing a Tungsten Tip for Scanning Tunneling Microscopy

Stephen Sasaki
Mentors: V. Ara Apkarian & Joonhee Lee

A scanning tunneling microscope (STM) is an imaging device using tunneling electrons. An STM requires an atomically sharp metal tip to achieve atomic resolution. The quality of the tip being used in an STM is a determining factor of the final image results. For the most part, producing homemade STM tips by electrochemical etching is both tedious and time consuming. The purpose of this project was to develop a setup in which higher quality metal tips could be produced in a more efficient and reliable manner. To achieve this goal, we designed and fabricated a translational stage actuated by a stepper motor. The stepper motor is controlled by a computer program, which provides users with a great degree of control over the tip etching process. As a result, the etching process was facilitated by the automation, and the performance of the tips produced by the new setup was satisfactory in actual experiments.

Mechanisms by which Human Embryonic Stem Cell-Derived Motor Neuron Progenitors Provide Neurotrophic Support following Cervical Spinal Cord Injury

Anna Sato
Mentor: Hans Keirstead

The ability to regain sensory and motor functions following spinal cord injury (SCI) is limited, due to extensive neuronal death and the inability of the adult central nervous system (CNS) to regenerate severed axons and remyelinate demyelinated axons around the injury site. Although...
studies have shown that cells derived from embryonic stem cells (ESCs) are promising candidates for cellular replacement therapy, the mechanisms by which stem cells exert their effect as neurotrophic support of the ESCs post-transplantation are still uncertain. In our previous studies, we have demonstrated that human motor neuron progenitors (hMNPs) enhance functional recovery following bilateral cervical contusion injury and observed an increase in neuronal survival and descending serotonergic innervations. This led us to hypothesize that these findings were due to neurotrophic support. In this study, I have investigated the mechanisms of the hMNPs that change SCI pathology in which we analyzed the expression and activation of the intracellular signaling pathways that are known to play a role in cell survival and growth. Adult female rats underwent a laminectomy and moderate bilateral contusion injury at cervical level C5. hMNPs were transplanted 7 days post-injury and animals were sacrificed for analysis on days 1, 4, 7, and 12 post-transplant. The hMNP-treated rats demonstrated an increase in functional recovery but a decrease in the cell survival signaling pathways compared to control rats; SCI pathogenicity was also observed. Such findings show that hESC-NMNPs secrete factors that inhibit the signaling pathways leading to effects of apoptosis, immune activation, and inflammation.

Assessing the Attitudes of UCI Undergraduate Students toward Cancer Clinical Trials
Priyanka Saxena
Mentors: Hoda Anton-Culver & Erin Kent
Adolescents and young adults (AYA, ages 15–39 at age of diagnosis) who are faced with cancer diagnoses have shown to have had less effective treatment results and higher mortality rates when compared to younger and older populations. Research has indicated that lack of participation in clinical trials is a key factor limiting the rate of progress in the AYA group and may be, in part, influenced by their perceptions toward trials. The purpose of this study was to understand how a relatively healthy population of young adult undergraduate students perceives the benefits and risks of participating in cancer treatment and prevention trials. A questionnaire based on the Attitudes toward Cancer Trials psychometric scale was used to rate and categorize the participants’ attitudes toward questions regarding participation in trials. Some of the initial conclusions we have extracted from the data indicate that there is some degree of confusion and misunderstanding among college students regarding the procedures, methodologies, and practices of clinical trials. The data findings also verify the prevalence of the optimistic bias theory, which states that adolescents and young adults tend to consider themselves invulnerable to serious illnesses, such as cancer. The results from this study illustrate the need to change AYAs’ perceptions about invincibility and further increase awareness about participation in clinical trials.

The Effects of Experimental Disclosure: Imagining One’s Best Possible Future Self
Kara Scartaccini
Mentor: Joanne Frattaroli
Thinking about one’s future can be very daunting, especially for individuals who are taking a graduate entrance exam that may alter their future drastically. Expressively writing about stressors has overall health benefits both psychologically and physically. This study investigated whether expressively writing about “one’s best possible future self” could improve graduate school entrance exam scores, specifically for the MCAT, LSAT or PCAT. Participants were asked to describe in detail one’s ideal future where the exam had gone as well as possible and their career goals had been realized. Students were randomly assigned to write about either their best future self or to a neutral writing condition about 10 days before their exam. They also completed measures of depressive symptoms, study habits, working memory and test anxiety approximately one month before, 3 days before, and one week after their exam. Due to a small sample size of 20 participants, no significant differences were found between groups for any outcome measures. However, findings for depressive symptoms, study habits, working memory, test anxiety, and test performance were all in the expected direction, and data collection is ongoing. Exploratory analysis showed that women had significantly better studying habits than men after the writing session as well as up to the exam.

Understanding the Relation Between Sleep and Memory In 9- and 10-Month Old Infants
Caroline Schiek-Gamble
Mentor: Angela Lukowski
Sleep has been shown to benefit long-term memory in adult humans, but comparable studies have not been conducted with infants. This study was designed to investigate the influence of napping on recall memory in the first year of life. To this end, nine- and ten-month-old infants participated in two sessions that were separated by a two-hour delay. Some of the infants were scheduled to nap during the two-hour delay whereas others were scheduled to be awake. At the first session, infants were presented with four two-step event sequences; some infants were allowed to imitate the sequences immediately after their presentation, whereas the others were not. Infants wore a small activity monitor around one of their ankles during the delay and their parents completed a log of their activities. Memory was assessed at the second session by presenting infants with two of the same sequences that they saw at the first session; generalization was assessed by presenting in-
The relationship between Turkey and the United States has been characterized as a “strategic partnership” consisting of two nations with common goals and converging security interests. Since the fall of the Soviet Union in 1989 the relationship has been in a constant state of flux, as Turkey attempts to diversify its foreign policy and secure its borders and NATO reconfigures its strategic purpose. This, as well as increasing nationalism, has led many researchers to conclude that Turkey is looking to its neighbors in the Middle East for support and turning away from its Western partners. My research analyzes the evolution of Turkish foreign and security policies from the Cold War to the present day, focusing on patterns and threats to Turkish national security. By looking at the evolution of policies through patterns and threats to national security, one can better predict future policy changes. Methods used to gather this information included a literary analysis of a variety of sources from think tank publications, news articles, and books. The main finding of this paper concludes that Turkey will not turn away from its Western allies in favor of Middle Eastern countries, because of its primary economic and security concerns, and will continue to maintain good relations with the U.S.

**Free Ride: A Case Study of the Free Rider Problem on an American Megachurch**
Eric Schlothan  
*Mentor: Michael McBride*

When it comes to the congregation of any given church, there will always be a large spectrum of individuals with differing ways of participating. While some will not hesitate to volunteer finances, time, skill, or personal insight, others will regularly only commit the bare minimum in support of their church. In the case of larger churches, participation becomes less frequent as these greater populations are alienated and lack a strong sense of accountability. With a minimum of 2,000 congregants per week, the modern day mega-church has begun to adapt institutionally and organizationally to better administer their larger body. The common problem confronted by all mega-churches is not their ability to attract, but better incorporate their congregation beyond weekly services into a more devoted and intimate relationship. The term free rider can be used to identify these participants, as they take part in and consume certain religious goods without also contributing to the production of such desired goods. The purpose of this study is to understand the incidence of free-riding inside a specific modern day mega-church, and the organization used to implement specific controls, incentives, and rewards to hold individuals accountable to the body and church. My interviews with clergy and adherents show an involved and sophisticated organization used to create an intimate environment where dedication and participation not only increased accountability, but furthered additional participation and want for greater affiliation.
Construction of Flow Chamber to Study the Effect of Flow on Direction that Cilia Beat
Meriam Sebaa
Mentor: Clare Yu
How can flow affect the direction in which cilia beat at various stages of *Xenopus* larval skin development? Studies have shown that fluid flow can act as a positive feedback in directing the beating patterns of cilia. This can be further studied using a flow chamber that will be used to study how flow can affect cilia's beating patterns throughout the developmental stages. The flow chamber is constructed from plexi-glass, tubing, a reservoir, a recirculating pump, and a valve to control the velocities through the chamber (along with gravity). This will allow a steady flow to be obtained in order to study the effects of this flow on the developing *Xenopus laevis* tissue ex-plants.

Reducible Peptide Nanogel for siRNA Delivery
Kellie Seetho
Mentor: Zhibin Guan
Gene delivery can be achieved by using recombinant viruses or synthetic vectors. One great advantage that synthetic vectors hold above viral vector is the flexibility in their design, which offers great potential for improved safety and high transfection efficiency. A saccharide-peptide hybrid copolymer (SPHC) scaffold has been designed and reported by our group to be degradable, nontoxic, non-immunogenic, and to exhibit promising transfection efficiency as a synthetic vector for DNA delivery. However, efficient delivery of siRNA has not been achieved using SPHC. In attempt to enhance the transfection efficiency, another SPHC- and peptide-based nanogel has been designed. Nanogel particles are swollen networks of cross-linked polymers that have been reported to have high loading capacity of the guest molecules. The nanogel precursor has been synthesized by step-growth polymerization of tetralysine- and dicysteine-monomers. Currently, conditions for nanogel formation are under investigation. Once nanogel particles are obtained, the nanogel particles will be characterized and complexation with siRNA will be tested.

Social Influences on Females Leading to Gang Affiliation
Samantha Serrano
Mentors: Caesar Sereseres & Al Valdez
This study examines how social relationships such as family, peer groups, and intimate relationships influence females to join gangs. The Latino community has the highest numbers of gang members in the United States. The Latino population has increased in the United States with large numbers of migrants. Female gang membership, although small in proportion to males, has been increasing. Primary data taken from interviews with gang experts will be used to understand the relationships of female gang members in urban and suburban areas. Expert interviewees were identified as persons who work with or are closely involved in gang research, development, and prevention programs. Research shows that peer relationships with other gang members are predicted to be most influential in drawing females to gangs. The findings from this study show that family relationships are the most frequent predictor of gang membership. The analysis compares these findings to those of the previous findings within the literature. The findings also have implications in the development of educational programs geared toward promoting youth avoidance of gangs.

Islamic Economics as an Alternative to Capitalism and a Solution to the Financial Crisis
Osama Shabaik
Mentor: William Maurer
Recently the world was riddled by the worst economic crisis since the Great Depression, leading to the loss of trillions of dollars in wealth and contributing to a widening gap in income inequalities. Capitalism, so often praised for economic growth, was now on the hot seat. The 2008 financial crisis was blamed on a variety of factors, stretching from business greed and sub-prime mortgages to corporate heist. Amid the wide spectrum of possible causes for the crisis, many within the economic field argued and agreed that the problem could be solved within the framework of capitalism by reshaping the network of banking regulations to prevent what caused the current crisis. Very few people turned to the realization that an inherent part of capitalism is its cycles of booms and busts. To understand the current economic crisis, a close look must be taken at the history of capitalism and its current structure. This paper discusses the nature of capitalism, the role of banks and their ability to loan money at interest, and how they have factored into the current economic crisis and world poverty. The paper shows that as long as that issue is not resolved, the current climate of economic cycles will continue to plague society. In looking at alternative forms of economic governance, it will be argued that the teachings found in Islam provide the modern solutions needed to structure a new system capable of preventing future economic crises.

Dissecting Malignant Gliomas for Cellular and Genetic Heterogeneity: An Analysis of the *TP53* Gene Mutation Status
Nirvi Shah
Mentor: Yi-Hong Zhou
Malignant gliomas are the most common primary brain tumors of the central nervous system. They are often resistant to treatment and decrease an individual’s lifespan substantially. *TP53*, a transcription factor essential in multicellular organisms, is responsible in regulating the cell
cycle and functioning as a tumor suppressor. Previous research in Dr. Zhou’s lab has established a primary culture technique to enrich a subpopulation of tumor cells from clinical glioma specimens that express certain neural stem cell markers. The existence of neural stem-like cells (NSLC) in malignant gliomas has recently been reported to be a tumor population resistant to radiation therapy. After thorough analysis, this study evaluated the genetic alterations in the TP53 mutation status of NSLC compared to that of tumor mass cells (TMC) in glioblastoma multiforme (GBM). In order to study the mutation status of TP53, a nested PCR was carried out using two primer sets. The purified PCR products were then sequenced and analyzed for mutations. A single substitution mutation of Arginine to Histidine at codon 273 (R273H) was identified in all established glioma cultures. However, transient cultures from the same tumor specimens showed no mutation (wild-type of TP53). The results suggest that more than one population of cells may be present within a tumor, and it appears that the tumor cells carrying the TP53 mutation have selective advantages in culture. The study is still in progress with various other primary culture samples derived from lower grade gliomas to further analyze and assess whether the TP53 mutations are specifically occurring in certain gliomas and/or their subpopulations. These conclusions will provide us with a better understanding of the mechanism underlying GBM malignant behaviors and resistance to clinical therapy.

Georges de la Tour and the Contemplative Magdalene: Reinterpreting the Baroque
Rachel Shapiro
Mentor: Lyle Massey

Scholars of seventeenth-century painting often emphasize the ways that works by French artist Georges de la Tour (1593–1652) adhere to a cohesive model of art produced in Catholic regions during the Counter-Reformation. La Tour’s oeuvre, replete with apostles, saints, and early martyrs, does seem to mirror the predominant themes of contemporary Catholic art. Nevertheless, some of these works reveal a strong interest in Carmelite mysticism, a movement that was initially viewed with suspicion but was eventually incorporated into the Church of Rome. Carmelite mysticism came to play a critical role in the French School of Spirituality, a religious movement that developed in the seventeenth century. The influence of mysticism is particularly notable in la Tour’s paintings of Saint Mary Magdalene, which are unique in depicting her as a contemplative. In this project, I analyze three of la Tour’s representations of Mary Magdalene in relation to several other contemporary depictions and demonstrate their construction of Carmelite spirituality by reading them against Carmelite texts. This reading has two consequences. First, it shows that the Carmelite order developed a notion of Mary Magdalene’s identity beyond that of a penitent prostitute, an identity that was used to resist papal hegemony. Second, it shows that both Georges de la Tour and his patrons were more likely to have been influenced by Parisian spirituality than by the official Counter-Reformation piety approved by Rome. In conclusion, I argue that this revised interpretation of the Magdalene paintings requires us to reevaluate the influence of locally meaningful religious movements on Counter-Reformation art.

Identification of Parameters for Cellular Response to Laser Induced DNA Damage of Mitotic Chromosomes
Adria Sherman
Mentor: Michael Berns

Laser microirradiation can be used to induce damage in a localized region on mitotic chromosomes, which results in the recognition and repair of DNA that is vital for the integrity of the cell. When a mitotic chromosome undergoes damage, a phase paling occurs followed by an accumulation of a dark material, which has been identified as an aggregation of DNA repair factors. Different laser systems induce different types of damage. However, the specific laser parameters for the various types of DNA damage have not been fully developed. To define some of these parameters, I used the femtosecond NIR 800 nm Ti:sapphire laser and the nanosecond 532 nm green second-harmonic Nd:YAG laser to induce damage in a localized region of the chromosome. After cutting, I stained for gamma-H2Ax, a known double strand break marker, and Nbs1, an initial DNA damage response protein. For the NIR laser, the lowest peak irradiance to see a visible phase paling is 2.2375x10^{11} W/cm^2. The lowest peak irradiance to see a visible phase darkening is 2.3025x10^{11} W/cm^2. However, peak irradiances as low as 1.7707x10^{11} W/cm^2 can be used to see a presence of gamma-H2Ax, indicating that there was still damage caused to the chromosome despite the lack of visual evidence (paling) under phase contrast microscopy. For the green laser, a peak irradiance of 1.2828x10^{9} W/cm^2 did not generate a phase paling nor a phase dark spot and no formation of gamma-H2Ax or Nbs1 recruitment.

The Influence of Prior Knowledge on Recall for Height
Jenny Shi
Mentors: Pernille Hemmer, Michael Lee & Mark Steyvers

Many aspects of our experiences do not have to be explicitly remembered, but can be inferred based on our knowledge of the regularities in our environment. Such knowledge can operate at multiple levels of abstractions. For example, this could lead recall for the height of a particular person to be influenced not only by general knowledge about heights of people, but also by specific
knowledge about the heights of men and women. We assess the relative contribution of this type of prior knowledge on reconstructive memory. In a series of behavioral studies we first assessed people’s a priori expectations of the heights of men and women. We show that people’s a priori expectations are in line with the true distribution of heights in the population. We then tested memory performance in a continuous recall task in which subjects have to reconstruct from memory the height of people shown earlier in a sequence. The stimuli were either naturalistic images of males and females or gender-ambiguous silhouettes. Our results suggest not only that prior knowledge can improve average recall, but also that knowledge can come from multiple levels of abstraction such as gender and the overall height of people.

False Memories and Intrusions Elicited from Categorical and Non-categorical Word Lists
Jenny Shi
Mentor: Mary Louise Kean

Memory is extremely prone to alteration, especially when certain expectations are heightened. For instance, when presented with semantic word lists, participants confidently recalled words that were associated with the lists’ themes but were not included on the actual studied lists. This study aims to examine word list conditions that are more prone to eliciting these false memories or intrusion errors. In a list learning recall paradigm, we present categorical lists (e.g., list of words with semantic themes or phonological relations), and non-categorical lists. Our results demonstrate that the creation of false memories can not only be influenced by conceptual associations, but phonological associations as well. The key point, however, is that non-categorical lists elicit a higher amount of false memories and intrusions compared to categorical lists. In addition, participants are more accurate in their general recall of words from the themed lists than lists of unrelated words. This suggests that our schemas and expectations can be beneficial towards our memory, as it facilitates recall on average through categorical associations.

Gender Roles in Perception of Female Criminals Based on Crimes Committed
Reveka Shteynberg
Mentors: Mona Lynch & Donna Schuele

Women and men have been historically stereotyped as more likely to commit certain crimes based on gender. Recently, the gender gap between criminals has narrowed, and women are catching up to men in numbers of crimes committed. To add to jury selection research, this study examines how the perceptions of potential jurors of both genders will affect the outcome of a case when a woman is on trial. Approximately 180 subjects—90 male and 90 female undergraduate students—were surveyed. Participants were assigned to one of three types of criminal scenarios: White-Collar Crime, Prostitution and Child Abuse. Male and female students, as potential jurors, were asked to complete a questionnaire immediately after reading one of three crime scenarios about a female offender. Participants provided answers based on their perceptions of the specific crime committed by the female offender, the female offender’s degree of culpability, and what punishments they would recommend for the particular crime. Preliminary analysis of the data suggests that there are differences in how men and women perceive female offenders based on the crime committed.

Inhibition of Regenerative Responses in the Salamander Limb by Extracellular Matrix
Cynthia Shu
Mentor: David Gardiner

The purpose of this study was to characterize the role of position-specific extracellular matrix (ECM) in regenerative responses of the salamander limb. The ability of salamanders to regenerate limbs is a riveting process that is under intense study, with the general goal of inducing regeneration in humans. Previous studies have characterized the process, but the complete mechanism has yet to be unraveled. The same genes expressed during limb development have been identified in regenerating limbs, indicating the re-expression of developmental genes during regeneration. It has been speculated that the adult human’s inability to regenerate is due to inhibition of developmental genes, which are present but inactive. Studies on chick embryos have found that the ECM is an influential factor in limb development. The ECM contains growth factor-binding molecules such as heparan sulfates (HS), which possess the ability to bind signaling molecules to either inhibit or activate a cellular response. In this study, the influence of amputation plane derived-ECM was investigated using a surgically inducible model of regeneration. Results indicate that anterior/non-contralateral grafts into anterior host sites inhibit a regenerative response, and posterior grafts lead to a normal induced regenerative response. We propose that the HS in posterior ECM grafts are occupied by growth factors and, thus, cannot bind activating signals released by the nerve, leading to a host growth response. In contrast, the HS of anterior ECM are unbound by growth factors and can therefore bind the activating signals, inhibiting a regenerative response.

Expression and Biochemical Characterization of the Extracellular Domain E1 of the Mycobacterium tuberculosis Protein MmpL3
Guneet Singh
Mentor: Celia Goulding

Mycobacterium tuberculosis (Mtib) is the causative agent of tuberculosis, a disease that infects one third of the world’s
High Rate of Metabolism Sensitizes Cells to FTY720
Gurpreet Singh
Mentor: Aimee Edinger

One of the key distinguishing features of a cancerous cell is its limitless growth potential, achieved through growth factor independence. Cancer cells continually express nutrient transporters on their surface independently of growth factors. As a result, cancer cells continue to grow and proliferate uncontrollably. These mutations also cause cancer cells to have an irreversibly high metabolism, thereby resulting in a higher extracellular nutrient dependence. The hypothesis that cells dependent upon a high rate of metabolism are more sensitive to FTY-720 treatment was tested. It was shown that cells with higher extracellular nutrient dependence died faster than cells with a lower extracellular nutrient dependence when treated with FTY-720. Inhibition of glycolysis with 2-deoxy-D-glucose and inhibition of protein synthesis with rapamycin desensitized cells to FTY-720 treatment. Under similar conditions significant protection was also observed in another FTY-720 analog, AAL-149. These results support the general idea that drugs that down-regulate nutrient transporter proteins could make effective cancer therapeutics.

Heavy Majorana Neutrino Search and ATLAS Data
Quality Monitoring Display
Kevin Slagle
Mentor: Anyes Taffard

The recent discovery of neutrino masses introduces a new problem: determining the mechanism through which neutrinos attain their mass. The see-saw mechanism provides an attractive theoretical answer that justifies why neutrinos have small masses (~1eV). The theory predicts lepton number violation and at least one heavy (up to GUT scale) right-handed Majorana neutrino (N). With the data collected by the ATLAS experiment at the Large Hadron Collider (LHC), we can search directly for evidence for heavy Majorana neutrinos. We focus on decays to a same-sign electron/muon pair with two jets. A resonance peak around the mass of the heavy Majorana neutrino can be reconstructed by combining appropriately the lepton and jets in the event. This channel offers a striking signature for early discovery, as it has the advantage of having low SM contributions, which primarily come from detector mis-measurements, and therefore do not peak at any particular masses. We aim to perform the search using the first 10pb-1 of data collected by the ATLAS experiment and complete the analysis by the end of the summer. This is very exciting because the LHC provides collisions at the highest energy ever achieve by a collider and thus opens new windows to search for unobserved physics phenomena. The results of this analysis will help to shed light on how neutrinos attain their mass, which is essential to gaining understanding of the early universe and origin of dark matter.

Intra-Tester and Inter-Tester Reliability of Inclinometry to Measure Plantar Flexion in Female Ballet Dancers
Shannan Slagle
Mentor: Jeffrey Russell

Female ballet dancers require extreme plantar flexion to stand en pointe. Inclinometry has been reported as a procedure for measuring this motion, but its reliability has not yet been demonstrated. The purpose of this study was to assess the intra-tester and inter-tester reliability of inclinometry when measuring plantar flexion in female ballet dancers. Unlike prior research, this project applied the technique to x-rays to allow for precise location of measurement landmarks on the leg and foot. Lateral ankle x-rays were taken of eight female ballet dancer volunteers (mean age=23.0±3.3 yrs, ballet experience=18.6±3.1 yrs) while they stood en pointe. An inclinometer was applied to the x-rays at the anterior border of the tibia and the dorsal foot along the surfaces of the bones and then along the skin overlying the bones by two researchers who performed three trials each using both the bone and skin landmarks. These data were analyzed by ANOVA for re-
peated measures. Intraclass correlation coefficients for the two methods performed by the two researchers ranged from .973 to .998. The researchers’ mean measurements were significantly different (p=0.001) when the skin landmarks were used, but not when measuring with the more exact bone landmarks. This study suggests that inclinometry is a reliable method of measuring ankle plantar flexion in dancers. Between two examiners, reliability may decrease, especially when the landmarks used are prone to variability (such as skin overlying bone). Inclinometry is a promising method for measuring ankle motion in female ballet dancers.

Examiner Memory Rehearsal as the Process of Change in the Intensity of Remembered Emotions
Marcus Solomon
Mentor: Susan Charles

Rehearsal is the process of recalling and reviewing memories, which may, over time, lead to an increase in the emotional intensity of the recalled content. Sixty-five participants were assigned to either a positive or negative emotions, which may, over time, lead to an increase in the emotional intensity of the recalled content. Sixty-five participants were assigned to either a positive or negative emotional experience. They were assessed for their experience initially and their recalled experience a week later. Neurotic participants who spent more time thinking and talking about their experience tended to recall fewer negatives and more positives. Happy—or optimistic—people tended to think less about experiences, and rumination—a behavior that neurotic people are more likely to engage in—is linked to being unhappy. In this study, however, this time spent thinking and talking may have been spent on coping and reappraisal.

C-myc-IgH Translocation in Lupus-Prone Mice
Tandis Soltani
Mentor: Paolo Casali

There is overwhelming evidence suggesting an increased risk of lymphomas in systemic lupus erythematosus (SLE). The mechanism of this process has not been identified yet. It has been shown that oncogene translocations are critical for lymphomagenesis. In B cells, translocation of oncogenes, such as c-myc, are dependent on activation-induced deaminase (AID). Our lab has shown that HOXC4 is critical for AID expression. In SLE patients and lupus-prone MRL/lpr mice, both HOXC4 and AID are significantly upregulated. We hypothesized that in Lupus, the disregulated HOXC4 expression results in disregulation of AID expression that may cause oncogene translocations such as c-myc-IgH. To test these hypotheses, we have analyzed c-myc-IgH translocations in wildtype or HOXC4(-/-), AID(-/-), Ung(-/-) MRL/lpr mice using specific PCR approach. The double stranded DNA breaks which are important for gene translocation c-myc-IgH DNA regions have also been analyzed.

Posttraumatic Relational Syndrome: A New Traumatic Disorder
Tandis Soltani
Mentor: Andrei Novac

Posttraumatic Relational Syndrome (PTRS) has been proposed as a variant of Posttraumatic Stress Disorder (PTSD). We propose that individuals with PTRS have a history of childhood abuse or neglect, develop a pattern of impaired relationships in adult life, and are able to function adequately in other areas of their daily life. We hypothesize that PTRS is independently occurring of PTSD and Borderline Personality Disorder (BPD). The Posttraumatic Relational Inventory (PTRI) was designed as a diagnosis tool for PTRS. It has three parts: Part I determines the level of childhood trauma; Part II explores the patient's functionality in their work, school, and community; and Part III inquires about difficulties in romantic relationships. A patient with PTRS would score high on all parts, indicating a traumatic childhood, good functionality in the community (distinguishing them from patients with BPD), and poor functionality in intimate relationships. The PTRI is designed to give a minimum score of 10 and a maximum score of 50 in each part. In our preliminary analysis of the 14 female patients surveyed, we arbitrarily set a score of 25 or higher on each part to be an indication of PTRS. Two patients met the PTRS criteria. We conclude that the proposed PTRS is present, may be independent of PTSD diagnosis despite shared symptoms and traumatic origins, and is measurable by the PTRI. We hope to determine the precise boundaries of PTRS in the future and design more specific treatment protocols for patients with PTRS.

A Study on Ion Exchange Chromatography of Proteins
Christina Song
Mentor: Faizy Ahmed

Monoclonal antibodies and other bio-therapeutics are increasingly used in the treatment of diseases such as cancer. FDA regulations require the complete characterization of these molecules—including aggregate analysis, charge variations, and sequence analysis—to approve new drugs. Because of the highly efficient and reproducible nature of High Performance Liquid Chromatography (HPLC), it is commonly used to develop methods for the analysis of bio-molecules. In conducting this study, the technique of Ion Exchange Chromatography (IEC) was implemented for the separation of charge variants in protein samples. Proteins, such as Cytochrome c, Ribonuclease, Lysozyme and Aprotinin, were separated on a weak, polymer-based cation exchange column. The elution profiles of these proteins and their contaminants, both acidic and basic, were studied using either a sodium chloride or sodium phosphate gradient. The effects of changing the flow rates and gradient times on protein separation were studied in these...
experiments. The separation of Ribonuclease (pI 9.6) was of particular interest since it eluted after Lysozyme (pI 11.4) in NaCl. However, in the NaPO₄ gradient, it eluted before Aprotinin (pI 10.8), according to its pI. Continued studies on the separation of proteins for protein characterization, using ion exchange chromatography, can be very useful to the growing biopharmaceutical industry.

Effect of Microstructure on the Corrosion Resistance of Commercially Pure Titanium
Varit Soon
Mentor: Farghali Mohamed
Titanium (Ti) and its alloys are important materials for medical and dental implant applications. For load-bearing implant applications, there is great interest in increasing the strength of commercially pure (CP) Ti to replace Ti alloys, which are stronger, but may have toxic effects on the body because of their alloying elements. The strength of a material, such as CP Ti, can be increased by refining the grain structure within the material (the Hall-Petch relationship). However, to ensure the success of fine-grained CP Ti, it is essential to determine the corrosion resistance of the material—that is, the ability to withstand chemical decomposition in reactive environments. In this experiment, samples of CP Ti produced using two different techniques—equal channel angular pressing (ECAP), and cryomilling followed by consolidation—were subjected to corrosion testing alongside coarse-grained CP Ti. The corrosion test that was performed involved immersing the different samples of CP Ti in a temperature-controlled salt solution. Images of the immersed samples were taken at specific intervals using optical microscopy. The sample that corroded first was determined to have the least corrosion resistance. To relate the corrosion resistance of the samples to their grain structures, the samples were prepared and analyzed using X-ray diffraction (XRD) for texture measurements, and scanning electron microscopy (SEM) and transmission electron microscopy (TEM) for microstructural analysis. Based on new experimental evidence reported for corrosion resistance of fine-grained materials, it is expected that fine-grained CP Ti should have better corrosion resistance than coarse-grained CP Ti.

Pen and Sword: The Role of the Print Media in Conflict Stricken Mexico
Wendy Sosa
Mentor: Caesar Sereseres
The research examines the impact of Mexico’s drug war on the print media, especially on newspapers with large national circulation and those based outside the northern border region. The Committee to Protect Journalists names Mexico as one of the most dangerous places to practice journalism. By examining this current critical security threat, I explain the strategies the print media has taken in covering the current conflict and the constraints of such coverage, leading to an analysis of the role of the print media. The time period studied in this research initiates with the current administration of Mexican President Felipe Calderon, which includes expansion of drug-related violence along the northern border, the increase of federal troops to combat the violence, and an absence of rule of law in the region. I use a qualitative research strategy. Data has been collected from online editions of newspapers, archives, interviews, and published reports. This research expects to find that investigative journalism has become a casualty of war. The situation for journalists covering the drug war has reached a level where reporters have taken protective measures of self-censorship, and more journalists choose not to report on the subject. Impunity on violence against journalists leaves Mexico with fewer tools to combat its current situation.

The Colored Cultures of Musical Theatre
Brandon Spooner
Mentor: Dennis Castellano
Musical Theatre is a unique form of the performing arts that combines singing, acting, and dance to create a theatrical genre that is translatable to a wide audience of artists. This art form creates an environment that invites artists to share their collective talents and artistic values for the common cause of theatre. Through musical theatre, we have the opportunity to examine and eliminate the societal barriers of color, religion, sexual orientation, and economic status and begin to communicate using the language of emotion. Through musical theatre, we have seen how the European standards of theatre have been translated for the African American culture and then re-invented in today’s multicultural based society. We also witnessed how the cultural specific message presented by the African American culture has become universal to all races and creeds. By stripping away the color of the message, we are left with a transparency that can effectively take on the characteristics of other surfaces but still obtain its initial message to its audience.

Capillary Valving and Pumping
Dhivya Sridhar
Mentor: Marc Madou
The value of CD microfluidics as a field lies in its ability to create tests that are faster and more effective than the ones that exist currently. This can be done mainly through optimizing the ideal sizes of the most commonly used microfluidic features. For my project, I am attempting to optimize the valving design that transports liquids from one part of the CD to another. To do this, I experiment with three different types of channels. The first set of experiments deals with changing channel widths. The length of each channel is set at some arbitrary value and the width...
of each channel is varied from 300 µm to 3mm to see which is the most effective at capillary valving. The second phase of the project deals with varying channel length to determine the specific release of the fluid depending on width. The methodology is similar, except the chosen width is based on the results of the first part. The third phase deals with different outlet shapes to the waste reservoir; it explores the different geometries necessary to create meniscus inversion to siphon fluid from the channel to an outer chamber. The applications of this research are widespread—regardless of what kind of function the project serves, maximizing the efficiency of these CDs can make the whole field much more economical and useful.

Plasmacytoid Dendritic Cells and Age-Related Immunosenescence
Aishwarya Sridharan  
*Mentor: Anshu Agrawal*

Plasmacytoid dendritic cells (pDCs) are innate immune cells that control pathogen invasions and mobilize the adaptive immune system. pDCs affect the immune response by releasing interferons (IFNs), and by priming T lymphocytes. Therefore, age-associated alterations in pDCs may compromise the ability of elderly humans to mount effective immune responses. Although previous studies have shown pDC functions decline with age, the mechanisms behind this immunosenescence are not well understood. To address this question, this study investigates how pDCs from young and elderly subjects respond to bacterial and viral ligands, and their effects on the CD4 and CD8 T cell response. The data show that pDCs from aged subjects have impaired secretion of type I and type III IFNs in response to stimulation, when compared to their young counterparts. Additionally, aged pDCs displayed decreased ability to activate the proliferation and effector functions of CD4 and CD8 T cells. The aim of this study is to delineate the various mechanisms within the pDC signaling pathway that are impaired with age. Decreased pDC function may therefore be an important mechanism contributing to the increased susceptibility to infections in the elderly.

The Effects of Sedentary Activity on Enjoyment of Physical Activity
Patrick Stanley  
*Mentor: Margaret Schneider*

Sedentary activities take up time that young adolescents could be using to engage in physical activity. Adolescents who spend more time engaging in sedentary media-based recreational activities also may develop a preference for these forms of entertainment that has a detrimental impact on their perceived enjoyment of physical activity. This study explores the relationship between the adolescents’ enjoyment of physical activity and time spent in media-based sedentary activities. Data were analyzed from the UCI Mood & Exercise study. Two indicators of sedentary activity were used as well as two scales of enjoyment of physical activity. It was found that sedentary activities, in particular Internet browsing and video game playing, are negatively associated with adolescents’ enjoyment of physical activity. Adolescents who spent more time watching videos and/or browsing the Internet reported lower enjoyment of physical activity. The results suggest that the impact of sedentary media-based entertainment on adolescents’ physical activity behavior may go beyond the immediate time cost associated with the sedentary activities.

Reading to Infants: The Impact of Maternal Verbalizations on Infant Language Outcomes
Katherine Stewart  
*Mentor: Stephanie Reich*

Research has documented the myriad benefits of reading to young children. However, the bulk of these studies have focused on preschoolers’ reading experiences with research on infancy remaining less frequent and typically retrospective. In this most crucial period of language development, only a handful of studies have examined the verbal exposure infants receive during story time and its possible impacts on linguistic abilities at the onset of first words. To address this paucity of reading research, this study explored the reading activity of 162 low-income, ethnically diverse mothers and their infants. Data were collected during pregnancy and when infants were 2, 4, 6, 9, 12, and 18 months old. This study explored when mothers began to read and how frequently they read to their children, if and how mothers vocalize during reading episodes, and how maternal vocalizations during reading influenced children’s language development at 18 months. Specifically, the use of eight types of vocalizations, demonstrated in previous studies to promote talking and listening, were coded from videos of mother-infant reading and used to predict the development of expressive and receptive language with an observational language assessment. Findings suggest that mothers vocalize during reading episodes, and how mothers vocalize during reading episodes, and how mothers vocalize during reading episodes, and how mothers vocalize during reading episodes, and how mothers vocalize during reading episodes.

Construction of an Active MicroRheometer
Scott Strayer  
*Mentor: Elliot Botvinick*

The construction of the Active Micro-Rheometer began in response to the need of Dr. Botvinick’s BEAMS lab. The BEAMS lab currently conducts active micro rheology to measure cell based mechanotransduction (the forces a cell
laser dosimetry parameters (fluences of 8J/cm², 12J/cm², 16J/cm² for Er:YAG), laser powers of 100mW to 1.2W for the femtosecond) and examined with a high power dissecting microscope. Further imaging and analysis with conventional histology (hematoxylin and eosin staining) was done to provide detailed information on crater depth and peripheral thermal damage. Preliminary results show some carbonization but demonstrate little thermal damage to surrounding tissues. The ablation rates were calculated to be 48–137 mm³/sec for the Er:YAG and 0.000565 mm³/sec for the femtosecond laser. The femtosecond laser offers a more precise ablation than the Er:YAG laser, but both are demonstrated to be possible alternatives to the surgical-skill dependent microfracture procedure.

Where are they Now?: Life Course Changes of Young Adults in Rural and Small Town Areas

Victoria Suarez
Mentor: Elliott Currie
Since contemporary criminological theory is derived from urban models, theory-based research is needed to explain current trends of criminal behavior in rural and small town areas. Substance use in rural areas occurs in equivalent amounts to use in urban areas. Further understanding of the reasoning for substance use in rural areas is necessary because the amount of existing research is very small and there is almost no qualitative research. This study aims to understand which contextual and individual forces influence substance use among rural and small town young adults. This phenomenon was viewed through the life course theory in order to identify turning points that may be caused by life experiences specific to a rural and small town setting. Participants were recruited through an online social network of a high school located in a Mid-Atlantic, rural region of the United States. Interviews exploring topics of substance exposure over the life course were conducted in person and over the phone. Preliminary findings suggest that substance users in this rural area have difficulty transitioning out of substance use due to negative economic situations, lack of constructive social alternatives, and the ease of access to illicit substances. Understanding the factors that influence substance use among young adults in rural areas can lead to the creation of more effective prevention programs that target the special needs of this population.

Determining the Efficacy for Combined Pulsed Laser and Topical Delivery of Rapamycin to Inhibit the Regeneration of Coagulated Blood Vessels

Victor Sun
Mentor: Wangcun Jia
Port-wine stains (PWS) are vascular birthmarks caused by dilated post-capillary venules near the surface of the skin. If a PWS is allowed to continue growing, it may cause deformity or bleeding, or inhibit sight or speech if it is near the eyes or mouth. The pulsed dye laser (PDL) is the current treatment of choice for removing PWS, since the selective photothermolysis of hemoglobin coagulates PWS vessels. However, laser irradiated vessels usually regenerate within a few months and return with larger diameters, making multiple treatments necessary. Our research attempted to improve the outcome of PWS treatment by combining laser irradiation with a topical antiangiogenic
drug called Rapamycin (RPM) to biologically inhibit blood vessel regeneration. We installed window chambers on Golden Syrian hamster dorsal skinfolds as a model for blood vessels. We laser irradiated and tested three different topical RPM concentrations. We found that, relative to the laser irradiation group, the combined laser and antiangiogenic drug groups had decreased vessel reperfusion, with the 1% RPM concentration showing the lowest vessel reperfusion. This study shows the potential treatment of using laser irradiation and an antiangiogenic drug for removing PWS.

**Philippine Celebrity-Politics**
*Angela Cecil Taglinao*
*Mentor: Christine Balance*

Since the fall of the Marcos regime in 1986, there has been an increase in the number of celebrity icons entering the political realm of the Philippines. There has been a change in the Filipinos' political culture, with more Filipinos transitioning their political trust to celebrity icons. Limited scholarly studies address the celebrity-politics issue, while the phenomenon has become profuse and normalized among Philippine government and society. Philippine celebrity-politics goes beyond the assumptions of money, power, and prestige. Through an extensive analysis of Filipino scholarly literature, direct observation of Filipino cultural norms, and examination of popular media, it can be argued that celebrities invest a career in politics due to a combination of the existing social-class structure, a troubled elections history, the impact of the entertainment industry upon Philippine culture, the Philippines' kinship/networking customs, and a unique connection between voters and celebrity-politicians. The purpose of the study is to generate a deeper understanding of why Filipino celebrities are hyper-integrated at national and local levels of the political-power system. Moreover, the study provides insight on why Philippine celebrities may run for office and get elected, the qualifications of Philippine politicians, and comparisons between U.S. and Philippine political-celebrity cultures.

**Imagining Gender and Ethnicity in the Algerian Space**
*Maysam Taher*
*Mentor: Dina Al-Kassim*

In The Wretched of the Earth, arguably the most influential work to have come out of the Third World on the issue of decolonization, Frantz Fanon issues a warning against the pitfalls of nationalism once independence is obtained, calling instead for a socio-political consciousness that can truly represent the diversity within the postcolonial state. The newly independent Algeria seems to correspond to what Fanon cautions his readers about, as the rise of the state appears to be inscribed in a discourse of difference, omitting women and Kabyles from the nation-building project. It is estimated that 10,941 women participated in the Algerian War of Independence (1954–1962), working as informants, cooks and nurses, at times carrying and using weapons, and being assigned tasks to perform in the maquis. The majority of these maquis were located in the sheltered mountainous terrains of Kabylie, and the region was amongst the most affected by the war. Despite being part of the struggle for independence and enduring the wounds of war for the sake of liberation, neither women nor Kabyles were rewarded for their efforts by being recognized as legitimate citizens, and saw instead a series of measures adopted to further alienate them. Drawing on Marnia Lazreg's The Eloquence of Silence, a study of Algerian women's status through nearly two centuries of being envisioned and redefined by both colonizer and colonized, this project explores the emergence of the imagined boundaries and narratives of exclusion relating to gender and ethnicity that unfold and become embedded in the discourse of the newly independent nation. Through a comparative analysis of works by Mohamed Dib, Assia Djebar and Taos Amerouche, all Algerian authors writing in French, I seek to present a literary cartography of the feminine space created through the subversion of the tools of oppression by those who were not offered a place within the vision of a free Algeria.

**The Role of Cultural and Normative Social Processes on Heavy Drinking and Alcohol-Related Problems among Asian Americans Undergraduates**
*Stephanie Takamatsu*
*Mentors: Jeannet Castellanos & Derek Iwamoto*

Binge drinking (5/4 drinks in a two hours setting for men/women) is highly prevalent among college campuses across the nation and is a significant public health problem. Despite these problems, little is known about the etiological factors and mechanisms of binge drinking and alcohol-related problems among Asian American college students. This study advances the literature by examining how socio-cultural (i.e., masculine and feminine norms, ethnic identity and discrimination), and normative social-cognitive processes (i.e., alcohol expectancies and descriptive norms or estimates of peer use) impact problematic drinking among Asian American students. This study includes 1,053 Asian Americans college students (73% females). Multiple regression analysis revealed that the masculine norms playboy and winning were associated with binge drinking for men, after controlling for the effects of fraternity status, descriptive norms and alcohol expectancies. For women, the feminine norms sexual fidelity, investment in appearance, and thinness were related to binge drinking, after parceling out the effects of sorority status and the normative social cognitive processes. The findings illustrate the impact feminine and masculine norms have on binge drinking and
its associated problems among Asian Americans. Findings suggest that alcohol prevention programs may be more effective if gender-specific norms are assessed and integrated.

Syllabic Structure of Rhyme and Overlap Words Affecting PSE
Alison Tan
Mentor: Mary Louise Kean

The classic model of working memory considers the phonological loop to be a temporary store for verbal information. Previous research into Baddeley’s working memory model found differing results in immediate serial recall (ISR) studies for phonologically similar word items. Recent findings identify those different effects of phonological similarity obtained in other studies is related to how the researchers operationalized phonological similarity. We used three sets of 15 entirely monosyllable word lists in lengths of 5, 6, and 7. Results were gathered from 40 monolingual native English speaker participants. The goal of this study is to observe whether the level of interference is the same for overlap and rhyme categories in ISR and free recall (FR). We predict that overlap and rhyme will behave differently due to structural differences where rhyme (i.e.: cat sat fat rat) consists of a coherent constituent and overlap (i.e.: map man map match) does not.

Access Mechanisms in Long-Term Musical Memory
Alison Tan
Mentor: Kourosh Saberi

Absolute or perfect pitch is a rare form of long-term auditory memory that manifests as the ability to identify isolated musical notes as effortlessly as most humans can identify the color of an object. This study explores the two-system memory retrieval model in musical pitch—a semantic associative form of memory used by absolute-pitch (AP) musicians—and a more prevalent form of procedural memory which allows access to a more precise internal pitch template using the vocal-motor system. In Experiment I, AP and control musicians adjusted the frequency of a pure tone to match a visually displayed randomly selected musical note. In Experiment II, the same subjects vocally produced within 2 seconds the pitch associated with a randomly selected musical note label. In Experiment III, subjects repeated Experiment I while vocally producing the musical note displayed. We collected data on 42 highly trained musicians. Our preliminary analysis suggests that non-AP musicians can accurately access pitch information from long term memory using the vocal-motor system but not perceptual auditory mechanisms. Implications of these findings for models of auditory cognition and memory will be discussed.

Light Induced Electric Fields
Ahramahzd Tatavoosian
Mentor: Michael Berns

It is very well known that electric fields can induce poration in cell membranes; however, the techniques to do so can only be applied to large quantities of cells at once. Although other technologies are available to do single cell poration, the machines that do so are expensive, and do not allow imaging during the process. Fortunately, with the method of using photovoltaic coatings on conductive glass plates, fluorescence and confocal imaging of cells is possible while simultaneously allowing for the localization and patterning of electric fields. Not only can the method be used to observe changes within a cell during electro-injection, it can also be used to observe other cells that have not been porated/injected in the same viewing window. This technology could be useful in any biochemical laboratory that would like to test different antibodies and fluorescence tags that cannot initially enter the cell due to limitations in size or polarization. In accordance with the Michael Berns laboratory at the Beckman Laser institute, a micro assay consisting of thinly coated indium tin oxide and amorphous silica was designed to optimize the procedure of single cell poration and excitation using a laser source. Results found promising effects of cell poration within HEK and HeLa cells. Although further testing is needed, a new focus of the project was to design a portable and inexpensive setup in place of the confocal microscope, which was done digitally and is still in progress of being finished.

Longitudinal Study of Exhaled Nitric Oxide in Asthmatic Patients
Ahramahzd Tatavoosian
Mentor: Steven George

Asthma is a chronic disease of the lung characterized by repetitive inflammation within the airways. Due to its conflict with lung function, asthma finds itself under the broad category of Chronic Obstructive Pulmonary Disease (COPD), which has recently been confirmed as the fifth leading cause of death worldwide. Asthma contributes to these statistics by affecting more than twenty million people in the United States alone, with an increasing prevalence over the last three decades. Although methods to diagnose asthma exist, recent evidence suggests that these methods coupled with the use of partitioned nitric oxide can help diagnose the newly hypothesized categories of asthma. In accordance with Dr. Steven George’s Laboratory and previous pulmonary experiments, data were collected and analyzed on a group of medically underserved asthmatic children. Collected data included patient history, medications, symptoms, spirometry, exhaled NO measurements at multiple exhalation flows (50 ml/s, 75 ml/s, 100 ml/s, 125 ml/s, 150 ml/s, 175 ml/s, 200 ml/s). Upon
Political Awareness in Country of Origin
Amrit Tath
Mentor: Louis Desipio

Two opposing theories about assimilation patterns in the United States describe two different dynamics after immigration occurs. The first theory describes a sociopolitical landscape in which immigrants, particularly Latino or Hispanic immigrants, threaten to erode traits considered to be traditionally characteristic of the American citizenry. A second holds that there will generally be greater levels of assimilation with each successive generation. Patterns of shifts in cultural identity are often used to try to understand the needs and wants of the minority electorate. Much of the literature on cultural identity concentrates on domestic political behavior and inclinations of minority groups. Literature on political behavior and inclinations of these groups in relation to their country of origin heavily discusses remittances or money that is sent abroad to those countries. This study attempts to trace the Latino/a population’s propensity to be politically aware in their country of origin. The study also tries to find common patterns in non-electoral political behavior and participation, generational statuses, and socioeconomic statuses that may characterize such a group. Data collected in the Immigration and Intergenerational Mobility in Metropolitan Los Angeles (IIMMLA) is used to compare these characteristics. These figures will be used to further examination of assimilation patterns of the Latino population.

Shrink Film Patterning by Craft Cutter: Complete Plastic Chips with High Resolution/High-Aspect Ratio Channel
Douglas Taylor
Mentor: Michelle Khine

This research presents a rapid, ultra-low-cost approach to fabricating microfluidic devices for point-of-care (POC) diagnostics using a polyolefin (PO) shrink film and a digital craft cutter. The shrinking process (with a 95% reduction in area) results in relatively uniform and consistent microfluidic channels with smooth surfaces, vertical sidewalls, and high aspect ratio channels with lateral resolutions well beyond the tool used to cut them. The thermal bonding of the layers results in strongly bonded devices. Complex microfluidic designs are easily designed, and protein assays are readily integrated into the device. Full device characterization including channel consistency as well as optical and mechanical properties are included to show the feasibility of fabricating economical and robust microfluidic devices for POC applications using shrink film.

Women-Loving-Women: Quaring Black Urban Space during the Harlem Renaissance
Samantha Tenorio
Mentor: Jeanne Scheper

The experience of black “women-loving-women” during the Harlem Renaissance is directly influenced by what Kimberlé Crenshaw terms intersectional identity, or their positioning in the social hierarchies of race, gender, class, and sexual orientation that are simultaneously intertwined. Considering contemporary terms like lesbian and bisexual, it is difficult to define the sexual identity of many famous black women of the time period, such as Gertrude “Ma” Rainey, Bessie Smith, and Bessie Jackson to name a few. However, their work both on and off the stage contributes to the construction of identities during the Harlem Renaissance that transgress both racial and sexual norms. These social identities emerged from a long history of slavery and sexual oppression, and produced a seemingly free space for the expression of lesbian sensibilities in the black community during the Harlem Renaissance. At a time of racial segregation in America, but also of ideologies of uplift within the black community, social spaces existed in Harlem where sexual “deviance” and race-mixing could be articulated and seen explicitly. Using song lyrics, literature, and scholarly work on social and cultural spaces of the time period between 1919 and 1939, this paper analyzes how certain forms and sites of cultural production, specifically the blues, the cabaret, and literature helped to construct these transgressive identities.

Lessons the Israeli-Palestinian Leadership Can Take from the Indo-Pak Conflict
Daaman Thandi
Mentors: Daniel Brunstetter & Paula Garb

India and Israel received their independence from Britain a year apart, and both nations were mapped by a British Mandate that resulted in six decades of tension, war and conflict. While India accepted the bi-nation existence in 1947 giving birth to the nation of Pakistan, Arab Palestinians rejected the United Nation partition plan of 1948. Today, the general consensus to resolve the ongoing conflict in Israel is a two state solution, which would partition Israel into two sovereign states. This essay analyzes the three major roadblocks to the peaceful co-existence of India and Pakistan since the partition: the rushed and unplanned partition of India in 1947, the creation of a bifurcated state of Pakistan, and the unresolved issue of Kashmir. The article also applies the lessons learned from the India-Pakistan conflict to the Israeli-Palestinian challenges of settlements,
Differential Growth in the Peripheral Blood Cells from Dementia Patients
Jean Thomas
Mentor: Douglas Wallace
Alzheimer’s disease (AD) is a condition that results from the progressive degeneration of neurons. Patients affected with this disease initially demonstrate mild cognitive impairment, which gradually progresses into dementia. Interestingly, almost all individuals with Down syndrome (DS) develop AD-like symptoms during their fourth and fifth decades. The effects of dementia are not just limited to the brain, as mitochondrial dysfunction is also observed in the peripheral tissues of AD patients. To test if mitochondrial functions change with dementia status in the peripheral tissues, DS with dementia (DSAD) lymphoblastoid cell lines (LCLs) and AD LCLs were put in mitochondrially challenging media conditions. In detail, twenty-four cell lines (four groups; AD, DSAD, DS and control, and six samples from each group; three males and three females in each group) were supplemented with regular glucose media (as standard feeding) and galactose media (as to induce challenge to oxidative phosphorylation), and their growth rate was monitored via cell counting. At the end of the experiment, a growth curve was made to study the difference in the mitochondrial behaviors of these cell-lines. The growth rate was found to be faster in DSAD and AD groups than in DS and control groups that were under standard feeding, suggesting that the cells are more adaptive to glycolytic state with dementia status than controls since they might have potentially compromised for their mitochondrial function.

Co-Expression of N-myristoyltransferase-2 with Nef
Nicole Thomas
Mentor: Rachel Martin
Nef is a small accessory protein encoded in HIV-1—an epidemic threatening millions of lives—that is responsible for a high virus load, increased infectivity, and progression to AIDS. The post-translational myristoylation at the N-terminus is necessary for many of these functions and is mediated by the enzyme N-myristoyl transferase (NMT). Myristoylation anchors Nef to the membrane whereas unmyristoylated Nef mostly remains in the cytosol of the cell. While previous studies have determined structures for the different regions of myristoylated Nef, the dynamics of myristoylated Nef in the cellular membrane remain unstudied. Because NMT-2 hinders E. coli cell growth, the yield of myristoylated Nef remains low. This project aims to optimize the expression of myristoylated Nef with the co-expression of human NMT-2. The NMT-2 gene was subcloned into the vector pACYC184; a mutated T7 promoter was engineered into the vector to keep expression levels low. Mass spectrometry was used to confirm the myristoylation of Nef. Future experiments include the use of Nuclear Magnetic Resonance (NMR) on membrane bound myristoylated Nef. Co-expression of Nef with a less efficient NMT-2 expression vector leads to a greater amount of myristoylated Nef, thereby providing enough myristoylated protein for NMR studies that will advance knowledge of the importance of Nef in HIV-1.

Do Plant Growth, Resource Availability, and Site of Plant Origin Affect the Population Growth of a Specialist Aphid Species on Artemisia californica Plants?
Amanda Thompson
Mentor: Kailen Mooney
Plant defense theory suggests that plants exhibit tradeoffs in resource allocation to herbivore defense and growth, particularly in low-resource environments. I tested this prediction in a common garden experiment with Artemisia californica plants and a specialist aphid species. A. californica plants originated from five different sites across the species range. Plants received one of two precipitation treatments: high rainfall conditions to simulate precipitation at the northernmost part of A. californica’s range, or low rainfall conditions similar to those at the southern end of the range. During A. californica’s growing season, aphids were added to each plant and aphid population size was monitored for one month. Plant volume was estimated over a similar time frame. Plant growth rate was significantly affected by plant source site, with plants from southernmost sites growing faster than genotypes from more northernmost sites. There was no relationship between aphid per capita population growth rate and plant growth rate. After two weeks, there were significant differences in aphid population growth on plants from different source sites, but by the end of the experiment these differences diminished. Additionally, aphid population growth rate did not differ between plants in the high and low rainfall treatments. These results do not support predictions of tradeoffs from plant defense theory. However, if tradeoffs do occur for this species, it is likely that the adaptation of specialist herbivores to their host plants’ defense mechanisms may render them immune to the increased plant defense allocation exhibited by slower growing plants.

An Evaluation of Five Algorithms to Extract Java Source Code from Web Pages
Casey Thompson
Mentor: Susan Sim
Anyone who has been stuck while working on an unfamiliar programming problem knows the value of an example. Example source code, or a “code snippet,” is a few lines of code that provides a ready-made answer in a format that is...
easy to understand. Code snippets are highly valuable resources and there is a wealth of them on the Web. To build a repository, we need a mechanism to extract the source code from Web tutorial pages. To address this challenge, we developed and evaluated five algorithms that classify segments of an input page as source code or natural language. We conducted an evaluation using a corpus of 43 Web pages. Overall, the Rotation Forest machine learning algorithm on grouped content segments performed the best, achieving an overall accuracy of 93.4%. However, classifying segments only using <pre> and <code> tags is simpler and achieved the second highest accuracy of 90.3%; it is suitable for use when the input is known to follow HTML conventions. Finally, Rotation Forest on simple content segments is recommended when the formatting is unpredictable and unreliable.

R-Fadrozole Treatment in Ant1 Heart Disease to Reverse Fibrosis and Inflammation

Rosella To
Mentors: Douglas Wallace & Michael Zaragoza

Mutations of the adenine nucleotide transporter (ANT), a protein carrier that exchanges mitochondrial ATP for cytosolic ADP, have demonstrated in mice to exhibit phenotypes such as severe cardiac hypertrophy, inflammation, and fibrosis. One possible explanation is the excess oxidative stress from the Ant1 defect resulting in cellular damage. One study showed aldosterone synthesis was inhibited by the drug Fadrozole and reduced the levels of fibrosis in rats. We hypothesize that Fadrozole will decrease aldosterone levels and in turn reduce oxidative stress/NADPH levels and result in less ROS production, leading to a decrease in fibrosis and inflammation in our Ant1 mutant mice. We conducted a trial treatment with a total of 24 mice by administering Fadrozole on our Ant1 mutant and wild-type mice. With a total of 12 mice in each group, six Ant1 /- mutant mice and Ant1 +/+ wild-type mice were given Fadrozole for duration of 28 days. The rest of the control and mutant mice were not given the drug. The hearts were fixed and stained with Mason’s Trichrome, and images of the cardiac tissues were taken. The percent area of fibrosis was quantitatively measured with NIH’s ImageJ software. We analyzed for changes in fibrosis with Wilcoxon test and found to have no effect on the amount of fibrosis by the Fadrozole treatment. Our results do not provide evidence for significant changes in cardiac fibrosis using Fadrozole. Further research is required to understand how to reverse the effects of ANT1 mutation that causes severe cardiac disorders.

Regulation of CNS Autoimmunity Through β1,6GlcNAc Branched N-Glycan Alterations by 1α,25-Dihydroxyvitamin D3

Sevan Torossian
Mentor: Michael Demetriou

β1,6GlcNAc branched N-glycans produced by β1,6 N-acetylglucosaminyltransferase V (Mgat5) enhance binding of glycoproteins to galectins, strengthening a multivalent galectin-glycoprotein lattice on the surface of T cells. The galectin lattice negatively regulates T cell activation and autoimmunity by inhibiting actin cytoskeleton reorganization and recruitment of the T cell receptor (TCR) to the immune synapse. 1α,25-Dihydroxyvitamin D3 (1α,25-(OH)2Vitamin D3), the biologically active form of Vitamin D3, inhibits T cell function and autoimmune diseases such as Experimental Autoimmune Encephalomyelitis (EAE)—the mouse model for Multiple Sclerosis (MS) by an unknown mechanism. Deficiency of 1α,25-(OH)2Vitamin D3 has been proposed to be an environmental factor regulating T cell mediated autoimmunity in humans and rodents. We explored whether 1α,25-(OH)2Vitamin D3 negatively regulates T cell function by enhancing production of 1,6GlcNAc branched N-glycans and reducing T-cell activation proliferation and TH1 differentiation. We find that 1α,25-(OH)2Vitamin D3 enhances expression of T cell β1,6GlcNAc branched N-glycans in vitro and in vivo and suppresses T cell proliferation by this mechanism. Our data suggests a novel mechanism for environmental and genetic interaction in MS and other human autoimmune diseases.

Mothers behind Bars: Evaluating the Effectiveness of Rehabilitation Programs for Incarcerated Mothers

Catherine Tran
Mentor: Elliott Currie

Women represent the fastest growing section of the ever-expanding U.S. prison population. Mothers, in particular, tend to commit property crimes that usually do not require a severe punishment. Because they are not a violent threat to society, this population is most likely to benefit from rehabilitation efforts at minimum-security facilities. The purpose of this study is to examine effective alternatives to incarceration for mothers convicted of non-violent offenses. MOPS (Mothers of Preschoolers) Prison is a pilot rehabilitation program for incarcerated mothers in the James A. Musick jail in Lake Forest, California. Each participant completes an assessment of the program and their concerns regarding post-release success. Through the evaluation of pre-existing data, this study explores the specific components of a rehabilitation program that were most effective in improving attitudes, adjustment patterns, and vocational/parenting skills, as well as suggesting alternative methods that could be used to address the incarcerated mothers’ specific needs. The study shows that the
The Relationship of Epibiont Bacteria and *Pseudo-nitzschia* that Leads to the Production of Domoic Acid

Kevin Tran

*Mentors:* Sunny Jiang & Marilou Sison-Mangus

Certain forms of the diatom *Pseudo-nitzschia* have been observed to produce domoic acid, a toxin that plagues the shellfish industry and poses a health risk for humans if consumed. The mechanism behind the diatom’s toxin production is not fully understood; however, previous studies have shown that when the diatom was made axenic, when all bacteria and viruses were removed, *Pseudo-nitzschia* that were once toxigenic ceased to produce toxin. Using toxicogenic and non-toxigenic *Pseudo-nitzschia* attained from Newport Pier and Santa Cruz, we have isolated the epibiont bacteria that adhere to the surface of the diatom. These bacteria were cultured and found to have varying types of morphologies and were thusly sequenced using 16S rRNA to determine bacteria type. Four distinct genera of bacteria were found on three different *Pseudo-nitzschia* cultures: *Pseudoalteromonas*, *Rhodobacteraceae*, *Paenibacillus*, and *Bacillus*. Some of these bacteria were determined to be pathogenic and could be harming the diatoms, reinforcing the hypothesis that a relationship between bacteria and toxin production in *Pseudo-nitzschia* exists. Isolation and genotyping of epibiont bacteria will be continued with the remaining *Pseudo-nitzschia* cultures from Santa Cruz. The bacteria found on domoic acid-producing *Pseudo-nitzschia* will be compared to those found on non-producing diatoms, and a relationship between bacteria and toxin production will be determined from the results. If a relationship is determined, the isolated bacteria will be added to an axenic culture with the theory that domoic acid would be produced with introduction of the bacteria. This will help to determine the direct relationship between epibiont bacteria causing the production of domoic acid in *Pseudo-nitzschia*.

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Genetic Dissection of Signaling Pathways that Coordinate the Cellular Response to Cadmium and Arsenic Stress

Kim Tran

*Mentors:* Peter Kaiser

Research over the years has suggested that the ubiquitin ligase SCF*Met30* plays a key role in the regulation of the cell cycle and cellular defense upon cadmium or arsenic exposure. However, there are many proteins that are required in cellular response to heavy metal stress that are still unknown. The goal of this research is to expand the knowledge of SCF*Met30* regulation in general as well as gain insight as to how cells respond to heavy metal stress. To attain this objective, the Kaiser laboratory has conducted a genome-wide genetic interaction study. A number of genes were identified. Because genome-wide approaches have a significant false-positive rate, my project has been to recreate gene deletions of the identified genes in the *met30-6* background and to test the sensitivity of these mutants to heavy metal stress. I used a PCR-based gene-deletion strategy to create deletion mutants and these mutants were then combined with the *met30-6* mutant by mating to form diploid yeast cells. Sporulation and tetrad dissection was then used to generate haploid cells that had either single mutations or double mutations (*met30-6* and the deleted gene). A few shortcomings were encountered in creating the mutants, but I have now several of these candidate genes deleted and combined with the *met30-6* mutation for analysis. Analysis of these genes will bring the science community closer to understanding the molecular events regulating the cellular response to heavy metal exposure.

Chromatin Modifications of the *Upk2* and *Tgm1* Promoters in Human Bladder and Fibroblast Cells

Wendy Tran

*Mentor:* Bogi Andersen

Chromatin modifications at genes are often studied in the evolving field of epigenetics. In this study, different chromatin modifications at two gene promoters, *Uroplakin 2* and Transglutaminase 1, were observed and mapped. Because expression patterns of these two genes are tissue specific, we hypothesized that chromatin modifications would be different at the promoters of these genes, and this difference would correlate with gene activation. We found that chromatin modifications appeared to indeed be tissue specific, where *Uroplakin 2* clearly showed higher active enrichment in RT4 bladder cells, and Transglutaminase 1 in fibroblast cells. It remains unclear, however, why active enrichment appears to be observed in the Transglutaminase region of bladder cells.
The Effects of the Dream Act on Undocumented Students
Janeth Trejo
Mentors: Leo Chavez & Caesar Sereseres

Undocumented students have long been invisible to society and as a result have been defined by limitations. The study examines the possible outcomes the Dream Act will have upon the lives of undocumented students and how being “illegal” defines these students’ legal, academic and social limitations. The Dream Act reflects bipartisan legislation efforts that would ensure that undocumented students willing to attend college or serve in the military can contribute to society by enabling a path to citizenship and allowing states to determine eligibility requirements for in-state tuition. Despite high levels of achievement, community service, leadership experience, and a deep sense of commitment to American society, undocumented students still remain in limbo. Many of these students have undergone K–12 education successfully, yet have found limitations in their quest for higher education. Only 5–10% of undocumented students enter college or a two/four-year university every year due to their defined limitations and legal restrictions. In California, undocumented students are able to obtain higher education as a result of the AB540 bill, which allows qualified undocumented students to be exempt from paying significantly higher out-of-state tuition at public colleges and universities. Preliminary findings will contribute to the overall understanding of undocumented students’ struggles in higher education, their challenges and the limitations that confine them. This study sheds light on the complexities of undocumented students in order for decision makers to provide better support to these students in completing higher education.

Characterization of Anopheles stephensi Transgenic Line
Mikhail Tretiakov
Mentor: Anthony James

Although seemingly innocuous in the developed world, malaria continues to be a serious concern for much of the world’s population. Among other methods such as insecticide use or vaccination, the development of vector control is seen as a potential solution for the pandemic. My project uses an established line of Anopheles stephensi mosquitoes containing an integrated transgene, called a docking site, into which various other anti-malarial genes, such as anti-body-coding sequences, may be more safely and easily inserted. My role is to characterize the number and location of transgenes in one line of docking site-containing mosquitoes. Virgin transgenic females were crossed to wild-type males to establish two outcrossed lines, one of which was then individually out-crossed again. Following egg deposition, Southern Blot analyses were performed using genomic DNA extracted from these females. As a result, two initial lines, attP 44.2 and 44.3, were established, and were found to have two and three integrated transgenes, respectively. Further testing on attP 44.2 is underway to establish and characterize transgenic lines carrying a single docking site. The finding of multiple transgenes was unexpected, and impeded progress toward the establishment of the single-transgene line, as the initial hypothesis was that only one transgene would be present. Once established, however, a stable single-transgene line would be valuable as a control for subsequent integrations into the docking site, and would provide a baseline for analysis of fitness costs.

Case Study on Orange Outreach Gang Prevention Program: Does Prevention Work?
Louise Truong
Mentor: Elliott Currie

Orange Outreach’s nine-week course targets fifth graders who live in poor communities in Orange County where gang activity is often the norm. By educating the students about the consequences of getting involved in gangs and drugs and motivating the students to stay focused on school and dream about their career aspirations, the program hopes to prevent the children from joining a gang. To see whether Orange Outreach is positively influencing the students, I conducted a qualitative study at one of the elementary schools. I interviewed students, teachers, and speakers from the program, passed out questionnaires for the students to fill out on the first and last day of the program, and observed all nine of the program courses. After collecting and analyzing the data, I discovered how the facilitators’ methods affected the students, and gained some insight on the students’ background and environment. The study demonstrated that although not all students live in gang-ridden communities or are aware of the strong presence of gangs in their community, many others have been asked to join a gang. Gangs are recruiting at younger ages, specifically targeting elementary students. Thus, it seems necessary to start intervention as young as possible. I will discuss evidence on whether the Orange Outreach approach is an effective way to do so.

Racial/Ethnic Differences in the Relationship Between Depression and Diabetes among Patients with Type 2 Diabetes
Quynh-Thu Truong
Mentors: John Billimek & Dara Sorkin

Type 2 diabetes patients are more likely to be at risk for psychological disorders such as depression, which can further contribute to major health problems and poor quality of life. Depression is under-treated by health care providers in primary care settings, and studies on ethnic minorities such as Vietnamese and Mexican-Americans are limited. This project assessed whether Type 2 diabetes pa-
patients’ self-reported clinically-relevant levels of depression are appropriately identified by their primary care physician. In surveys from non-Hispanic White, Hispanic and Vietnamese patients, depressive symptoms, mental health and quality of life were assessed and correlated with patients’ difficulty of accessing healthcare, their frequency in seeing mental health providers, and their use of hospital or emergency room services. Vietnamese patients reported having the most depressive symptoms and the poorest quality of life. Hispanic patients with high levels of depressive symptoms reported significantly less use of mental health providers; yet, there were no ethnic differences in use for patients with moderate levels of depression. Findings suggest that poverty experienced by the Hispanic group might contribute to their low use of mental health providers, which correlates with the high percentage of uninsured Hispanic diabetic patients. Only 90 patients reported moderate levels of depression; thus, the limited amount of data makes it difficult to detect any significant differences. Further research should investigate patients with moderate levels of depression and assess if the level of use of mental health providers might contribute to patients’ depressive symptoms in Type 2 diabetes.

### Selection of ATP Aptamers from Human Genomic Pool

**Quynh-Thu Truong**  
**Mentor:** Andrej Luptak

Specific ribonucleic acid (RNA) sequences can be isolated to bind to the desired ligand in solution as well as to solid support. Using in vitro selection, which consisted of random nucleotides that would be amplified to create a pool of RNA, Ellington and Szostak identified the first structure of RNA aptamers. This project used human genomic DNA to provide a better understanding of ATP binding and the relationship it has with the human biology. The in vitro selection for ATP aptamers in this project used the “Systematic Evolution of Ligands by Exponential Enrichment” (SELEX) process. Randomly sequenced genomic DNA was first transcribed in the presence of radioactive alpha-³²P to generate radioactive RNA that can be traced throughout the selection process. Sephadex G-25 beads were used to purify the eluted RNA sample from rATP. In the later cycles, Sephadex G-25 stopped being effective and were replaced with Micro-spin Filter to wash away the unnecessary rATP that surrounded the molecule. The percentage of binders gradually increased with each round of selection. With the knowledge of ATP aptamers, we can further our understanding of how ATP might be regulated in humans and possibly in many other species as well. Further experiments should examine the purification process of rATP from RNA samples and test for the consistency with each proceeding round.

### Exhaustive Exercise Does not Affect Limb Bone Properties of the American Alligator

**Henry Tsai**  
**Mentor:** James Hicks

Effects of exercise on skeletal growth and remodeling have been studied in a variety of mammals and some birds, but the skeleton of reptiles has received scant attention. We investigated the effects of long-term (17 months) exhaustive exercise on a treadmill or in a flume on limb bones of the American alligator (Alligator mississippiensis). Whereas terrestrial exercise increases both limb bone loading and cardiovascular activity, aquatic exercise increases only the latter. We found no significant differences in whole bone morphology and microstructural changes of the alligator humerus, regardless of exercise regimen. The lack of observable skeletal change could be attributed to a possible insufficient level of exercise administered, as well as metabolic differences between alligators and endotherms in prior studies.

### Effect of Wnt-Antagonist DKK3 and Frzb on Osteosarcoma Growth and Metastasis

**Gilbert Tse**  
**Mentor:** Bang Hoang

Osteosarcoma (OS) is the most common primary malignancy of bone in adolescents. About 80% of osteosarcoma originate in the bones around the knee and tend to metastasize to the lungs in early stages of the development. Novel anti-tumor strategies are largely needed to overcome the lethal cancer. Recently, the Wnt signaling pathway was reported to play an important role in the growth and metastasis of other cancers. In this study, the role of the Wnt signaling pathway in osteosarcoma and the anti-tumor effect of Wnt antagonists were further elucidated. The Wnt antagonists, Frizzled-B (Frzb) and Dikkopf-3 (DKK3), were transfected into the osteosarcoma cell line MNNG/HOS. Stable transfectants over-expressing Frzb and DKK3 were established by G418 selection. Cell motility was measured by a scratch wound assay. In a 24-hour period, control cells filled the scratch wound by 100%. Frzb- and DKK3-transfected cells only filled the wound by 53.1% and 32.86%, respectively, showing the inhibitory effect of Wnt antagonists on OS cell migration. Proliferation rate of OS cells was measured by an MTT assay. Compared with the control cells, over-expression of Frzb and DKK3 significantly suppressed the proliferation of OS cells. Western blot and real-time PCR assay indicated that Frzb and DKK3 down-regulated expression of MMP2, c-Met and S100A4 in OS cells, which are extensively reported to be involved with cancer cell proliferation and metastasis. Our data showed that the Wnt signaling pathway plays an important role in OS, and blocking Wnt signaling using Wnt antagonists exhibited dramatic antitumor effect on OS.
**Ex vivo Oral Wetness**
Travis Tucker  
*Mentor:* Petra Wilder-Smith

The aim of this project is to develop and validate a means of quantifying dry mouth and its response to medication using Optical Coherence Tomography (OCT). Dry mouth, a condition common among geriatric patients, has many causes that range from systemic or local medical conditions to the side-effects of many common medications. While manifestations of dry mouth vary, the most common symptoms include difficulty swallowing, chewing, speaking, or eating. Porcine skin and oral mucosa, subject to progressive, controlled wetting served as the first *ex vivo* models. The skin and oral mucosa were imaged dry at baseline and then subsequently to each measured wetting episode using swept source OCT to image at 1310 nm. Changes in tissue as small as 10% w/vol could be detected using the described approach. Optical coherence tomography may provide a novel non-invasive in vivo means of detecting and assessing dry mouth.

**The Role of the Steroid and Xenobiotic Receptor (SRX) in Inflammation and Tumor Formation**
Gina Turco  
*Mentor:* Bruce Blumberg

The steroid and xenobiotic receptor (SRX) negatively regulates inflammation and immune response through NF-kB. SRX has previously been associated with drug and xenobiotic metabolism; however, much less is known about its role in inflammation and immunity. Therefore, we explored the effects of SRX on gene expression in pathways important for inflammation and immunity using quantitative real time RT-PCR (qPCR). We chose anti-apoptotic and pro-inflammatory genes for our analysis because SRX-mice display increased lymphocyte proliferation. Our data confirm the role of SRX as a negative regulator of apoptotic and inflammatory genes. We also found that SRX plays a key role in regulation of B cell proliferation and maintenance. Understanding the precise role that SRX plays to negatively regulate the NF-kB signaling pathway can impact the treatment of cancers and immune disorders.

**The Deuterium Isotope Effect, its Fortification of Biological Macromolecules in Drosophila melanogaster, and its Effect on Lifespan and Health**
Luke Underwood  
*Mentor:* Michael Rose

The heavy and stable isotope of hydrogen, 2H, has been shown to make carbon-hydrogen bonds more resistant to oxidation. According to the free-radical theory of aging, the accumulation of oxidative damage is predicted to be a major component of organismal aging. The incorporation of 2H into biological macromolecules should make organisms more resistant to oxidative damage and, if the theory is correct, should slow the process of aging. To test this hypothesis, *Drosophila melanogaster* larvae were raised in four different concentrations of heavy water, 2H2O. To measure the effect of varying exposure of 2H on the mean lifespan of *D. melanogaster*, the number of individuals that died during each 24-hour period was recorded over the course of about two months. Analysis of the data reveals that deuteration had a significant effect on lifespan, such that flies exposed to 2H lived longer than those that were not exposed to 2H during development. However, 2H appeared to slow development, such that flies that were exposed to 2H emerged from their eggs later than those flies that were not. Ultimately, the hypothesis appears to have been supported. The results of this experiment support the free-radical theory of aging and provide a basis for studies of the kinetic isotope effect in mammals.

**The Effects of \( \gamma \)-Substitution on the Rates of Reaction of Exocyclic Acetals**
Brandon Usami  
*Mentor:* Keith Woerpel

The Woerpel laboratory has used electrostatic attraction, the attractive force felt between two opposing charges, and anchimeric assistance, which results from an attraction between two opposite charges that leads to the formation of a bond, as powerful tools for controlling the conformation of molecules. A plan was developed to test the influence of the spatial distance between an electronegative substituent and a positively charged oxocarbenium ion by obtaining data on the rates of reaction of three oxocarbenium ion precursors. Three analogous cyclopentane derivatives were designed and synthesized with an oxocarbenium cation substituent and a \( \gamma \)-benzyloxy group as the other substituent. A trans-substituted cyclopentane containing a benzyloxy substituent is hypothesized to experience only electrostatic attraction. The cis-substituted cyclopentane oxocarbenium cation is expected to react with the nucleophile through an anchimeric assistance mechanism. The corresponding unsubstituted cyclopentane will serve as the standard for comparison. Relative to the unsubstituted oxocarbenium ion precursor, the cis-substituted cyclopentane should react faster due to anchimeric assistance, while the trans-substituted cyclopentane is likely to react slower due to electrostatic attraction. The determination of the relative rates of nucleophilic addition to these substrates should then elucidate these mechanisms. Through extensive experimentation on these substrates, we have developed the conditions necessary to perform a competitive rate experiment between the trans and unsubstituted cyclopentane, and between the cis and unsubstituted cyclopentane. The results will help us understand how exocyclic oxocarbenium cations are influenced by \( \gamma \)-heteroatoms.
The Cognitive Benefits of Learning by Tutoring
Archana Vaidyanathan
Mentors: Nicole Gage & Elizabeth Van Es
A central question in educational theory is how students best encode material for long-term recall. Bargh and Schul addressed how students benefit cognitively from tutoring, finding higher post-test performance for subjects who prepared to tutor vs. controls. Their subjects did not actually tutor, however, leaving open the question of effects of tutoring experience. We explored cognitive gains when subjects engage in tutoring. Subjects (N=88) were randomly assigned to Learning conditions (Non-tutoring, Tutoring) and asked to read two passages followed by Post-test 1. Non-tutoring subjects were asked to review the passages, while Tutoring subjects were asked to tutor the material to another student, after which all took Post-test 2. We predicted that Tutoring subjects would score higher than Non-Tutoring subjects on both general and specific material questions due to deeper encoding. We found a Group difference in overall test performance that neared significance; however, it was in the direction opposite from what had been predicted: Non-tutoring subjects out-performed Tutoring subjects on both Post-tests, perhaps due to a short-term memory load during the brief tutoring preparation period. Thus, while the tutoring experience may have long-term cognitive gains, perhaps preparing to tutor someone else vs. preparing oneself prior to a knowledge test causes some disruption in encoding since students traditionally study in the latter manner. Additionally, while all subjects performed significantly better on Post-test questions tapping generalized vs. content-specific knowledge, the Non-tutoring group performed significantly higher than the Tutoring group, providing further evidence for a generalized knowledge gain for students engaged in self-study.

Using the Carrot or the Stick: Should Employee Health Programs Reward Healthy Behavior or Penalize Unhealthy Behavior?
Chad Valasek
Mentor: Peter Ditto
Many U.S. companies have begun to provide incentives for employees to maintain healthy lifestyles—in some cases, by either rewarding their healthy weight employees (discounting healthcare premiums) or by punishing their overweight employees (with additional fees added to existing premiums). Even when these punishment and reward programs have the same consequences for an employee’s absolute state of wealth, the two policies may still not be information equivalent. We argue that policies reveal information about policymakers’ preferences and attitudes, even when their choices are formally equivalent to other options. Punishments programs are most likely to signal negative attitudes about overweight employees, while reward programs are most likely to signal positive attitudes about healthy weight employees. Study 1 shows that choosing such policies “leak” information—when placed in the role of policymaker, bias towards overweight employees predicted the type of incentive program chosen. Study 2 shows that people “absorb” different information from reward and punishment healthcare policies. How employees and the public react to healthcare incentive programs may reflect not just costs, but also the message that the policy sends to its employees.

Finite Element Method for Designing Microplatform to Study MechanoSensitivity of Neurogenesis
Michele Van
Mentor: William Tang
The search for an effective treatment of neurological disorders is critical because these disorders, ranging from migraines to epilepsy and dementia, currently affect approximately one billion people, according to the World Health Organization. The key component in helping to understand the underlying causes for these disorders lies in the biological and mechanical behaviors of neurons. Beyond the traditional biochemical investigations on neuronal behaviors, the study of neuronal morphogenesis under mechanical stimulations may shed additional light on the complex functions of the nervous system. Finite Element Method (FEM) has been implemented in finding the most suitable Polymethylsiloxane (PDMS) platform to aid in experimental testing of neuronal morphogenesis. Various square and rectangular platforms undergoing either 0.1, 1, or 10 relative units of displacement have been simulated and analyzed on COMSOL®, a commercial FEM simulation tool. Initial results suggest that square PDMS provides better distribution of strain than rectangular platforms. Preliminary work has also been accomplished to indicate that circular platforms are the optimal geometric platform that can present the best strain distribution. Circular PDMS has proven to be more useful than square PDMS because uniform strain has been distributed over a larger area. Future work will involve collaborating simulation results with experimental devices and then performing refined simulation tasks to further improve the platform design.

Caregiver Perceptions of Daily Assisted Exercise
Jessica Vaughan
Mentor: Dan Cooper
Premature birth is associated with lower lean mass, increased blood pressure and decreased fitness in adulthood. These outcomes may be prevented through early interventions in infancy. The purpose of this study was to develop and assess the feasibility of a home-based exercise intervention program for premature infants that could be car-
A Summer Intensive with Cornerstone Theater Company in Eureka, CA

Victor Vazquez
Mentor: Don Hill

The world community meets theater in the Cornerstone Theater methodology. Cornerstone Theater Company is a Los Angeles-based multi-ethnic, ensemble-based theater company, whose work engages communities all across the nation by using the theater to share stories from communities in immediate and innovative ways. They commission and produce new plays, both original works and contemporary adaptations of classics, which combine the artistry of professional and community collaborators. By making theater with and for people of many ages, cultures and levels of theatrical experience, Cornerstone builds bridges between and within diverse communities in [their] home city of Los Angeles and nationwide. This summer, I moved to Eureka, CA to work on a site-specific and new Cornerstone production called “Jason in Eureka.” Thirty non-actor community members were cast alongside professional actors, and an entire month was spent learning the methodology of creating this invigorating and special kind of theater that roots itself within the world community, sharing theater to and with the public. I learned how to budget, advertise, audition, cast, direct, write, design, manage and build a non-profit type of theater that engages and shares theater with the masses.

Rhodiola rosea Increases Lifespan and Improves Healthspan in Aged Drosophila melanogaster

Karen Vo
Mentor: Mahtab Jafari

This study evaluated Rhodiola rosea’s effects on aged Drosophila melanogaster. Rhodiola rosea is an herbal extract that has been observed to increase lifespan in flies. By studying the extract’s effects on aged organisms, insights may be made in using it to benefit the aged human population. The flies were allowed to age before being supplemented with the plant extract to examine whether they exhibit the same lifespan-extension benefits seen in younger flies. R. rosea significantly increased the lifespan of both male and female flies at three, four and five weeks of age. Additionally, protection against oxidative stress as well as an increase in activity levels of the aged flies were observed, which is consistent with the effect of R. rosea supplementation in young flies. These findings indicate that R. rosea can both increase lifespan and healthspan in aged Drosophila, indicating that it may one day be a promising treatment for lifespan extension in aged human populations.

The Hardiness Approach to Healthy Romantic Involvement

Thanh Thao Vo
Mentor: Salvatore Maddi

Hardiness research over the years has indicated its effectiveness as a method to manage stresses relating to performance, conduct, and health. However, hardiness research is limited in the area of social relationships. The purpose of this study is to explore the ability of hardiness to manage stressful circumstances and promote psychological well-being in romantic relationships. Specifically, the study examined the commitment component of Sternberg’s triangular theory of love in relation to both hardiness and attachment style. Three surveys were used: the hardiness scale, the multi-item measure of adult romantic attachment, and the Relationship Involvement Scale (RIS). Based on survey data from 90 undergraduate students who are in relationships, the study found significant correlations among all three variables: higher hardiness and secure attachment style correlated with higher levels of relationship commitment/involvement, respectively. When investigating the predictive value of hardiness and attachment style to relationship commitment/involvement, attachment style was found to be a greater predictor. Although hardiness was not a significant predictor above and beyond attachment style, the correlation between hardiness and relationship commitment/involvement proposes potential future research in hope of finding a hardiness approach to healthy romantic involvement and, thus, defining hardiness’ role in romantic relationships.
Interactions Between Childhood Health and Private Insurance
Angela Vossmeeyer
Mentor: Ivan Jeliazkov

Using the Panel Study of Income Dynamics, this paper evaluates the affect childhood health has on the purchase of private insurance. While still controlling for other life-cycle interactions such as education, employment and socioeconomic status, probit regression models are estimated using maximum likelihood. Looking at intergenerational transitions, this study uniquely analyzes retrospective reports of childhood health and examines how they influence the choice of private insurance and at what ages these effects have the greatest impact. The study finds that childhood health has a significant positive correlation with the purchase of private insurance; however, its impact falls behind that of employment, education and marital status. While controlling for different age groups, this study also finds that childhood health has its greatest effect on the purchase of private insurance in later years. The effect increases until the age of 65—when Medicare and Social security are introduced—at which point it diminishes. In light of the recent healthcare debate, it is important to assess early life occurrences to better understand the demand for insurance.

Adaptive Motor Control Through Artificial NeuroEvolution
Grant Vousden-Dishington
Mentor: Jeffrey Krichmar

The transformation of input feedback signals into accurate feed-forward movements in the CNS is an open problem in neuroscience. This research approaches the problem of efficient motor control using neuroevolution—the practice of using genetic programming to create and optimize neural networks—to determine the optimal topology and connectivity of a motor control network. The task of the experiment will be to guide a simulated, single-degree-of-freedom arm to its target smoothly with minimal error, taking into account torque due to gravity, inertia, and the Coriolis effect. Many mathematical models of motor control and motor learning have been proposed, but few of such models have been used in real-world platform to experiment with motor learning. This research explores an encoding scheme for an evolutionary algorithm that optimizes the topology and synaptic weights between neural nodes based on NeuroEvolution of Augmenting Topologies (NEAT). The networks created by this algorithm will be applied to a simulated arm model based on Hill models of agonist-antagonist muscle structure found in mammals. Our results should reveal more about the types of learning needed for accurate motor control and, ultimately, we will implement our networks on a robotic arm to test their performance in simulated and real environments and discuss the validity of these learning algorithms. Preliminary results suggest NEAT is capable of creating neurocontrollers that master the inverse dynamics of a simulated robotic arm with very precise movement.

Spectral Characterization of Dental Demineralization and Decay
Diana Vu
Mentor: Petra Wilder-Smith

Dental decay is a common disease that affects people throughout the world. Coronal and root surface decay are the two prevailing forms of dental decay. Neither form of decay can accurately and consistently be detected underneath restorations and are in sites that are difficult to access using existing diagnostic techniques. Even more important is the detection of dental demineralization, as early detection permits chemical remineralization, preventing progression of demineralization to outright and irreversible decay. Currently, radiography is the only adjunct to clinical examination that is widely used in dental offices. However, it poses some negative effects, such as harmful radiation, partial image distortion, and diagnostic inaccuracy due to superimposed structures on the 2-D images. To address this issue, I characterized optically healthy, demineralized and decayed enamel and dentin using multi-photon microscopy (MPM). The information that I obtained provided the basis for developing spectral optical coherence tomography (OCT) for the diagnosis of dental de-mineralization, re-mineralization, and decay. OCT is a non-invasive, high resolution optical imaging modality similar to ultrasound that avoids harmful ionizing radiation and patient discomfort from radiographic sensors or film. From the study, I found that clinical caries diagnostics using OCT is achievable. Spectral domain OCT combined this imaging capability with spectral data on the target tissues. Thus, far greater sensitivity and specificity for early changes in tissue mineralization was possible. This study shows that OCT may serve to improve diagnostic accuracy, improve safety, and reduce cost in the future.

Deficits of Working Memory Processing in Schizophrenia
Nicholas Vu
Mentor: Steven Potkin

The purpose of this project is to investigate and characterize which deficits of working memory are present in schizophrenia, the role of emotion in working memory, and which brain areas are involved with working memory. Schizophrenia results in abnormal functioning of the prefrontal cortex and limbic system, which leads to profound deficits in working memory and emotional reactivity. Functional magnetic resonance imaging was used in conjunction with an emotional and neutral working memory task to evaluate differences in brain activation in healthy volun-
Clinical setting. Holds great promise for safe and rapid implementation in stroke—an approach that, due to its non-invasive nature, therapeutic intervention in the acute phase of ischemic injury has not been fully studied. Using a rodent model of cerebral ischemia, we have previously demonstrated that stimulation of a single whisker within a three-hour window following ischemic onset can fully protect the cortex from impending injury. In this study, we attempt to optimize this therapeutic intervention by investigating whether an increase in the amount of stimulation can accelerate the recovery rate of whisker functional representation in the ischemic barrel cortex. Using Intrinsic Signal Optical Imaging (ISOI) and post-mortem 2,3,5-triphenyltetrazolium chloride (TTC) staining, we assessed the functional and structural viability of the rodent “barrel cortex” before and after focal ischemia, as simulated by permanent occlusion of the middle cerebral artery (pMCAO). Either immediately or three hours after pMCAO, 25 large whiskers corresponding to the ischemic barrel cortex were stimulated intermittently for two hours. Our data indicated that, immediately following the ischemic event, multiple-whisker stimulation promoted faster recovery of evoked neuronal activity compared to single-whisker stimulation. If delayed three hours after ischemic onset, however, multi-whisker stimulation resulted in more substantial cortical infarct than that sustained when single-whisker stimulation was administered three hours post-pMCAO. Taken together, these findings highlight the important implications of plasticity-based therapeutic intervention in the acute phase of ischemic stroke—an approach that, due to its non-invasive nature, holds great promise for safe and rapid implementation in the clinical setting.

Multiple-Whisker Stimulation Promotes Rapid Recovery of Cortical Function Following Ischemic Stroke
Quynh Vu
Mentor: Ron Frostig

While the processes of adaptive reorganization in the cerebral cortex have often been used to facilitate rehabilitation after stroke, whether similar mechanisms of cortical plasticity can be marshaled for complete protection from ischemic injury has not been fully studied. Using a rodent model of cerebral ischemia, we have previously demonstrated that stimulation of a single whisker within a three-hour window following ischemic onset can fully protect the cortex from impending injury. In this study, we attempt to optimize this therapeutic intervention by investigating whether an increase in the amount of stimulation can accelerate the recovery rate of whisker functional representation in the ischemic barrel cortex. Using Intrinsic Signal Optical Imaging (ISOI) and post-mortem 2,3,5-triphenyltetrazolium chloride (TTC) staining, we assessed the functional and structural viability of the rodent “barrel cortex” before and after focal ischemia, as simulated by permanent occlusion of the middle cerebral artery (pMCAO). Either immediately or three hours after pMCAO, 25 large whiskers corresponding to the ischemic barrel cortex were stimulated intermittently for two hours. Our data indicated that, immediately following the ischemic event, multiple-whisker stimulation promoted faster recovery of evoked neuronal activity compared to single-whisker stimulation. If delayed three hours after ischemic onset, however, multi-whisker stimulation resulted in more substantial cortical infarct than that sustained when single-whisker stimulation was administered three hours post-pMCAO. Taken together, these findings highlight the important implications of plasticity-based therapeutic intervention in the acute phase of ischemic stroke—an approach that, due to its non-invasive nature, holds great promise for safe and rapid implementation in the clinical setting.

Effect of Various Parameters on Size Exclusion Chromatography of Proteins
Tracy Vu
Mentor: Faizy Ahmed

Size exclusion chromatography (SEC) is a method that determines the average molecular weight and distribution of a polymer. Using high-performance liquid chromatography, proteins are separated by porous particles according to size. Molecules smaller than the hole size enter the pore and have longer paths through the column. Larger molecules cannot penetrate the pore and elute earlier when certain volumes of the mobile phase pass through the column. In this experiment, various parameters were used to determine the separation of proteins: thyroglobulin (670 kd), immunoglobulin A (IgA: 320 kd), immunoglobulin G (IgG: 150 kd) bovine serum albumin (BSA: 68 kd), ovalbumin, ribonuclease (RNase), and uridine (222 kd) as a total volume marker. Different flow rates, ranging from 0.4 ml/min to 1.2 ml/min, were applied to 3 μm and 5 μm particle packed columns. Monoclonal antibodies (mAbs) are becoming increasingly important in the treatment of diseases like cancer. One of the important characterizations of mAbs involves determination of dimers, which can lead to lower therapeutic efficacy as well as immunogenicity. IgA (300 kd) and IgG (150 kd) were used in this study as model proteins to indicate the resolution of monoclonal antibody dimer (300 kd) and monomer (150 kd). The separation was better at lower flow rates of 0.4 ml/min. Since the proteins are diffusion unstrained, faster flow rates result in lower resolution.

EMME Interface
Phong Vuong
Mentor: Ramesh Jain

Retrieving multimedia data with current web-based keyword search techniques is suboptimal at locating pertinent information. Due to the semantic gap that exists between intermedia data and user defined annotations, string matching is only as effective as the associated tags. By designing a multimedia search system based on the Event Model approach, the semantic gap can be narrowed simply by organizing digital information based on the occurrence of that media data in everyday life. Our goal is to develop a framework to enhance multimedia search by designing an intuitive graphical web-based application that uses a map, timeline, and tree as a means of navigating through the event model structure.

Second Life: Online Forum for Self-Expression, Dating, and Gender Differentiation
Donna Vu
Mentor: Tom Boellstorff

In June 2003, Linden Lab developed a virtual reality world called Second Life (SL) as an online social networking
community. In it, online users called Residents can interact with each other through the use of avatars. These SL Residents can socialize with other SL Residents, explore, travel throughout the SL world, participate in individual and group activities and/or events, and design and trade virtual property and/or services with one another. With continual updates from 2003 until the present day, this community of people continues to grow in popularity as every race, gender, religious background, and mindset is represented, with the common interest being the cyberspace culture. This study analyzes the uses of avatar body language, uses of texting, and uses of emoticons in order to understand how Second Life Residents construct identity, individually and collectively, in the context of a range of everyday behaviors, activities, and events. Collectively with virtual world interviews with SL Residents and scholarly research on virtual worlds and identity formation in general, this project will contribute to an understanding of how online users ages 18+ from around the world come together to participate in virtual world life and construct identity through sharing useful information and/or creating alternate avatars in a community and niche of cyberspace culture as defined by the Residents themselves.

Do You Think He Noticed Me? An Exploration of Budding Romance throughout Adolescence

Delora Wang

*Mentor: Samuel Gilmore*

This study explores differences between the formation of platonic friendships and romantic relationships, and then examines how these differences change throughout adolescence. The goal was to generate more information on the development of romantic relationships during early adolescence, as research in this area seemed insufficient, then place the findings in a developmental context to understand their significance in the process of maturation. Subjects consisted of male and female college students 18–25 years old. Through ethnographic interviews and guided journaling, subjects were asked to reflect upon the nature of their friendships and romantic relationships at the ages of 12–14, 16–18, and 20–22. Respondents identified what they deemed to be the most important aspects of their friendships and romantic relationships, which tended to follow a developmental trajectory indicative of physical and cognitive maturation. That is, the qualities perceived as important and the general characteristics in both types of relationships moved from simple to complex with age.

Pre- and Post-Operative Concordance Rate and Immunohistochemical Profile of Adenocarcinoma and Adenocarcinoma in situ of the Uterine Cervix

Tawny Watanabe

*Mentor: Krishnansu Tewari*

Invasive adenocarcinoma (IA2) and adenocarcinoma in situ (AIS) of the cervix have no established diagnostic markers, and it remains difficult to distinguish AIS from IA1 (microinvasive adenocarcinoma) and IA2. When a woman wishes to conserve her fertility, differential diagnosis is very important because IA2 and AIS require different surgical procedures—IA2 requires a radical hysterectomy while AIS can be treated with a simple hysterectomy or cervical conization. The goal of this project is to determine whether certain markers will allow more accurate differential diagnosis. We did a retrospective study on patients diagnosed with adenocarcinoma or adenocarcinoma in situ from 1990 to 2008 at UCIMC and LBMMC, recording the diagnosis at different stages of treatment, along with different factors, including Positive or Free Margins, Coexisting Cervical Intraepithelial Neoplasia (CIN), Mitotic Figures, Lymphovascular Space Invasion (LVSI), Number of Pregnancies and Deliveries, and Smoking History. We then used immunohistochemical staining (markers Cox2, CD1a, CEA, p16, and Ki67) of tissue collected from the patients’ procedures, which will be analyzed with a pathologist. We hope to learn whether factors are correlated with either AIS or IA2, so that they may lead to more accurate diagnosis. We hope to conclude that diagnostic markers can allow a woman to choose a more conservative treatment to conserve her fertility.

Acquaintance with Others in Husserl and Merleau-Ponty

Jason White

*Mentor: Martin Schwab*

I examine, compare, and critique Edmund Husserl’s and Maurice Merleau-Ponty’s phenomenological accounts of our acquaintance with other people. In addition to discussing how and where the two accounts differ, I attempt to show that each ultimately goes wrong. Husserl’s phenomenology turns to consciousness as the source for answers to philosophical questions. As a consequence, his theory has been accused of solipsism. He tries to meet this objection by proposing that our experience of others is accomplished by the transference of the sense of our own ego onto the other’s body. I argue that the experience he describes falls short of attaining the other ego as its object, and therefore fails to overcome solipsism. In contrast to Husserl, Merleau-Ponty argues that our acquaintance with others is both precognitive and essential to our own constitution as selves, and thus too deeply ingrained to be genuinely suspended. He suggests that although we do have an unassailable knowledge of others, this knowledge is complicated
by a phenomenological asymmetry that necessarily obtains between individual selves, rendering our knowledge of others imperfect, though still legitimate. He proposes that our cognitive relation to others is analogous to that of our own deaths: certain knowledge without the capacity for thorough contemplation. I argue that this analogy reveals a deficiency in Merleau-Ponty’s account, as it reduces the other ego to a mere limit of our own experience. My presentation will focus specifically on Merleau-Ponty’s account.

**Adverse Events of Lisdexamfetamine Dimesylate in Children With or Without Prior Exposure to Stimulant Medication for Attention-Deficit/Hyperactivity Disorder**

Amanda Wong  
*Mentor: Sharon Wigal*

Lisdexamfetamine dimesylate (LDX) is a prodrug stimulant treatment approved by the U.S. Food and Drug Administration for Attention-Deficit/Hyperactivity Disorder (ADHD). There is no current research on the adverse effects of LDX treatment in true stimulant-naive subjects and those with prior exposure to stimulants. This clinical study describes the frequency, duration, and severity of treatment emergent adverse events of LDX in 27 children, aged 6 to 12 years old, diagnosed with ADHD. Subjects were dose-optimized, starting with a 30 mg dose and titrating up to 50 mg or a maximum of 70 mg during subsequent study weeks if needed. Stimulant-naive subjects were more likely to report trouble sleeping, stomach pain, and hyperfocus and were less likely to experience dizziness than subjects with prior exposure to stimulant medication. There were no significant differences in the duration of adverse events between exposure groups. Some stimulant-naive, but no prior-exposure subjects, reported severe adverse events. Stimulant-naive subjects also were more likely to settle on a lower optimal dose of LDX by study completion. Based on these findings and its efficacy, LDX may be a good treatment choice for patients in both the stimulant-naive group and for patients in the prior-exposure group who are currently untreated for ADHD symptoms or who are unsatisfied with their current ADHD therapy.

**Analyzing PTEN for Mutations in Tumor Stem Cells and Tumor Mass Cells of Malignant Gliomas**

Anthony Wong  
*Mentor: Yi-Hong Zhou*

Glioblastoma multiforme (GBM) is among the cancers that have the most dismal prognosis and is one of the most lethal cancers, which increases the need to further understand the composition of the tumor. Current research shows that GBM is composed of a radio-resistant tumor subset population showing neural stem-like features, which are called neuro-stem like cells (NSLC). The dismal prognosis of GBM can be attributed to many factors; one of which is the presence of NSLC. NSLC have shown to be drug resistant and therefore have the ability to reinitiate the tumor cell population. To further understand the heterogeneous composition of the tumor cell population, we genetically compared glioma primary cultures enriched with either NSLC or tumor mass cells (TMC) and then analyze each for their different genetic alterations. Once the genetic alterations were determined, the genetic changes were compared against the other condition to finally determine if TMC or NSLC are genetically the same or different. In this study, PTEN is the gene of focus because it is one of the genes found mutated in cancer, including GBM. Results from a single patient sample support the presence of a genetic heterogeneous tumor cell population.

**The Advantages of Being Beautiful: Returns from Physical Attractiveness**

Jaclyn Wong  
*Mentor: Andrew Penner*

Previous research has shown the advantages of physical attractiveness, from improved psychological well-being, to success in school and increased chances of getting a job. This study extends previous research in two key ways. First, I use nationally representative data from the National Longitudinal Study of Adolescent Health (Add Health) to examine returns to physical attractiveness over the life course. Second, I build on previous work by focusing on the differences between the returns of physical attractiveness for men and women. I find that attractiveness has a significant impact on an individual’s odds of graduating from high school. There was no difference in returns between males and females. These findings show that attractiveness provides limited advantages, and that, contrary to prior research, attractiveness does not matter more for females than for males. I conclude by discussing the implications of these findings focusing in particular on the formation of gender stratification.

**Using X-ray Crystallography to Determine the 3-Dimensional Structure of a Light-Activated Transcription Factor**

Jared Wong  
*Mentor: Hartmut Luecke*

Certain bacterial proteins are activated by conditions in the external environment, rather than by internal physiology. Several proteins isolated from the bacterial species *Erythrobacter litoralis* feature a domain that reacts to exposure to light. In the protein El222, the signal is propagated through the protein by means of a conformational change, inducing a DNA binding response. The molecular mechanism by which the activation signal is transmitted to the latter domain is currently unclear. Understanding how the activation signal propagates from the LOV domain to the LuxR domain in the protein El222 could provide an addi-
Facile Exterior Modification of Retroviruses via Bioorthogonal Conjugation for Biomedical Applications
Shirley Wong
Mentor: Young Jik Kwon
Retroviruses are key vectors used in clinical gene therapy because of their relatively low immunogenicity and ability to achieve sustained expression of the integrated gene. However, there are many inadequacies in working with these vectors due to difficulties in obtaining high-titered stocks. More importantly, the envelope on the retrovirus impedes engineering effective and convenient vectors designed for directed transduction, targeted delivery, and facile concentration because of the challenge in modifying the envelope without affecting its crucial roles on viral transduction tropism, infectivity stability, and cellular entry. In this study, we have developed a novel and convenient approach for modifying the exterior surfaces of retroviruses such that versatile functionalities can be incorporated to achieve efficient and simple concentration of viruses, directed viral transduction, and specific targeting of the vectors to desired cells. The sialic acids of glycoproteins on the surface of viruses as well as virus-producing cells were oxidized to generate aldehyde groups, which were further bioorthogonally conjugated with aminoxy-bearing functional molecules. It was confirmed that the retroviral envelope could be labeled with a fluorescent dye, which can be useful for tracking retroviral vectors in a cell as well as in vivo. We have demonstrated that magnetic particle-conjugated retroviruses, prepared via aminooxy-biotin/avidin-magnetic particle ligation, can be concentrated easily using magnetic column separation, and can also be directed towards target cells by an external magnetic field, resulting in significantly enhanced transduction. Lastly, the potential of targeted transduction to specific cells was explored via the approach of conjugating monoclonal antibodies to the viruses using the same bioorthogonal conjugation method. This facile approach of exterior modification of retroviral surfaces offers effective conjugation, easy preparation, and wide applicability by using a variety of functional molecules, addressing key technical obstacles in retroviral gene therapy.

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Development of Tamoxifen-Inducible Rab7 Activation Construct
Eva Xia
Mentor: Aimee Edinger
Rab7 is a small GTPase that facilitates late endosome-lysosome fusion. Like other small GTPases, Rab7 exists in two states: Active state, guanosine triphosphate (GTP) bound, and Inactive state, (guanosine diphosphate) GDP bound. Previous published papers from our lab has shown that inactivation of Rab7 under growth factor limiting conditions protects the cell from growth factor withdrawal induced cell death by preventing the clearance of nutrient transporters on the plasma membrane. Also, acute activation of Rab7 in presence of growth factors is capable of triggering apoptosis. These data suggest that Rab7 could function as a tumor suppressor. The goal of my project is to develop a system by which Rab7 activity can be rapidly regulated. I hypothesized that acute, regulated activation of Rab7 can trigger death in cancer cells. To this end, I fused the ligand binding domain of the Estrogen receptor with Flag Rab7 Q67L to generate a Tamoxifen-responsive form of Rab7 Q67L. The fusion protein was retrovirally introduced into FL5.12 cells, clones were isolated, and expres-
Evaluation of Proliferation-Dependent Gene Transfer Efficiency Using Combined Experimental and Numerical Methods
Charles Xue
Mentor: Young Jik Kwon

Gene therapy involves the use of various vectors and the efficiency quantification based on expression of transgene post-transsection (or transduction). These methods, however, suffer significant limitations in evaluating a vector’s capability. First, it is infeasible to differentiate the gene transfer efficiency to actively from non-actively dividing cells. Second, overall gene delivery efficiency at a certain post-transduction (or transfection) time could be highly over- or under-estimated. Both are key parameters playing crucial roles in determining overall gene transfer efficiency, particularly for in vivo gene delivery, but to understand and compare various gene vector systems quantitatively requires combined experimental and numerical techniques. In this study, human cancer cells were cultured in vitro with different levels of contact inhibition. The cells toward the center of the colony are unable to divide in the confined area, while the cells in the periphery actively proliferate. A stochastic model for cell and colony growth as well as a gene expression trend was fitted to experimental data. Employing gene expression rates at various incubation time points, the specific gene transfer rates of various gene vectors to actively dividing and non-dividing cells at the time of transduction (or transfection) were determined. Four different recombinant viral (retrovirus, lentivirus, adenovirus, and adeno-associated virus) and one polymeric non-viral (polyethylenimine/DNA polyplexes) vectors were used to transduce (or transfect) human carcinoma and glioblastoma cells. Results demonstrated that gene delivery systems have different preferences in transducing (transfecting) dividing to non-dividing cells, indicating new insightful information in choosing vectors in clinical gene therapy.

Does Our Preferred Method of Transportation Affect our Interpretation of Neighborhood Walkability?
Mitchell Yang
Mentor: Daniel Stokols

Walkability is the rating of an area’s degree of comfort for pedestrians as they would walk through the area. This field of study is related to many broader fields, such as public design and public health, with previous studies providing valuable information in dealing with many health problems, including obesity and mental health. This study examines a hypothesized relationship between a pedestrian’s transportation preference and their perceived walkability rating of their neighborhood. A survey was performed in two residential areas in the Woodbridge neighborhood of Irvine, CA, to provide data in hopes of elucidating the validity of this relationship. These residential areas were chosen because they were rated differently through an objective walkability analysis method provided by Walk Score™, with one area rated as “Somewhat walkable;” and another as “Very Walkable.” Further analysis was performed on the areas to verify these ratings. Currently, survey data are being collected in the two residential areas. The new methods developed for this study as well as its preliminary findings will be discussed.

Investigation of Boundary Sliding during Deformation of Nanocrystalline Metals
Joshua Yee
Mentor: Farghalli Mohamed

Nanocrystalline (nc) materials are novel materials whose grain size is in the range of 1–100 nanometers. These materials have unique features that differ from their conventional grain-sized counterparts. Although the occurrence of boundary sliding during deformation in nc-materials has been shown using computer simulations, it has yet to be observed experimentally in nc-materials. The occurrence of boundary sliding during deformation often has a negative effect in metals, since it can lead to the formation of cavities and voids, which in turn can lead to premature failure of the material. Scanning electron microscopy images of electrodeposited nc-nickel has shown some evidence of grain protruding on the surface that could be the result of grain boundary sliding. Atomic Force Microscopy (AFM) was used to supplement the surface topography change. Electron Back-Scattering Diffraction (EBSD) was also used to observe the change of orientation during deformation.

Developing Protocols for Fluorescent End-Labeling of RNA
Nathan Yee
Mentor: Andrej Luptak

RNA molecules play critical roles in a variety of biochemical processes, including protein synthesis, gene encoding,
and catalysis. To study the biochemistry of RNA, it is often useful to use fluorescent labels, which allow for visualization of the molecules and the ability to make focused observations in vitro. End-specific labeling of RNA with fluorogenic molecules is especially important because it allows for greater control over the amount of fluorophores attached to each transcript and allows for more precise quantification of RNA of interest as compared to random labeling. We are interested in attaching a fluorophore to the 5′ end of an RNA primed with a thiophosphate-modified guanosine residue, guanosine monophosphorothioate (GMPS). This study primarily focuses on the synthesis and purification of GMPS in preparation for end-labeling experiments. After synthesis and purification of major contaminants, spectroscopic analysis has suggested that further purification of our product may be required before moving on to RNA labeling. Additionally, we have begun screening of boronic acid-functionalized fluorophores for ribose-binding capability to be used in 3′ labeling applications.

An Analysis of School Dropout Rates of Students with Emotional Behavior Disorder
Huerta Yesica
Mentor: Estela Zarate

Student engagement is a multidimensional model that consists of four subtypes of student engagement, such as academic, behavioral, psychological, and cognitive utility, adapted from Christenson & Anderson. However, for the purpose of my investigation, only behavioral, psychological and cognitive utility engagement will be analyzed. The National Educational Longitudinal Study (NELS) will be analyzed as secondary data to focus on ESL Hispanic students with Emotional Behavior Disorder (EBD). NELS examined 1,052 students from elementary and secondary public and private schools in the United States. Among those students, there were 338 students with EBD and 96 students with both EBD and a learning disability. This new study will focus on Hispanic students with EBD. To analyze this data, the researcher will perform multiple regressions to identify the most significant variables. The variable that is predicted to be the most significant among the three is behavioral engagement. With the findings obtained, researchers will be able to create or improve prevention programs that address school dropouts, based on the factors that directly affect students’ decisions. Thus these programs will be able to motivate and encourage students to continue with their studies and remain in school.

Efficacy Differences of Emotion Regulation Strategies among Asian Americans and Caucasian Americans
Alison Yeung
Mentor: Susan Charles

Researchers in the past have suggested that behaviorally active coping mechanisms are most effective in emotional adjustment and that avoidance and active cognitive coping and cognitive reappraisal are less effective. However, the desirability of certain emotions and thoughts varies according to different thought processes, values, and motivations. Specifically, these elements are shaped largely by individuals’ cultural contexts; factors such as the voices of prominent leaders, various schools of thought and values, the degree of industrialization, and political institutions have played a role in augmenting the differences between Eastern and Western cultures. The objective of this study was to examine the cross-cultural efficacy differences of emotion regulation strategies employed by people oriented towards collectivistic and individualistic cultures, and how the use of different strategies may influence immediate emotional reactivity. Individuals who identified themselves as Asian Americans tended to embrace values of conformity to norms and emotional self-control more than those who identified themselves as Caucasian American. Asian Americans who reported social harmony as a goal were more likely to use cognitive reappraisal as an emotion regulation strategy, which was predictive of higher levels of positive affect.

Changes in Motivation of Non-Gifted Identified Students in the Presence or Absence of Gifted Identified Students and Effects on Academic Performance
Michael Yeung
Mentor: AnneMarie Conley

The National Association for Gifted Students estimates that three percent of students nationwide are gifted identified—students who show or have the potential for showing an exceptional level of performance. There is a long-standing argument over whether shared classrooms with gifted identified students provides for the needs of all students. The goal of this study was to examine the differences in achievement and motivation in gifted and non-gifted identified students and discover the possible consequences of shared classrooms. Analyses imply that despite distinct variation in achievement, there were no differences in achievement goal orientation and task value between gifted and non-gifted identified students. Differences in student self-efficacy existed but were not statistically significant. It can be concluded that student motivation is not affected by shared classrooms.
The Dark Side of Globalization
Tiffany Erica Yoshida
Mentors: Thomas Eppel & Wayne Sandholtz

Globalization is a positive force for the collaboration and leadership of nations, but also presents a “dark side” to the economies of countries. The dark side of globalization can be seen through drug networks, arms trafficking, alien smuggling, money laundering, intellectual property, and counterfeiting—just to name a few. The role of international law within the business of intellectual property rights and the counterfeiting of goods between China and the United States has been on the rise. China is the world’s most populous country, representing 20% of the world’s population with over 1.3 billion people. China is a nation making a fast transition from a command economy to a free market, yet it is not adhering to laws and regulations that are internationally recognized. The role of law enforcement and degree of consequence are primary reasons counterfeit continues to exist as a $16 billion dollar business in China alone. The counterfeiting business affects the national companies and corporations doing business in China and on a global scale, by applying the trademarks and patented material of a legitimate company to products that are fake. The main counterfeited goods are pharmaceuticals, software, apparel, jewelry, purses, DVDs, and auto parts—all of which contribute to the dark side of globalization. Globalization does not necessarily mean the continuation of the dark side; however, its elimination is not expected in the near future. However, there are preventative measures and possible solutions that may be enacted.

The Role of Cyclophilin D in ALS Pathogenesis
Stephen Yu
Mentor: John Weiss

Amyotrophic Lateral Sclerosis (ALS), a devastating neurodegenerative disease characterized by progressive motor neuron death and fatal skeletal muscle paralysis, affects thousands each year. Current models suggest that the G93A mutation and mitochondrial permeability transition pore (MPTP) opening regulated by the cyclophilin D protein may be implicated in some cases of ALS pathogenesis. In this study, we crossed cyclophilin D knockout (CypD-KO) mice with transgenic G93A mice to study the effects of cyclophilin D on disease onset, animal lifespan, and motor neuron pathology. Evaluated using the rotarod, the onset of symptoms in hybrid mice was found to be similar to that of transgenic mice, around day 120, with end-stage occurring at about day 130. Spinal cord slices stained for activated caspase-3, a marker for apoptosis, were found to be highly specific for motor neurons but not for astrocytes and glia. As expected, preliminary analysis of slices from pre-symptomatic day 60–70 G93A mice revealed many strong positively stained motor neurons, while slices from age matched hybrid mice showed lighter staining of motor neurons. Results suggest that cyclophilin D is implicated in the mechanism of ALS pathogenesis, and inhibition of this protein may offer some protection from apoptotic cell death. Further studies aim to determine the age of onset of apoptotic motor neuron death.

p-Type PbSe and PbS Quantum Dot Solids Prepared with Short-Chain Acids and Diacids
Mohammad Hossein Zarghami
Mentor: Mathew Law

We show that ligand exchange with short-chain carboxylic acids (formic, acetic, and oxalic acid) can quantitatively remove oleic acid from the surface of PbSe and PbS quantum dot (QD) films to yield p-type, carboxylate-capped QD solids with field-effect hole mobilities in the range of $10^{-4}$–$10^{-1}$ cm$^2$ V$^{-1}$ s$^{-1}$. For a given chemical treatment, PbSe devices have 10-fold higher mobilities than PbS devices because of stronger electronic coupling among the PbSe QDs and possibly a lower density of surface traps. Long-term optical and electrical measurements: (i) show that carboxylate-capped PbSe QD films oxidize much more gradually in air than do thiol-capped PbSe films; and (ii) quantify the slower and less extensive oxidation of PbS relative to PbSe QDs. We find that whereas the hole mobility of thiol-capped samples decreases continuously with time in air, the mobility of carboxylate-capped films first increases by an order of magnitude over several days before slowly decreasing over weeks. This behavior is a consequence of the more robust binding of carboxylate ligands to the QD surface, such that adsorbed oxygen and water initially boost the hole mobility by passivating surface states and only slowly degrade the ligand passivation to establish an oxide shell around each QD in the film. The superior hole mobilities and oxidation resistance of formic- and acetic-treated QD solids may prove useful in constructing efficient, stable QD photovoltaic devices.

Shine of the Renaissance Plan Blinds Residents to Implications
Jena Zarza
Mentor: David Smith

The urban phenomenon of gentrification alters both the business and resident populations of a city. Generally, studies on gentrification are conducted from a financial or economic point of view and are often completed in cities where the gentrification process has finished. The goal of this study was to examine gentrification from a public opinion point of view in a city where the gentrification process has just begun. An urban planning policy titled “The Renaissance Plan” was ratified in 2007 in the city of Santa Ana, CA, and aimed to improve the city’s economy through a variety of projects, including naming the process of gentrification as a specific goal of the plan. Randomly...
selected residents in the city of Santa Ana, CA were surveyed and interviewed on the topic of urban planning and changes in their neighborhoods. The results show that the majority of residents interviewed, in both high and low income ranges, supported the urban planning policy that names gentrification as a specific goal.

The War on the Drug Cartels: Options for Peace and Control
Suleika Zepeda
Mentor: Caesar Serereseres
Research has pointed out that drug trafficking organizations will exist as long as the illicit drug market exists. Since Mexican President Felipe Calderon declared war on drug traffickers and organized crime, more than 22,000 drug related murders have occurred, along with numerous arrests and extraditions to the United States. Yet, these efforts have not significantly affected drug trafficking operations—this is actually leading to the emergence of more traffickers. The weakening of the major cartels in México may lead to the birth of small cartels that could worsen their turf battles. The current strategy is more questionable. It has been called a failed war by some scholars. This study uses library data and interviews with professors and graduate students conducting research on drug cartels and violence. The purpose of the study is to question the possibility of negotiations between the government and drug trafficking organizations to end the war on drugs, an option that is rarely suggested and studied. Collaboration between the government and the drug cartels exists already at the micro level, which is known as corruption. This study examines the advantages and consequences of an alternative option—such as the Mexican negotiations between the government and drug cartels—to end the “war on drugs.”

Identifying Chemical Modulators of Cancer Cell Methionine Dependency
Mary Zhang
Mentor: Peter Kaiser
Cancer cells originating from a variety of different tissue types have been shown to induce cell cycle arrest, followed by cell death when grown under conditions that limit the amino acid methionine, but contain an ample supply of methionine’s immediate metabolic precursor homocysteine. In contrast, non-transformed cells under the same methionine starvation conditions retain their ability to proliferate normally. My experiments used a breast cancer cell line (MDAMB468) and methionine-independent derivatives of this cell line to analyze this pathway. I was interested in establishing a high-throughput format for a screen to identify small molecules that modulate the methionine-dependency of cancer cells. To achieve this goal, I developed assay conditions that would sensitize cells to activation of the SAM-checkpoint, the underlying cause of the methionine-dependency of cancer. Cell proliferation was monitored under varying methionine concentrations, and methionine levels that showed a slight reduction in the proliferation rate were chosen as the assay conditions. This assay has been used to screen the UCI chemical library. Initial hits from a partial screen are being reevaluated, and the remaining library is being screened. Identification of modulators of the methionine-dependency of cancer would be a major step towards novel strategies on systemic cancer therapy, because they would target a metabolic dependence that is unique to cancer cells, and is not seen in normal cells.

Group Projects

Effect of Increased Fibroblast Growth Factor 2 Levels on Telencephalon and Tectum of Chicken Embryos
Amanda Freise & Johnny Huang
Mentor: Georg Striedter
The purpose of this study was to investigate the effects of FGF2 on brain size in chicken embryos. To that end, we injected chicken embryos with FGF2 at embryonic day 4. We measured volumes of the telencephalon, tectum, and the rest of the brain from sections of embryonic day 7 and embryonic day 12 embryos stained with Giemsa. The data show that FGF2 induced significant expansion of the optic tectum, but not of the telencephalon, as previously thought. We suggest several reasons for these results: precursor proliferation in the tectum, the earlier exit of telencephalic cells from the cell cycle, delays in neurogenesis, and differences in FGF receptor expression between birds and mammals. We also highlight future studies that can be done to further investigate the functions, mechanisms, and importance of FGF2.

Influence of Spring Tides on the Population Dynamics of Fecal Indicator Bacteria in Southern California Coastal Waters
Neal Maler & Selina Singh
Mentor: Sunny Jiang
Fecal indicator bacteria (FIB) are organisms that are used to monitor and indicate water quality in coastal environments. Although FIB are not always pathogenic, their presence in recreational water indicates fecal pollution, which may ultimately lead to gastroenteritis and other illnesses in those exposed to the contaminated water. This project tested whether the retrieval of high tides causes coastal water quality degradation due to additional contaminants entering the water from land. Through understanding why and how FIB levels rise and decline, one can better prepare for unsanitary water conditions. Sampling was conducted during Fall and Winter at five different lo-
cations each within Dana Point, CA and Balboa Harbor, CA. Water samples were collected 1 hour before, during, and 1 hour after targeted tides on spring tide dates. The E. coli and Enterococci were identified by the membrane filtration method outlined by the EPA. Certain sites with higher FIB population densities demonstrated the expected trend that FIB levels increase with the onset of higher water levels. Through data analysis, it has been shown that FIB population levels vary within a short time period and the large variability is likely responsive to environmental conditions.

Processing of Nanocrystalline Aluminum by Cryomilling and CIPping
Jason Fung & Ronald Truong
Mentor: Farghali Mohamed

Nanocrystalline (nc) materials are novel materials whose metal grain size is in the range of 1–100 nanometers. These materials have unique features different from their conventional grain-sized counterparts. One method of obtaining these nc-materials is through a process known as cryomilling, which is the mechanical attrition of powders within a cryogenic medium. Conventional method of consolidating cryomilled powders such as high temperature isostatic pressing (HIP) requires high temperature which can lead to grain growth. In this project CIP was used to consolidate the sample. The resulting grain size of the CIPped samples is measured by using X-ray diffraction and transmission electron microscopy (TEM). Hardness and density of the CIP samples were also performed. The grain size of CIP samples are compared with HIP samples.

Drug Delivery System Using Electro-Active Polymer Valves and Efficient Electrodes Using Pyrolyzed Polypyrrole
Mark Shimada & David Szeto
Mentors: Lawrence Kulinsky & Marc Madou

Polypyrrole (PPy)-based MEMs devices have a wide range of applications in the biotechnology field. Research shows PPy-based MEMs devices can be used as an actuation mechanism for a time-release drug delivery system and a manufacturing method for a highly sensitive biosensor. In both applications, PPy-based MEMs devices can be fabricated with ease in large quantities. The research in the applications of Polypyrrole takes advantage of its unique material properties to produce efficient and reliable MEMs devices. One of the achievements is the creation of the PPy-based three-dimensional high surface area electrodes ideally suited for such electrochemical applications as biosensors and microbatteries.

Modulation of Glycosylation of Cystic Fibrosis Transmembrane-Conductance Regulator
Wen Hsin Chang & Gevork Tatarian
Mentor: Michael Demetriou

The intent of this study is to observe the rescuing effect of glycosylation on defective cystic fibrosis transmembrane-conductance regulator (CFTR) in cystic fibrosis cells. Cystic fibrosis (CF) is a hereditary autosomal recessive disease that affects the conductivity of chloride ions in epithelial cells. CF patients suffer from frequent lung and sinus infections, gastrointestinal and endocrine problems, infertility, and shortening of life-expectancy. CF is caused by mutation in the CFTR gene. The most common cause of disease is the mutation at 508th amino acid position, which results in a loss of phenylalanine. This mutation, though, is thought to produce functional CFTR protein, results in defective N-glycosylation and reduced cell surface expression. Glycosylated protein interacts with glectin, promotes surface retention, and opposes loss by endocytosis. We hypothesize the increase of N-glycan by addition of metabolites such as N-acetylgalactosamine (GlcNAc) on CFTR can help provide protein stability on the cell surface. A 15% increase of CFTR on the cell surface has been observed in the GlcNAc treated cells. A functional channel efflux assay indicates a difference in ion conductivity in the treated cell, requiring less forskolin for channel activation compared to untreated control cells. An influx assay reveals minimal difference in conductivity between the treated cells and control. Although only a small difference is observed between the treated and untreated cells in the influx assay, the difference in the efflux assay and cell surface expression suggests a possible rescuing effect with metabolites should be further studied.

Degradation of Antidepressant Pharmaceuticals Using Free Radical Chemistry
Brian Nguyen & Francis Rodriguez
Mentor: William Cooper

Trace levels of pharmaceutical compounds are ubiquitous in nature and have recently been classified as emerging contaminants of concern. This experiment focuses on three main antidepressant compounds—duloxetine, venlafaxine and bupropion—as they are found in wastewater and surface waters across the United States. Conventional wastewater treatment facilities are not effectively removing these antidepressant compounds and, therefore, this experiment explores removal mechanisms with three reactive species: hydroxyl radicals, hydrated electrons, and singlet oxygen. Hydroxyl radicals, however, have proven to provide the fastest reaction with orders of magnitude at least one or two times greater than hydrated electrons, or singlet oxygen reaction. This experiment requires the use of an Ultra Violet light and Solar Simulator to degrade the antidepressant compounds at varying periods of time to de-
Chest radiographs (chest x-rays) are one of the most common radiographic studies ordered in the Emergency Department of a hospital, with an estimated 22 million carried out every year. Chest radiographs expose patients to unsafe radiation, impose radiographic costs of over $900 million yearly, and also contribute to hospital over-crowding. This study aims to create a decision-rule for patients with blunt trauma, using clinical criteria to distinguish patients who have little to no risk of significant acute intrathoracic injury requiring urgent care as evident in chest radiographs. Executing these criteria will decrease the number of chest radiographs ordered for blunt trauma patients without overlooking significant intrathoracic injuries, potentially saving money and radiation for patients and hospitals alike. For every patient enrolled in this study, basic demographic information is noted, along with the mechanism of the trauma. In addition, patients are assessed for whether the patient: is above 60 years of age, was injured through rapid deceleration, has chest pain, has a distracting painful injury, is intoxicated, shows any impression of altered mental status, and has chest wall tenderness. In addition, all radiographic procedure reports relevant to the thoracic region are looked at to determine if intrathoracic injury incurred. Chest radiographs, chest computed tomographys, and abdominal computer tomographys are considered. Injuries noted are paralleled with the above criteria. The study is currently ongoing. Many blunt trauma patients who received chest radiographs are expected to have a low risk of significant intrathoracic injury given the absence of the above clinical criteria, and at least 99% of blunt trauma patients with significant intrathoracic injury are expected to be positive for at least one of the above clinical criteria.

From Dreams to Waking Life
Audrey Nguyen & Christine Ta
Mentor: Larry Jamner

Past studies investigating the effects of waking life on dreams have found that affective intensity of experiences during waking life predicts the affective content of dreams. This study examined the effects of affective dream content on wakeful moods. We hypothesized that affective dream content determines wakeful moods (i.e., negative affect dream content results in negative wakeful moods, while positive affect dream content results in positive wakeful moods). Our objective was to gain a better understanding of the impact dreams have on mood during subsequent waking life by examining the relationship between dream content and next-day mood reports. Four males and four females, aged 19 to 22, have fully completed the study thus far. Verbal dream reports were collected immediately following the last REM stage of a participant’s sleep cycle, as detected and signaled by a sleep actigraph that was worn. Self-reported moods were collected multiple times per day for five days using a Palm Pilot personal digital assistant. Dreams were assessed using the Hall/Van de Castle coding system. Results are being discussed in respect to their implications.

Dynamic Microbial Production of Greenhouse Gases in Secondary Activated Sludge: N₂O Production from Wastewater Treatment Processes through Aerobic Denitification
Kathryn Lehr & Shayna Mcelveny
Mentor: Betty Olson

The denitrification process in wastewater treatment is an important bio-reaction. An incomplete process of denitrification caused by the presence of oxygen results in significant emissions of a greenhouse gas; nitrous oxide. Various types of heterotrophic bacteria are responsible for this reaction in conventional activated sludge; of these bacteria we targeted Paracoccus and Pseudomonas. We investigated the bacterial community of a wastewater treatment plant over a one-year period. Using molecular techniques such as PCR and qPCR assays to examine the environmental samples, we were able to validate the current molecular methodology in use and the significance of aerobic heterotrophic bacteria in activated sludge.
laser speckle imaging (LSI) and fluorescence imaging. It was hypothesized that damage to the blood vessels would promote VEGF activity, thus starting the formation of new vessels and the dilation of existing ones, leading to a disruption of flow followed by an increase over time. Mean blood flow values quantitatively reveal a reduction in flow after laser, as well as a steady increase in flow due to recovery. The SFI and GFP images suggest that deprivation of oxygen to a specific area will induce VEGF promoter activity in that site, as illustrated by fluorescence seen in multiple mouse window chambers. Moreover, the data reveal apparent angiogenesis and collateral vessel perfusion, which both contribute to vascular repair in tissue.

**The Role of Extracellular Matrix Components in the Induction of Ectopic Blastemas in Ambystoma mexicanum**

Rachele Mariano & Tiffany Vu  
*Mentor:* David Gardiner

As embryos, all vertebrates have totipotent cells, allowing them to regenerate any body part. However, after the embryonic stage, they can no longer undergo regeneration. Fully-developed salamanders, particularly the axolotl (*Ambystoma mexicanum*), still retain the ability to regenerate any part of their body following an injury. The pathway that most vertebrates undergo when injured is scar tissue formation. Axolotls, however, do not form scars. Their cells have the ability to dedifferentiate and form ectopic blastemas. Axolotl cells also contain positional information—information that is involved with where cells are located in the body during development. Through nerve deviations and extracellular matrix (ECM) grafting, the axolotl wound healing process and the interaction between limb components of differing positional values have been observed. It is shown that urea-treated anterior ECM, when grafted into an anterior wound site, does not produce an ectopic blastema. However, urea-treated posterior ECM grafts do result in asymmetric, ectopic blastema formation. Anterior ECM grafts treated with urea and the enzyme heparitinase-III (HepIII) also result in blastema development. Although the molecular process for blastema formation is not known, there is evidence that heparan sulfates within the ECM play a regulatory role in growth factor activity and act differently in anterior ECM and posterior ECM.

**SPOT Synthesis Tripeptides may Reveal Unfavorable Interactions Related to Mutant Human γ-S-crystallin (G18V)**

Alvin Kung & Wesley Yan  
*Mentor:* Rachel Martin

The human eye lens consists of structural proteins called crystallins that are responsible for maintaining the high transparency and high refractive index of the eye lens. When these proteins are damaged due to either UV light or mutated by an inherited genetic predisposition, they can misfold and form insoluble aggregates that can precipitate in the eye lens and form cataracts. Currently, the only treatment for cataracts is the removal of the cataractous eye lens followed by replacement with an artificial intraocular lens. However, if the unfavorable interactions between the mutated proteins could be disrupted, a treatment for cataracts may be developed. To do this, binding assays with tripeptides synthesized by SPOT synthesis and fluorescently labeled wild type and G18V S-crystallin were screened for sequences that bound to G18V and not wild type. These sequences reveal information about where the unfavorable interactions between the proteins occur and may be able to disrupt protein aggregation. Further binding assays and surface plasmon resonance will aid in additional screening of the tripeptides that bind positively to G18V.

**Quantitative Determination of Diamantane in Nanocrystalline Aluminum Stabilized with Diamantane by Using GC-MS**

Garron Tou & Steven Westermire  
*Mentor:* Farghali Mohamed

Nanocrystalline aluminum stabilized with Diamantane is processed by cryomilling. The addition of diamantane inhibits grain growth in nanocrystalline aluminum. It is crucial to determine quantitatively the amount of Diamantane in the nanocrystalline alloy. The purpose of this experiment is to create a calibration curve to determine the amount of diamantane embedded in aluminum samples. Adamantane is used as an internal standard to improve the overall precision of the experiment. Using Gas Chromatography-Mass Spectrometry (GC-MS), the area peak ratios of diamantane to adamantane were calculated to create the calibration curve. This result allows for analysis of the amount of diamantane in cryomilled aluminum samples stabilized with diamantane.

**The Protective Effects of Estrogen on bEND Cells**

Mengying Guo & Felicia Wong  
*Mentors:* Sue Duckles & Diana Krause

Evidence has shown that women have longer life spans and reduced cardiovascular disease than men because of the protective effects of estrogen. Pre-menopausal women are less likely to suffer vascular diseases like ischemic strokes, and the risk increases greatly postmenopausal. Estrogen has the potential to reduce and protect against stroke, atherosclerosis, Alzheimer’s disease and other age-related disease. Our lab is working to understand estrogen’s protective effects on the brain and brain blood vessels. We have found that estrogen has important protective effects on mitochondria, reducing reactive oxygen species and increasing mitochondrial efficiency. We are especially interested in the endothelial cells that line the blood vessels because of the key role they play in keeping the blood ves-
sels healthy. Currently we are validating a culture model of immortalized mouse brain endothelial cells (bEND.3 cells) to use to explore mechanisms of estrogen action. In particular, we are measuring endothelial and mitochondrial proteins by Western blot, such as cytochrome c and manganese superoxide dismutase. In addition, we have developed an assay to measure mitochondrial free radicals, that is, measurement of aconitase activity.

Diverse Perceptions of Participation in the National Children's Study (NCS) in Orange County, California
Hazel Alvarenga & Tuyet Hong Thi Tran
Mentor: Kimberly Lakes

U.S. minority populations are underrepresented in biomedical research. When people from diverse ethnic and racial backgrounds are not included in research, restricted variability on key independent variables occurs, raising questions about the reliability and validity of associations found. Moreover, underrepresentation of minorities in research limits our ability to address health disparities for these populations effectively. However, attempts to expand research participation may face unanticipated challenges in recruitment, retention and informed consent as cultural beliefs and prior social experiences introduce new and diverse perspectives on the research process. The objective was to describe the experiences, perceptions, attitudes and values that are brought to bear when individuals from different racial and cultural backgrounds consider participating in biomedical research. Fifty-six diverse women and men participated in focus groups facilitated by researchers. Group sessions were audio-recorded, transcribed verbatim, and analyzed using qualitative thematic methods. Themes emerged in the following areas: concerns about privacy, the length of the study, trust between communities and science representatives, the burden of study visits, expectations for the research relationship, participation risks, scope of commitment implied by informed consent procedure, compatibility of research protocol with general cultural beliefs/values, and decision-making processes. A major facilitator of participation was the potential return of information that might help a subject's child. The findings indicate that, to recruit diverse participants, it is return of information that might help a subject's child. The return of information to families and communities.

Analysis of Local Texture across Layers in Electron-Beam Melted Ti-6Al-4V via Electron Backscatter Diffraction
Brandon Saller & Travis Van Den Vlekkert
Mentors: Farghali Mohamed & John Porter

Ti 6Al-4V (Ti 6-4) is an aerospace and biomedical titanium alloy of 6% Aluminum, 4% Vanadium, and 90% Titanium. Ti 6Al 4V (Ti 6-4) is an aerospace and biomedical titanium alloy of 6% Aluminum, 4% Vanadium, and 90% Titanium. A major facilitator of participation was the potential return of information that might help a subject's child. The findings indicate that, to recruit diverse participants, it is return of information that might help a subject's child. The return of information to families and communities.

Mentors:
Brandon Saller & Travis Van Den Vlekkert

PDMS and In-Chip Compressive Immobilization and Maintenance of C. elegans
Philip Chao & Brandon Wong
Mentor: Elliot Hui

Since assays of vertebrate animals require expensive and complex instrumentation, researchers have targeted Caenorhabditis elegans as a model organism to explore the intricate web of genetic interactions that have already been identified but not understood. Due to the micro-scale nature of C. elegans (~40–50 μm in diameter and 1 mm long), immobilization is difficult; however, laser ablation of neurons, high resolution microscopy, and analysis of cellular development and gene expression all require C. elegans to be almost motionless before experimentation. Unfortunately, popular immobilization techniques are either irreversible, tedious, or change the natural biochemical state of the worm. The objective of this project is to create multiple adjacent semi-cylinders extruding from poly(dimethyl siloxane) (PDMS) as a platform to immobilize Caenorhabditis elegans in a configurable manner. Through gradual compression, a specimen is immobilized between the peaks and valleys formed from the extruding semi-cylinders. Early analysis of the device has demonstrated successful immobilization of C. elegans without affecting the health of the specimen or its progeny. Successful characterization of the device should lead to various laser ablation experiments to demonstrate functionality of the platform.

Toxicological Responses to Bacillus thuringiensis israelensis: Mortality Comparisons Between Two Vernal Pool Inhabitants
Catherine Drake & Linda Kim
Mentor: Peter A. Bowler

From 1999 to 2002 six vernal pools were created along the southwestern edge of the University of California Natural Reserve System's (UCNRS) San Joaquin Freshwater Marsh Reserve. The created pools were inoculated with dried benthic samples from a series of small vernal filled basins.
that were taken from the UC Irvine main campus. Resilient populations of *Brachinecta lindabli* and half a dozen vernal pool vascular plant indicator species developed and have been appearing annually as the pools fill with winter rain. The pools also sustain mosquito larvae, and the application of BTI, a *Bacillus thuringiensis israelensis* derived larvicide used to reduce mosquito larval presence, was suggested. Before using BTI, however, we tested its impact on *Brachinecta lindabli* individuals and other invertebrates recovered from the pools. A sequence of nine tests was conducted in which the recommended dosage of liquid BTI was applied to microcosms containing vernal pool water and ten individuals of the fairy shrimp, as well as mosquito larvae and other invertebrates from the pools. BTI has been reported to have no impact and cause no mortality to other species of fairy shrimp, but toxicity effects for *B. lindabli* have not been previously investigated. Our results indicate that BTI kills mosquito larvae within hours, but does not appear to be toxic to *Brachinecta lindabli*. In most of the tests, no mortality occurred during the first few days after treatment, and subsequent mortality followed the general pattern of natural mortality in the controls.

**Prospective Evaluation of Ultrasonographic Measurement of the Optic Nerve Sheath Diameter and Invasive Monitoring of Intracranial Pressure**

Stacy Hata & Thuy-Chung Nguyen  
*Mentors:* John Christian Fox, Shahram Lotfipour & Warren Wiechmann

Numerous studies have suggested that ultrasonographic measurement of the optic nerve sheath diameter (ONSD) may be clinically useful in determining the presence of elevated intracranial pressure. A prospective blinded observational study was performed using a convenience sample of adult patients with invasive intracranial pressure (ICP) monitors in the neurosurgical intensive care unit of a level-I trauma center. Forty-nine patients were enrolled by 8 EPs. One EP enrolled 28 consecutive patients, and separate analyses were performed on this subgroup. Elevated ICP (>15mm Hg) was found in 28.6% of patients. Ultrasound had a sensitivity of 42.9% and a specificity of 74.3% to detect an abnormal ONSD. Linear regression analysis showed no significant correlation between ICP and ONSD. The subgroup analysis showed elevated ICP in 39.2% of patients. Ultrasound had a sensitivity of 45.5% and specificity of 100%. Linear regression in this subgroup showed significant correlation between ICP and ONSD. This subgroup was compared to the remaining EPs, who enrolled 21 patients of whom 3 had elevated ICP (14.3%). Sensitivity and specificity were 33.3% and 50% respectively. Linear regression showed no significant correlation in this subgroup. These data show that ultrasound has poor sensitivity in measuring abnormal ONSDs in the setting of increased ICP and that there is no statistical correlation between these values. However, the data suggest that the correlation between ICP and ONSD is operator dependent, and increased exposure to ocular ultrasounds can improve the precision and accuracy of ONSD measurements.

**The Prospective Role of Bedside Ultrasound in the Emergency Department in Determining Treatment of Ureteral Calculi**

Bhakti Patel & Jim Tran  
*Mentors:* Eric Chin, John Christian Fox & Shahram Lotfipour

The gold standard for diagnosing patients who present to the Emergency Department (ED) with renal colic is computed tomography (CT scan). However, CT imaging is a source of radiation which increases the risk of cancer. A possible alternative is ED ultrasound, which reduces radiation and is much more cost-effective, to measure urine jet frequencies. If a significantly reduced urine jet frequency can be positively correlated to stones greater than 4mm in diameter, we would then suggest that these patients undergo CT scans after bedside ultrasound. The relative jet frequency (RJF) was defined as the number of bladder jets on the symptomatic side divided by the total jet frequency. Specifically, an RJF of less than 35% of the unaffected side will be defined as abnormal and obstructed. Patients who presented to the ED with renal colic were identified and a 4-minute ultrasound of the bladder was performed to count the number of urine jets on both the right and left sides of the bladder. We then compared the ultrasound imaging to the CT scan to determine the location and size of the kidney stone. Sixty-three patients were enrolled, and 20 were excluded for having three or fewer jets. Using RJF of less than 35% to detect the presence of uretal calculi was 87.5% sensitive and 100% specific. Analysis also suggests that kidney stones larger than 4 or 5 mm in diameter obstruct the path of urine from the kidney to the bladder and so result in a greatly reduced urine jet frequency on the side with the kidney stone compared to the contralateral asymptomatic side. Therefore, bedside ultrasound may be a useful diagnostic test for the presence of ureteral calculi in the emergency department.

**Cryomilling of Aluminum Sheet**

Kyle Magnuson & Christopher Stone  
*Mentor:* Farghalli Mohamed

Cryomilling metal powders is one of the primary methods used to produce nanocrystalline (NC) and ultra fine grained (UFG) materials whose grain sizes are in the range of 1–100 nanometers (nm) and 200–700 nm, respectively. After cryomilling, the powders need to be consolidated. In this project the starting material is in bulk form, in contrast to the conventional cryomilling method in which metal powders are the starting material. This helps limit con-
tamination and eliminates a step that requires consolidation. Preliminary results are shown in this presentation. This method has yielded some very promising results, with the hardness profile through the thickness indicating an increase in local strength. The microscopic structure of cryomilled sheets for different times is also presented.

Aesthetics of Brow Shape
Ashley Hamamoto & Tiffany Liu
Mentor: Brian Wong
Eyebrows, the hairs above the eyes that follow the shape of the brow ridges, play a significant role in an individual’s expression of emotions and nonverbal communication. They also serve as a reference to which other angles and contours of the faces are aligned. The static shape of the brows is an integral element of expression, and altering brow shape is a major revenue source for the 250,000 salons in the U.S. Our research aims to determine if an ideal brow shape exists. We selected 10 symmetric faces from our existing database of 300 synthetic Caucasian women’s faces. For each face, we altered the brow shape using Photoshop. Brow shape was altered in three ways using guidelines established by internationally recognized lay experts and in accord with the conventional approach as advocated in art and plastic surgical textbooks. We organized the photos in the form of an electronic survey and used both focus groups and Internet-based methods to rate the photos based on attractiveness using an ordinal scale. The data we collected and analyzed revealed the impact of the eyebrow shape on the perceived aesthetics of an individual.

Design and Fabrication of a Fully Encapsulated Microfluidic Diagnostic Device
Janice De Jesus & Transon Nguyen
Mentor: Elliot Hui
A fully integrated “lab-on-a-chip,” or LOC—a device that takes large-scale laboratory processes and builds them into a single chip—has several biomedical applications, including biochemical assays and disease detection. In addition to their small size and portability, the fact that most LOC devices are pneumatically driven has significant global health implications, as resource-limited areas around the world may lack the ability to power traditional diagnostic machines. Unfortunately, many current LOC devices lack true portability due to their use of multiple external sources of control. To alleviate this problem, our proposed design bases the microfluidic circuitry and logic of a LOC off of equivalent transistor-based electrical circuits. This similarity to electronic logic allows us to take advantage of circuit designs from a well-established logic family, thus allowing for the design of intricate pneumatic devices capable of complex operations. In conjunction with microfluidic circuits, hydrogels have been demonstrated as a material capable of analyte detection, due to their ability to grow and shrink in response to chemical stimuli. Because this proposed technology is still relatively new, certain fundamentals were established first. Research was conducted on the optimization of hydrogel formation, as well as the analysis of hydrogel swelling in response to stimuli. Such factors are essential for understanding how hydrogels can be incorporated into a diagnostic LOC. In the future, we intend to design a circuit that can precisely “read” such swelling and give an output based on hydrogel response, essentially unifying our research on microfluidic logic and hydrogel behavior.

Delicious Solar Technology
Sarah Ewing & Sean Marquez
Mentor: Hung Nguyen
With the rising need for renewable sustainable forms of transportation, recent research has resulted in fuel cell and battery powered electric vehicles being developed. However, there are limitations to these technologies. For example, hydrogen fuel cells need to maintain pressurized hydrogen storage tanks, and battery powered electric vehicles have a limited charge capacity and require a substantial amount of time to recharge. With a solar powered vehicle, we eliminate the need for pressurized gas and safety hazards that persist with acid based batteries, while still maintaining a minimal environmental impact. In addition, compared to fuel cell and battery powered forms of transportation, which require expensive forms of fuel, solar energy is free. DSSC (Dye-Sensitized Solar Cell) Technology generates energy from the sun by using cheap, harmless, readily available materials such as Titanium Dioxide (a material found in powdered donuts, toothpaste, and sunscreen lotion) and blackberries. The first process occurs when a photon from the sun is absorbed in the dye molecule that binds to the TiO2 (Titanium Dioxide), where an electron is then excited from the TiO2. It then enters the conductive layer, where it generates current to do work, and returns to the cell. Compared to other solar technologies, such as organic PV at about 6% efficiency, DSSC is a fairly efficient solar cell that manages almost twice the efficiency. By calculating the required solar cell dimensions for the required load demand, we can further estimate the performance of this technology for a life-sized vehicle.

A Retrospective Analysis Comparing Reported Alcohol Use Through a Medical Screening Exam at Triage and Computerized Response in the Emergency Department
Narciso Caceres & Omar Sandoval
Mentors: James Howard & Shahram LotfiPoul
Efforts to alleviate alcohol-related illness, injuries and, ultimately, cost are being carried out in Emergency Departments via screenings and brief interventions. Using the Emergency Department for early intervention is particu-
larily pivotal since an estimated 860 million annual visits to the Emergency Department can be attributed to alcohol related problems. The primary objective of this study was to investigate if the reported alcohol consumption responses provided by the patients are different between those given to the nurses during triage, versus the responses given through the computerized alcohol screening questionnaire/intervention, CASI. A retrospective chart review of the CASI database and the Medical Screening Examination (MSE) questionnaires are currently being analyzed. The results are still being analyzed but will be used to formulate correlations between quantities of alcohol consumption across different demographic parameters such as gender, age, language, AUDIT, and CAGE questionnaire. These results will demonstrate if electronic screenings lead to more honest responses when investigating alcohol consumption.

The Relationship Between Wrongdoing and Children’s Emergent Understanding of Truth and Lies

Bianca Barrios & Mayra Jimenez

Mentor: Jodi Quas

Research on children’s understanding of truth and lies indicates that this understanding develops around age four, and there is evidence that children first understand the moral connotation of a lie before they understand the definition. This suggests that young children who believe that any report of a wrongdoing is a lie may misinterpret scenarios involving truthful statements about acts of wrongdoing. This study tested this hypothesis. Fifty-one 4½- to 6-year-old children were presented with a series of vignettes in which two characters performed either good or bad acts and then told either the truth or a lie about their actions. Children were asked which boy told the truth/told a lie. The data was analyzed using a repeated measures analysis of variance (ANOVA) with condition (good or bad act) and report (truth or lie) as within-subject factors, age (3, 4, 5, and 6) as a between subjects factor, and summed accuracy scores as the outcome variable. Developmental improvements were evident, with 6-year-olds, \( M = .59 \), performing significantly better than 4-year-olds, \( M = .59 \), and 5-year-olds, \( M = .73 \). Children preformed better on conditions involving a good act, \( M = .85 \), compared to bad acts, \( M = .65 \); however, there was a significant gender X condition interaction, indicating that performance by condition differed for females only. These results indicate that wrongdoing can influence young children’s understanding of truth and lies. The theoretical and legal implications of these findings will be discussed.

Causes and Consequences of the Erosion of Emergency Department On-Call Panels and the Effect on Higher-Level-of-Care Inter-Hospital Transfers

Thuy-Chung Nguyen & Jimmy Tran

Mentor: Omar Amr, Shrahram Lotfipour & Michael Menchine

Recent literature notes a growing trend of deficiency in on-call specialist availability and an increasing need for higher level of care (HLOC) transfers for emergency department (ED) patients. The purpose of this retrospective study is to assess the financial implications to a university trauma center that frequently accepts transfers for HLOC. A chart review was conducted of all patients transferred to the University of California, Irvine Medical Center (UCIMC) from an outside ED for HLOC between January 1, 2007 and March 31, 2008. Charts identified were reviewed to determine the HLOC service received, patient characteristics, and the source of expected funding. Charges, costs, and collections were determined from the hospital financial services. Results indicated that UCIMC received a net gain of $2,576,200 during the 15 months covered by this study. Reimbursements varied drastically with insurance type. 39.9% were Medical/Medicaid with an average cost of $15,316, reimbursement of $7,734, a net loss of $2,168,510. 38.6% were private insurance; their average cost was $16,325 and reimbursement $36,697 for a net gain of $5,643,088. 10% were Medicare patients with an average cost of $26,095, average reimbursement of $28,433, net gain of $168,339. 7.1% uninsured/self pay with a cost of $16,746, reimbursement of $3,401, net loss of $680,557. 4.3% were MSI with an average cost of $22,768, reimbursement of $10,311, with average loss of -$368,160. The data suggests that hospitals receiving HLOC transfers could suffer financial harm from accepting a greater proportion of uninsured or Medicaid or MSI patients in comparison to hospitals that receive transfers with private insurances.

A Search for Eclipsing Binary Star Systems

Jesse Campbell & Ketron Mitchell-Wynne

Mentor: Tammy Smecker-Hane

For low mass stars, significant discrepancies exist between their observed physical parameters \( (i.e., \text{mass and radius}) \) and theoretical predictions of stellar evolution models. By accurately measuring the light curves of eclipsing binary star systems that contain low mass stars, we can accurately measure their stellar parameters. Our research team has monitored four candidate eclipsing binary systems provided to us by Scott Fleming (Univ. of Florida), who had previously found them to be spectroscopic binaries with periods ranging from 4.6–9.4 days. Using the UCI 24-inch telescope and ST9 CCD camera, our team observed a total of 64 nights over a 5-month period (5% temporal cover-
Role of Acetylcholine in the Arcuate Nucleus during Long-Lasting Electroacupuncture Inhibition of Cardiovascular Pressor Reflexes
Sarah Nisar & Kien Tran
Mentor: Stephanie Tjen-A-Looi

Previous studies have shown that electroacupuncture (EA) causes inhibition of cardiovascular reflex responses through the excitation of the arcuate nucleus in the hypothalamus, which excites the ventrolateral periaqueductal gray (vLPMG) in the midbrain, inhibiting the rostral ventrolateral medulla (rVLM) in the brain stem. However, little is known about the specific chemicals and mechanisms involved in the activation and inhibition of these nuclei. We hypothesized that acetylcholine is a major neurotransmitter that plays a role in the activation of the ARC during applied EA. Experiments were performed on α-chloralose anesthetized cats in which the gallbladder was exposed. Repeated pressor reflexes were induced by applying filter paper soaked in bradykinin to the surface of the gallbladder every 15 minutes. EA was then applied at pericardial meridian acupoints (P5–6) for 30 minutes, which inhibited changes in mean arterial blood pressure (MAP) from each pressor reflex. An acetylcholine receptor antagonist, atropine, was then microinjected into the ARC while MAP was monitored. In addition, acetylcholine was microinjected into the ARC of separate cats that had not undergone EA. Results show that atropine in the ARC reversed EA’s inhibitory effect on blood pressure changes. In addition, acetylcholine in the ARC was able to mirror the effects of EA by inhibiting changes in MAP from induced cardiovascular pressor reflexes. These results suggest that acetylcholine is involved in the activation of the ARC and that acetylcholine receptors are present in the ARC. The activation of these receptors is important in producing the effects of EA.

The Inflammatory Response to Brain Death and its Effects on the Suitability of Organs for Donation and Recipient Graft Function
Matin Khoshnevis & Tony Le
Mentor: Darren Malinoski

The inflammatory response to brain death affects the number and quality of organs suitable for donation. Hypertonic saline (HTS) has been shown to lessen the inflammatory response to hemorrhagic shock, but this has not been studied after brain death. 35–42 kg swine were anesthetized and had femoral artery and jugular venous catheters placed. An epidural balloon catheter, subdural intracranial pressure (ICP) monitor, and a subdural laser Doppler flow probe were placed. Brain death was induced by inflating the balloon and confirmed by a decrease in flow to <15% of baseline, ICP persistently greater than mean arterial pressure (MAP), and fixed/dilated pupils. Animals were then allocated to receive either a 4cc/kg bolus of 0.9% NaCl after brain death (NS, n=4), 7.5% NaCl bolus after brain death (HTS, n=6), or no brain death at all (SHAM n=6). Blood pressure was maintained at greater than 35mmHg for 6 hours with 2cc/kg boluses of NS and serum levels of IL-6, IL-10, and TNF alpha were measured at baseline and after 6 hours. All cytokines increased over time in both groups. Increases in IL-6, IL-10, and TNF alpha were less with HTS, but did not reach statistical significance. Future studies that increase the duration of the brain death phase and add to our sample size are planned.

Target for Mycobacterial-Drug Development: Mycobacterium tuberculosis Acyl-CoA Carboxyltransferase
Jessica Yang & Kimberline Yang
Mentor: Sheryl Tsai

The tuberculosis pathogen has become a dangerous bacterial infection worldwide because of its latency and resistance to current antibiotics due to its thick, waxy cell wall containing highly branched fatty acids. The cell wall is important for pathogen virulence, survival and latency. The enzyme that is necessary for the biosynthesis of the precursors for these fatty acids is acyl-CoA carboxylases (ACCases). By inhibiting the activity of this enzyme, the cell will be vulnerable to the effects of antibiotics because it no longer has the fatty acids contained in the protective cell wall. Individual subunits of this enzyme have been purified by affinity column chromatography to study the specificity of the enzyme for particular substrates and develop inhibitors for the protein active sites. The interaction between the individual subunits has never been studied. However it has been found that certain subunits such as an alpha subunit, AccA3, require other subunits, a beta subunit called AccD4, for the complete enzymatic reaction. Studying this alpha/beta subunit interaction allows for further research into understanding the interaction between the subunits of ACCases for the first time. This knowledge can eventually lead to development of new anti-tuberculosis drugs.

Exploring Self-Righteousness as Compensation for Lack of Perceived Control and Self-Esteem
Bojana Sandic & Marcus Solomon
Mentor: Susan Charles

Self-righteousness is conceptualized as the tendency to believe one’s own beliefs are correct and that the beliefs of others are wrong. An online questionnaire was used to
examine self-righteousness as a means of compensation for a lack of perceived control by developing it as a personality trait. Pilot test findings revealed that participants with higher levels of self-righteousness had lower mean scores of perceived control and lower mean scores of self-esteem. Although these results are preliminary, it is believed that these trends will become significant correlations as the data collection process continues. These findings support the hypothesis that self-righteousness may be an attempt to compensate for a lack of perceived control over the world; if this is the case, then self-righteousness is as much a coping strategy as it is a personality trait.

**Single Cell Resolution Circuit-Wide Imaging of *Drosophila* Clock Neurons in Whole Brain**

Steven DeGroot & Kelly Parson  
*Mentor*: Todd Holmes

Clock controlled circadian rhythms coordinate biological functions in virtually all eukaryotes and some prokaryotes. Malfunction of the circadian clock is implicated in many diseases, including diabetes and cancer. Animals have dedicated neural circuits in the brain that act as timekeepers for clocks distributed in the rest of the body. To further understand a model brain circadian circuit, we are implementing a sensitive live culture imaging procedure that allows us to observe multi-day continuous cycling of circadian clock promoter activity at single cell spatial resolution for the entire circadian circuit in a whole brain preparation. This is not achievable using standard existing technology such as immunocytochemical staining of clock proteins. To implement our imaging procedure, culture conditions had to be optimized, and we sought to develop behavioral assays that would allow us to image circuit activity similar to standard light-dark cycles as seen in the normal alternation of day and night. Low resolution anti-clock protein immunocytochemistry was used in parallel to generate a source of reference images. Finally, several trans-gene and mutant genotypes were combined in uniform genetic backgrounds that are capable of being imaged. We determined several culture parameters that are necessary for imaging and behavioral conditions that are optimal for imaging. Work on immunocytochemical reference images and generating uniform genetic backgrounds is in progress. We have applied these optimization improvements to our imaging procedure and results are shown.

**Comparing Semantic Role Labeling with Typed Dependency Parsing in Computational Metaphor Identification**

Christopher Pestano & James White  
*Mentor*: Bill Tomlinson

Metaphor, the partial framing of one concept in terms of another, pervades human language and thought. Eric Baumer’s Computational Metaphor Identification (CMI) system, along with the visual exploration tool metaViz, is an automated assistant for discovering metaphorical language in electronic text, with a variety of applications in creative and critical thinking. The existing implementation of CMI relies on the Stanford typed dependency parser, and is limited in the variety of grammatical relationships that can be recognized as employing the same metaphor. My work has been to address that limitation and hopefully enhance CMI by integrating a parser that performs Semantic Role Labeling (SRL). The RelEx dependency relationship extractor (http://opencog.org/wiki/RelEx) was successfully integrated with CMI and was demonstrated to unify at least some potential metaphors expressed in both active and passive phrases. The limitations of RelEx and the complex nature of semantic roles also identifies SRL as a developing technology. An open question is whether using SRL yields results that are more effective for the users of CMI.

**The Role of NRP in the vlPAG Inhibition of the rVLM Neurons and Pressor Response**

Michael Chau & Harry Do  
*Mentor*: Peng Li

Cardiovascular disease is known to be the leading cause of deaths in the world, with hypertension being one of many cardiac risk factors that may lead to lethal cardiac abnormalities. There are currently many preventive medications that lower these risks. A new popular alternative of treatment includes electroacupuncture (EA), which has long been used for its therapeutic effects in normalizing abnormal physiological conditions, and may minimize complications seen through more Western approaches to cardiac disease. Previous studies have shown that the EA activates the ventrolateral periaqueductal gray (vlPAG), which inhibits the activity of the rostral ventrolateral medulla (rVLM), the cardiovascular sympathoexcitatory nuclei. Other studies have shown that the nucleus raphe pallidus (NRP) also regulates rVLM activity. This study analyzes the possibility of an indirect projection from the vlPAG to rVLM through glutamate projections to NRP by using cellular neuronal recording coupled with hemodynamic analysis post-injection of glutamate agonist and antagonist, D,L-homocysteic acid and kynurenic acid (KYN). The results of the experiment strongly correlate with the hypothesis that there is an indirect pathway from the vlPAG to the rVLM pass through NRP.

**Male Reproduction as a Predictor of Death in *Drosophila melanogaster***

Christopher Monsour & Xuan Tran  
*Mentor*: Laurence Mueller

Fecundity death spiral in female *Drosophila melanogaster* is known as a distinct time frame before death when the dying female’s ability to produce eggs is significantly lower.
than the average fecundity of the general population. Although previous studies have confirmed the phenomenon of female fecundity death spiral, the male equivalent of a virility death spiral has never been examined. This experiment investigates the correlation between male virility and mortality by recording each experimental male’s ability to fertilize eight female virgins once a week, for the duration of six weeks. The experimental males that died within seven days of the weekly mating were found to have significantly lower virility than the non-dying males. These findings confirm the existence of a virility death spiral in male Drosophila and indicate the possibility of using male fruit flies to further study the dying process.

Computational Model of Magnetic Sensing in Cryptochrome Photoreceptor
Alexandre Colavin & Andrew Hohne

Mentor: Thorsten Ritz

Recent work of Ritz and others proposes that cryptochrome, the photoreceptive protein that regulates the circadian rhythms of animals and controls photomorphogenesis in plants, is also a candidate site for the radical pair magnetoreception mechanism, which is hypothesized to give many animal species their ability to navigate by means of the Earth’s magnetic field. The nonlocal nature of this mechanism has made experimental evaluation of this hypothesis difficult and inconclusive to date. Inspired by the holistic approach of the burgeoning field of systems biology, we developed a computational model based on a simple cryptochrome signaling network. Working in the MATLAB programming environment, we started from simple mass action kinetics and refined the model using published experimental data, such as absorption spectra and fluorescence decays of cryptochrome protein. Once the model was able to reproduce experimental results, we wrote and applied sensitivity analysis algorithms to analyze the dynamic and static properties of the system: fluorescence, steady state concentration and response time. Finally, we extended the model to calculate physiological signal-to-noise ratios for the experimental parameter space, yielding nontrivial results that can help explain previous data and provide a framework upon which to design future experiments.

Changes in Mouse Pulmonary Responses as a Function of Airway Mass Deposition of Methacholine
Brandon Haghverdian & Haydn Hoffman

Mentor: Michael Kleinman

Nebulizers are used in medicine to deliver liquid drugs into the respiratory tract as aerosol mists. Different models of nebulizers produce aerosols with specific size distributions of respirable particles. The objective of this study was to use two different nebulizers to test the effect of particle size distribution of aerosolized methacholine (MCh), a bronchoconstrictor that provokes lung airway narrowing, on drug deposition and changes in pulmonary function in mice. Our hypotheses were: that the nebulizer that produced a smaller particle size would allow greater drug deposition in the deep lung and there would be a difference in physiologic response, demonstrated by changes in pulmonary resistance and dynamic compliance, due to dose as a function of MCh deposition in the lungs. A cascade impactor was employed to determine the average mass median aerodynamic diameter (MMAD) and geometric standard deviation (GSD) of the MCh aerosols generated by the two nebulizers. The PARI nebulizer produced an aerosol with an MMAD of 0.53 microns (GSD = 1.24), while the Whisper Jet nebulizer produced an aerosol with an MMAD of 0.62 microns (GSD = 2.91). The MCh aerosols from each nebulizer were delivered to tracheally intubated BALB/c mice to determine whether physiological pulmonary responses differed based on aerosol size characteristics. Preliminary results demonstrated that the PARI-generated MCh aerosols elicited greater pulmonary changes in mice than those of the Whisper Jet, and additional studies are underway to clarify these findings. These results may explain differences in murine pulmonary function measurements in rodent models of pulmonary disease.

Understanding the Relation Between Language and Memory in Infants
Priya Chakrabarti & Hoa Nha Nguyen

Mentor: Angela Lukowski

Language has been shown to facilitate long-term memory in infancy. In particular, previous research has suggested that the provision of specific verbal reminders at delayed recall facilitates memory to a greater extent than when more general prompts are used. Also, specific verbal labels seem to be more helpful when they are presented at retrieval rather than at encoding. This study was designed to investigate the importance of linguistic support at encoding on measures of immediate imitation and delayed recall in 16-month-old infants. Infants were enrolled in one of three conditions. In the highly supportive condition, infants were provided with informative noun and verb phrases as the sequences were modeled. In the moderately supportive condition, infants were only provided with informative noun phrases as the event sequences were modeled. In the minimally supportive condition, infants tested in the other groups; effects may be apparent in infancy. In particular, previous research has suggested that the provision of specific verbal reminders at delayed recall facilitates memory to a greater extent than when more general prompts are used. Also, specific verbal labels seem to be more helpful when they are presented at retrieval rather than at encoding. This study was designed to investigate the importance of linguistic support at encoding on measures of immediate imitation and delayed recall in 16-month-old infants. Infants were enrolled in one of three conditions. In the highly supportive condition, infants were provided with informative noun and verb phrases as the sequences were modeled. In the moderately supportive condition, infants were only provided with informative noun phrases as the sequences were shown. Finally, infants in the minimally supportive condition did not hear any informative statements. Data collection is ongoing. However, our primary hypothesis is that infants tested in the highly supportive condition will show the most evidence of memory at delayed recall relative to infants tested in the other groups; effects may be apparent at immediate imitation as well. If these results are realized, they will indicate that the language used at encoding affects long-term recall memory and suggest that receptive lan-
The Kinetic Isotope Effect: A Method to Slow Aging?
Kyle East & Stephanie Hammel
Mentor: Athan Shaka

The process of aging for all living organisms consists of various causes that ultimately lead to death by disease or the cessation of cellular and, thus, bodily functions. With the decreased effectiveness of cellular repair, biomolecules such as DNA may suffer a greater amount of damage as an organism grows older. Our work aims at delaying damage by improving the resistance of the most vulnerable sites in these biomolecules. In vivo experiments with *Drosophila melanogaster*, the common fruit fly, were used to investigate the phenomenon. To try to protect the molecules from damage, we fed the flies deuterated food as larvae; deuterium shows a kinetic isotope effect in many chemical reactions, reacting more slowly than hydrogen. This manifests itself by a slower rate of reaction for carbon-deuterium bonds in comparison to carbon-hydrogen bonds. By substituting hydrogen atoms (1H) with deuterium (2H), we hoped to make the flies’ molecules resistant to damage. Using a dose-response curve with varying levels of one-time deuterium treatment, we experimentally determined an expanded lifespan of the fruit fly. This is consistent with the idea that the kinetic isotope effect does apply to the oxidative damage of biomolecules in *Drosophila*. As we continue to analyze the extent of deuterium incorporation into the flies, we hope that the findings may show us that deuterium does indeed hold the potential to increase lifespan in other living organisms, including humans.

Isolating and Trapping Malaria Infected Red Blood Cells in a Microfluidic Device
Siavash Ahrar & Peiran Lu
Mentor: William Tang

In this research, the feasibility of a point-of-care (POC) lab on a chip (LOC) device for detecting malaria infection from a small whole-blood sample was investigated. Previous work demonstrated that various stages of *plasmodium gallinaceum*-infected avian red blood cells (miaRBCs) in a blood sample could be detected based on their biomechanical changes in a way similar to the physiological traits of infected human erythrocytes, and therefore could be used effectively as a model system. The purpose of this research is to devise a mechanism to isolate and retain miaRBCs by analyzing the flow speed differences between infected and normal cells via characterization of media flow through a custom-designed microfluidic platform. Our experiment was divided into two stages: the quantitative study of erythrocyte movement, and the microfluidic experiment. In the blood study, a comparison of miaRBC and normal RBC flow speeds was determined after samples were placed under uniform shear flow rate in the device loading chamber at room temperature. The experimental results supported the assertion that progressive morphological changes in miaRBCs inhibit extracellular movement, resulting in a decreased flow speed. Characterization of the media flow rate was studied subsequently to provide experimental values for the shear flow profile. Preliminary results pointed to the viability of using a pressure gradient to purify the blood sample, trapping only the cytoadhering miaRBCs in the culture chamber and introducing a novel technique for malaria diagnosis.

Neural Pathways and Mechanism of Electroacupuncture Effect on Cardiovascular Depressor Reflex during Gastric Distension
Jennie Ho & Peter Hoang
Mentor: Stephanie Tjen-A-Looi

Gastric distension (GD) under anesthetic agents ketamine and xylazine evokes inhibitory cardiovascular reflex responses in hypercapnic acidotic rats, however little is known of the neural mechanism of the GD-induced cardiovascular reflex. We hypothesized that the cardiovascular reflex is transmitted through both sympathetic and parasympathetic afferent pathways. We also hypothesized that the pathway is affected by electroacupuncture (EA), and the nucleus ambiguus (NA) and caudal ventrolateral medulla (cVLM) are two nuclei in the medulla involved in the responses. Experiments were performed on male anesthetized rats that were artificially ventilated, and heart rate (HR) and mean arterial blood pressure (MAP) were monitored. Repeated distension of the stomach every 10 minutes induced consistent decreases in MAP and HR. The response was reversed with denervation of the celiac ganglia and vagal nerve with 1% lidocaine. Unilateral depolarization blockade of the cVLM through microinjection with kainic acid reversed only the hypotension response, while HR was unchanged. Conversely, unilateral depolarization blockade of the NA through kainic acid microinjection reversed only the bradycardia response. Bilateral stimulation with low frequency EA at acupuncture points P5–P6 for 30 minutes significantly reduced the decreased blood pressure and heart rate responses. Unilateral microinjection of atropine into the cVLM transiently reversed the effect of EA on the hypotension response, whereas microinjection of normal saline did not. Unilateral microinjection of gabapentin into the NA also attenuated the effects of EA while normal saline did not. These results suggest that both sympathetic and parasympathetic pathways mediated the decreased MAP and HR during gastric distension through a sympatho-inhibition and parasympatho-excitatory mechanism involving the cVLM and NA respectively. EA attenuates the cardiovascular depressor reflex through a cholinergic mechanism in the cVLM and a GABAergic mechanism in the NA.
Childhood Maltreatment among Juvenile Delinquents: Internalizing and Externalizing Symptoms
Ein Ho & Deanna Shiley
*Mentor:* Elizabeth Cauffman

Childhood maltreatment—defined as neglect, witnessing violence in the home, and emotional, physical, and sexual abuse by a parent or caregiver—has been found to be associated with high rates of both internalizing and externalizing symptoms during childhood. This study examined the relation between childhood maltreatment and mental health among male adolescent offenders. Specifically, we examined how maltreated and non-maltreated juvenile delinquents differed in externalizing and internalizing symptoms. Our sample consisted of 373 male juvenile offenders, ages 14–17, held in a Southern California juvenile secure facility. Five interviews were conducted, the first occurring within 48 hours of institutionalization. Follow-up interviews occurred weekly for three weeks, followed by an additional interview at two months. A variety of measures were used to identify various forms of maltreatment, and the Child Behavioral Checklist was used to measure internalizing and externalizing symptoms. Regression analyses revealed that only sexual maltreatment (as opposed to other types of maltreatment) was significantly related to internalizing symptoms. In addition, the number of types of maltreatment experienced was significantly associated with internalizing, but not externalizing symptoms. These results suggest that maltreatment is more related to internalizing than to externalizing symptoms among adolescent male offenders. Consequently, maltreated youth—especially those who have experienced sexual or multiple types of maltreatment—should be targeted for treatment, with an emphasis on addressing internalizing symptoms.

Exhaled Gases in Emergency Department Patients with Diabetes Mellitus
Mital Patel & Sarah Perez
*Mentors:* Shahram Lotfipour & Jeffrey Suchard

Diabetes Mellitus is a condition in which the body either doesn’t produce enough, or does not properly respond to, insulin, a hormone produced in the pancreas. Patients with diabetes mellitus may develop a wide variety of problems, including high blood glucose levels, production of ketone bodies, or diabetic ketoacidosis (DKA). Our study sought to investigate what gases are exhaled by Emergency Department patients at UCI Medical Center who have diabetes mellitus. Although exhaled gas analysis, such as the “Urea Breath Test” for Helicobacter pylori infection and the “Breath Hydrogen Test” for intestinal malabsorption, has been commonly used for decades, the precise quantities of the various gases has not been correlated with the patient’s disposition. If such a correlation exists, exhaled breath analysis might be developed into a diagnostic tool in the future. To address this question, diabetic patients were approached for consent. The gas samples were taken by Matthew Gartner, a pre-doctoral student at the Rowland/Blake Laboratory. Mr. Gartner had the patients breathe into a stainless steel canister through a Teflon straw. Additional gas samples of the room, a healthy control, and Matt were obtained for controls. The canisters were then taken back to the Rowland/Blake laboratory at the UCI main campus to be analyzed on the three Gas Chromatography systems. The data is still in the process of being analyzed, and the exhaled gas amounts will be quantified and compared to the illness and severity that each patient was diagnosed with.
New York Satellite
Mouhanad Aboul-Zelof & Hayley Palmer
Mentor: Eli Simon

The New York Satellite Program includes daily classes that range from various genres of dance, to vocal coaching, to auditioning techniques, to television and film acting. This intensive program proved to us that diligence, dedication, and talent are necessary to survive in this industry. In addition, establishing connections is an imperative part of becoming successful in the field, and this program has definitely given us a good foundation. Our extraordinary teachers forced many of us to venture out of our comfort zones. The daily challenges we faced reminded us that life is about pursuing our passions and that we must learn to “be comfortable with being uncomfortable.” We also discovered how much we tend to limit ourselves by underestimating our abilities. You can never reach your full potential until you turn off that voice in your head that says “This is the best I can do,” or “I think this is good enough.” The goal of the performer is to go into class, onstage, and into life with no concept of limitations - only visions of what we strive for. This program gave us a more accurate idea of what a bicoastal acting career would really entail, and why we might prefer one coast over the other depending on the lifestyle we desire as performers. Now that we are able to make a more educated decision regarding where we would like to establish our careers, we can clearly focus on turning our goals into reality.

Talk to Me: Early Adolescent Communication Style and Later Friendship Quality
Caroline Chu & Joyce Hsiao
Mentor: Wendy Goldberg

The objective of this study was to examine adolescent friendships by investigating early interactional styles and later friendship quality. Eighty-seven sixth-grade participants from one site of the Study of Early Child-Care and Youth Development, and a friend of their choice (47 girls, 40 boys), participated in the observational phase in which the pairs discussed vacation plans and made informal conversation. These conversations were videotaped for later coding of verbal and nonverbal behaviors. In tenth grade, the same participants completed questionnaires about peer relations and friendships. Preliminary results suggest both verbal and nonverbal communicative behaviors early on were associated with several aspects of later friendship quality. For example, eye contact and positive mood in sixth grade were positively correlated with self-reported help and guidance from friends at tenth grade. Results underscore the importance of examining early adolescent communication styles in relation to later quality of friendship.

Emergency Department Psychiatric Agreement on Disposition Study
Stacy Hata & Kelly Wang
Mentor: Shahram Lotfipour & Daniel Thompson

To treat psychiatric patients, emergency physicians must consult a psychiatrist before making a final decision on the disposition of the patient. However, this procedure causes a delay in the ultimate treatment of the patient, thus preventing the emergency department from running at optimal levels of efficiency. Since very little research has been done regarding the actual need for these psychiatric consults in management of emergency psychiatric patients, we used a survey to analyze the agreement between emergency physicians and the psychiatric consultant and their respective decision on the disposition of the psychiatric patient. Over a seven-month period, 200 subjects were obtained. Of these, the majority were suicidal patients (59.5%) and overall, 69.5% of the all patients were admitted. In general, the emergency physician decision to admit was 85.3% sensitive and 44.4% specific compared to the psychiatry decision. However, for suicidal patients, the emergency physician decision to admit was 90.4% sensitive and 42.3% specific. For the 35.0% of patients in whom the emergency department assessment on the 6-point Likert scale was a “definitely admit,” 88.4% were admitted by the psychiatrist. According to the data, patients who present to the emergency department for suicidal ideation most likely will not need a psychiatric consult prior to admission for this subset of “definite admits.”

Spirituality and Religion: Latina/o Students’ Coping, Well-Being, and Persistence
Jessica Khayat, Jesus Renteria & Sandra Saravia
Mentor: Jeanett Castellanos

Latina/os are the fastest growing U.S. racial and ethnic minority group but experience underrepresentation at 4-year universities. Recent research on Latina/o college students has focused on the factors that contribute to educational persistence, the process of success, and means of coping, to increase retention rates within educational institutions. More specifically, recent work has identified spirituality and religion as key elements to Latina/o students’ coping and persistence. As such, the purpose of this study is to explore how psychological, social, and cultural factors contribute to Latina/o undergraduate persistence in the context of implementing spirituality and religion as coping means to navigate their educational journeys. The qualitative study implements the psychosociocultural framework, with a sample of 28 upper-division undergraduates. Preliminary findings suggest that spirituality and religion play a part in students’ daily coping. Results will provide better understanding of the Latina/o educational experience for university officials and faculty. Understanding the role spirituality and religion play within this community can
lead to the implementation of changes that improve Latina/o experiences in college, and perhaps lead to higher retention of Latina/o students in 4-year universities.

**Processing of Nanostructured Copper by Electrodeposition**

Aaron Jimenez, Saam Ostovari & Eric Somogyi  
*Mentor: Farghalli Mohamed*

Electrodeposition is a process in which metal films are obtained by electroplating from a suspension of small particles that are deposited with the plated metal. The advantages of electrodeposition over other coating methods include uniformity of deposition for complex shapes, reduction of the waste often encountered in dipping or spraying techniques, low levels of contamination, and the ability to process parts continuously. This study has been conducted by applying pulse current electrodeposition to produce nanostructured copper that can be used for assessing properties. The results have demonstrated the formation of a deposit of nano-crystalline copper onto a brass sample. The morphology and characteristics of the deposit were examined using various microscopic techniques, such as TEM.

**The Effects on Memory after Multiple Presentations**

Gig Phoong, Cameron Rabideau & Gregory Sanchez  
*Mentor: Charles Chubb*

The more experience one has of a stimulus, the better we expect one’s memory to be for it. However, preliminary results suggested this expectation might be violated in the following experiment. Phase 1: participants viewed images of objects and judged whether they were more likely to be seen indoors vs. outdoors. Some images were presented three times, others only once. Phase 2: After a brief delay, participants were given a surprise memory test in which they were presented with another series of images; Half were “old,” *i.e.*, identical to images seen in phase 1. The others were “lures,” *i.e.*, slight variations of images seen in phase 1. We hypothesized that sensitivity to lures vs. old images might be higher for images seen once vs. thrice in phase 1. On the contrary, *d'* for discriminating lures from old images was 1.30 for thrice-seen images vs 0.73 for once-seen images. However, participants were much more biased to judge thrice-seen than once-seen images as old, suggesting that the decision statistic they used was sensitive not only to the difference between a lure and the original image but also to the information acquired by the number of presentations of the image to the lure.

**Assessing Neighborhood Effects on Educational Outcomes**

Victor Araujo, Johanna Martinez & Justina Ryan  
*Mentor: Elizabeth Cauffman*

It is well established that crime levels vary in different socioeconomic neighborhoods. Social disorganization theory explains this disparity by looking at community disadvantage, which consists of measures of community poverty, residential instability, and ethnic heterogeneity. More recently, neighborhood disadvantage has been explored in schools to explain differences in behavior and academic performance. While most research is conducted with older adolescents, school misbehavior involving academic and interpersonal problems often appears at an earlier age, increasing risk for later misconduct. Thus, this study examined a sample of younger adolescents, ages 11–14. Using GIS (geographic information systems), a sample of 261 middle school students were geocoded and linked to year 2000 census data. Official records and individual assessments were also collected. Results show that students from more disadvantaged neighborhoods reported more attendance infractions, violent infractions, and decreased school bonding. Results suggest students from disadvantaged neighborhoods are less likely to attend school, leading to decreased bonding with their classmates, teachers, and their academic environment. This may lead to the rejection of norms and values effective in maintaining a safer, positive school environment as seen by the increase in violent infractions. It may be beneficial for programs and agencies to encourage students—specifically students from disadvantaged neighborhoods—to bond with their school environment in order to achieve academic success.

**Effect of Scales and Turbulence Intensity on the Mixing of a Passive Scalar in Grid-Generated Turbulence**

Scott Bougie, Allen Giragosian & Thang Pham  
*Mentor: John LaRue*

The mixing of a passive scalar in turbulent flow has been an attractive topic of study in the field of fluid mechanics. A passive scalar is defined by Warhaft as a “diffusive contaminant in a fluid flow that is present in such low concentration that it has no dynamical effects (such as buoyancy) on the fluid motion itself.” Examples of a passive scalar mixing can be found in many natural phenomena and industrial applications. Natural phenomena include passive scalar contaminants mixing in the atmosphere such as a smokestack injecting smoke into the air or a chemical spill mixing in the ocean. Industrial applications include moist air mixing with dry air in a humidifier, or multiple reactants mixing in a chemical reactor. This study focuses on a particular application of passive scalars mixing, the mixing of gaseous fuel with air inside of a gas turbine pre-mixer. A gas turbine pre-mixer is a device used to mix air and gaseous fuel before it enters a combustion chamber, which can contribute to reduced emissions and improved efficiency of the gas turbine.
Polymer Electrolyte Membrane Fuel Cell Fabrication
Andrew Chester, Justin Huang & Yangbin Wu  
Mentor: Yun Wang

Fuel cells are a promising technology because of their unique ability to generate electricity at a high level efficiency without producing any harmful emissions. Our project focused on building a small-sized proton exchange membrane fuel cell that uses hydrogen as the fuel source. The primary challenge was to develop a membrane that was highly catalytic, both ionicly and electronically conductive, and conducive to the flow of gas and liquid through the membrane. Our design consisted of three separate layers hot pressed to form a single membrane. The two outer layers consisted of porous and hydrophobic carbon paper that had been painted with a carbon-backed nano-platinum catalyst. The inner layer consisted of a thin perfluorinated ionic polymer called Nafion™. The fuel cell was analyzed via theoretical modeling and experimental testing. Our simplified model predicted a maximum power output of 3.5 Watts for our 5x5 cm fuel cell. This occurs when operating at the predicted optimum current density of 1.07 A/m² or roughly a fuel input of 1 g Hz/hour. Further testing and investigation of the fuel cell will be conducted throughout the current quarter.

Health Professionals’ Perceptions on Tobacco Harm Reduction
Penney Libao, Ann Nguyen & Chelsea Semrau  
Mentor: David Timberlake

The objective of this study is to evaluate the perceptions of health care professionals on tobacco harm reduction and identify why they hold their beliefs. We currently work under Dr. David Timberlake, evaluating smokers and their perceptions of tobacco harm, from which we derived the idea for this study. The study uses semi-structured interviews conducted from January to May, 2010. Professionals ranging from physicians to tobacco cessation specialists were interviewed one-on-one in their workplace setting. Health professionals seem to entertain the idea of tobacco harm reduction and in support of the idea; however, they do not believe in the actual power and likelihood of such products being popular in society. Due to the nature of their professions—desiring to increase the health of individuals and the population—they naturally long for healthier products to promote healthier lifestyles, whether it be food, beverage, or tobacco. This longing is, however, tempered by the realistic challenges that come along with actually changing addictive behavior.

The Effects of Smoking on Cerebral Oxygenation in Adult Smokers Using Near-Infrared Spectroscopy
Joyce Ang, Thanh Cao & Kimberly Leung  
Mentor: Jean Gehricke

Smoking is the leading cause of preventable disease in the United States, with a smoking prevalence rate of 20% in adults. Nicotine, the major psychoactive ingredient in cigarettes, has been found to have substantial effects on cerebral activity. The aim of this study is to characterize how cigarette smoking affects brain oxygenation. It was hypothesized that cigarette smoking leads to higher oxygen metabolism and an overall reduction in cerebral oxyhemoglobin during smoking as compared to baseline measurements. Cerebral oxygenation and hemodynamic changes were monitored using non-invasive near-infrared spectroscopy (NIRS) before, during, and after smoking a cigarette in five smokers (mean age 22.4 ±1.14 years), following 12-hour smoking abstinence. NIRS measurements were baseline corrected and were separated into nine sequential time intervals (20 seconds each) for the entire smoking duration. Results showed that oxyhemoglobin was reduced from the beginning to the midpoint of the smoking period, which was followed by an increase from the midpoint to the end of the smoking period. An increase in deoxyhemoglobin was observed from the beginning of smoking to the first puff of cigarette smoke, which was followed by a reduction towards the end of the smoking period. Cigarette smoking has been observed to induce vasoconstriction of cerebral arteries, which may contribute to the initial reduction in oxyhemoglobin. The findings may explain the development of smoking-related diseases and long-term cognitive decline.

The Importance of Interactions in Reducing Social Stigma
Ani Artsvelyan, Megan Joyce & Alexandra Ramon  
Mentors: Dana Garfin & Roxane Cohen Silver

This study examined social stigma towards four potentially stigmatizing conditions. Stigma serves as a social mark setting others apart in society. Certain stigmas such as physical disabilities are visible, whereas others remain undetected until personally disclosed. Previous research has indicated that people tend to stigmatize others with certain physical and mental illnesses or who have been convicted of a crime. However, few studies have explored these ideas in an interactional setting. One hundred, fifty-two college age females were randomly assigned to interact with a confederate who disclosed a physical or mental illness, a criminal conviction, or nothing (control condition). Self-report data on preference for social distance was collected both before and after meeting the confederate. Participants reported less preference for social distance from the confederate after the face-to-face interaction. The pre-measures indicated a difference in preference for social...
distance between the five groups. In contrast, after the interaction, there were no differences between the five conditions in stated preference for social distance. These findings are consistent with previous literature suggesting that contact with people who have a stigmatizing condition reduces preference for social distance and may increase interpersonal and social acceptance.

**Patient Monitoring System via Pulse Oximetry**
Siavash Ahrar, Jonathan Orosco & Samy Zaynoun  
*Mentor:* Zoran Nenadic

Oxygen saturation and accurate pulse measurements are vital signs used in emergency care. Pulse Oximetry (PUO) provides a noninvasive measurement of such vital signs. The principal behind PUO is spectral analysis. Blood oxygen levels can be determined by measuring the absorption spectra of hemoglobin. Since the two forms of hemoglobin, oxygenated (HbO2) and reduced hemoglobin (Hb), have significantly different spectra between the 600 nm to 1000 nm wavelengths, knowing the concentration of HbO2 to Hb allows for the determination of oxygen saturation (SaO2). Our group designed and assembled a PUO device that uses two LEDs, with wavelengths 660 nm and 940 nm, and a photosensor to measure the transmitted light through a finger. The design included the following blocks: first, an analog front-end performing LED driving, signal conditioning of the photodiode current using a transimpedance amplifier, and additional filtering using op-amps; second, a digital block consisting of a microcontroller to perform A/D conversion of the photodiode signal, data storage of calculations on a FPGA board, and a graphical LCD for displaying a photoplethysmograph with the corresponding SaO2 levels. We successfully demonstrated wireless data transfer from the finger probe to our data collection board. Our device is currently able to accurately measure and display the pulse rate on the LCD, while measurement of the oxygen saturation is proving to be a larger challenge to overcome.

**Stand Assist Rehabilitation Apparatus**
Justin Carter, Mehnosh Gundevia & Justin Lin  
*Mentor:* David Reinkensmeyer

Spinal Cord Injury (SCI) is defined by permanent disability or loss of movement (paralysis) and sensation below the site of injury. Level of injury can range from complete tetraplegia to incomplete paraplegia. Cardiovascular and neurological control is severely disrupted during spinal cord injury limiting movement and sensation. It is well documented that the effect of exercise on cardiovascular function is beneficial. Stand Training is a novel technique that involves intense exercise of the affected limbs. Our project goal is to develop a rehabilitation device for stand training in SCI patients to be used either at home or at a training facility with minimal assistance from a therapist. This device is built in such a way that there are three main parts—the actuation for the affected limbs, the stability support skeleton and the circuit control system—which all work synchronously to simulate standing for SCI patients (paraplegics) who have lost function in their lower extremities.

**Enhancing Recruitment among Diverse Populations: A Comparison of the Methods Used in Five Diverse Communities and their Outcomes**
Michelle Choi, Geoffrey Ngo & Angela Patanawong  
*Mentors:* Mary Coggins & Kimberley Lakes

Increasingly, there is an emphasis in the health sciences to include diverse populations in research. Historically, minorities have been underrepresented in health research, ultimately contributing to health disparities for these populations. The Orange County Vanguard Center for the National Children’s Study (NCS) developed tailored community outreach and engagement methods as part of its overall strategy to recruit a representative sample of Orange County families. From our experience in the NCS, we learned that neighborhood-based recruitment requires tailored approaches that vary widely across communities. We present neighborhood characteristics and demographics from five diverse neighborhoods in the following Orange County cities: Costa Mesa, Huntington Beach, Aliso Viejo, Fullerton, and Rancho Santa Margarita. We describe the community outreach and engagement methods tailored for each community and compare recruitment results in these communities. Across the five communities, the percentage of residents who completed the initial survey ranged from 76% to 97%. The percentage of women agreeing to complete a lengthier pregnancy survey ranged from 83% to 96%. Our results from questions assessing if and how residents had heard of the NCS prior to the survey indicated that tailored outreach methods were modestly effective in engaging diverse communities in the NCS. We discuss differences in completion rates and challenges encountered in those communities. Anticipating challenges and tailoring outreach methods using some of the strategies we describe may enable future researchers to increase diversity among their participants.

**The Effect of Stigmatized Conditions on Social Anxiety Levels**
Allie Lam, Victoria Piar & Sara Tousi  
*Mentors:* Dana Garfin & Roxane Cohen Silver

Past research has shown that stigmatizing conditions are associated with anxiety. A large portion of those studies has focused on the anxiety level experienced by the stigmatized individual. However, this study used an interactional setting to focus on the anxiety level of non-stigmatized individuals when exposed to an individual with a perceived stigma. We recruited 152 female students from the Univer-
Corrosion Properties of Nanostructured and Commercial Copper
Ignacio Lopez, John Shek & Eric Shum
Mentor: Farghalli Mohamed
Understanding corrosion behavior is of significance to industry because its occurrence and associated damages are responsible for billions of dollars in losses in terms of maintenance, repair, and injury. The emergence of nanocrystalline materials has motivated research for the purpose of understanding the corrosion behavior of this new class of materials. In this investigation, the corrosion characteristics of electroplated nanocrystalline copper characteristics during and after continuous salt spray corrosion simulation were closely examined. The results were then compared with those of commercial grade copper, which underwent the same corrosion treatment procedure.

Conducting Research in Diverse Communities: Implications for Outreach and Recruitment
Kathleen Carter, Jocelyn Lo & Ragy Saad
Mentor: Kimberley Lakes
The Children's Health Act of 2000 initiated the National Children’s Study (NCS), a longitudinal study that will recruit 100,000 children to study environmental and biological influences on child health and development. Orange County was selected as the location for one of seven original Vanguard Centers, where the protocol for the study would be piloted. For this research project, we studied the ethnic, socio-economic, geographic, political, and religious characteristics of particular segments of Irvine, Tustin, Anaheim, and Westminster that were selected randomly for inclusion in the NCS. Based on these characteristics, we developed individual community strategies that aimed to increase resident participation. Our first step in developing an outreach framework involved organizing comprehensive segment profiles for each community that outlined similarities and differences that could affect the effectiveness of various outreach strategies. We then implemented various outreach strategies in each segment prior to and during the study phase involving household and pregnancy surveys. We report subsequent participation rates for the household survey (ranging from 74% to 96%) and pregnancy screening (ranging from 74% to 91%) across segments. We identify challenges encountered in each segment and discuss methods developed to address those challenges. We also report the percentage of participants who had heard of the NCS through our outreach, and the method of outreach they reported as successfully reaching them. To successfully engage a wider range of the population, researchers need to tailor outreach and recruitment based on unique community characteristics.

A Comparison of Tailored Research Outreach and Recruitment Methods and Outcomes in Five Different Neighborhoods
Andrew Pham, Sonia Sapra & Megan Wang
Mentor: Kimberley Lakes
The National Children's Study (NCS) will recruit thousands of children and follow them over a span of 21 years to better understand the impact of biological and environmental factors on child health and development. The Orange County Vanguard Center at UC Irvine is involved in the pilot phase of the NCS; one goal of this phase is to identify effective community outreach and engagement strategies to enhance recruitment and gain the trust of community members. A range of community outreach strategies were developed to inform and gain the trust of culturally and socioeconomically diverse communities. We distributed recruitment materials to each home; attended community events in libraries, parks, and schools; and established Neighborhood Advisory Communities in each selected neighborhood. We compare and contrast the outreach methods used in five diverse neighborhoods within the following cities: Laguna Beach, Santa Ana, Garden Grove, and Yorba Linda. We compare participation rates in a household survey (ranging from 84% to 99%) and a pregnancy survey (ranging from 86% to 95%). We also report the percentage of participants in each neighborhood who had heard of the NCS prior to the surveys and the individual percentages for each outreach method participants indicated as their prior source of information about the study. Overall, direct and indirect methods of outreach were successful in different ways and to different extents in each neighborhood. Our work in the past year demonstrates that with tailored methods of outreach, community-based studies can have high participation rates.

Corrosion Properties of Nanostructured and Commercial Copper
Ignacio Lopez, John Shek & Eric Shum
Mentor: Farghalli Mohamed
Understanding corrosion behavior is of significance to industry because its occurrence and associated damages are responsible for billions of dollars in losses in terms of maintenance, repair, and injury. The emergence of nanocrystalline materials has motivated research for the purpose of understanding the corrosion behavior of this new class of materials. In this investigation, the corrosion characteristics of electroplated nanocrystalline copper characteristics during and after continuous salt spray corrosion simulation were closely examined. The results were then compared with those of commercial grade copper, which underwent the same corrosion treatment procedure.

Undergraduate Research: Launching the Future
It has been found that the electroplated nanocrystalline material is more resistant to salt spray corrosion than commercial grade copper.

**SensorChip**

Jacqueline Li, Aileen Ramirez & Geetika Singh Potdar  
*Mentor:* Mark Bachman

The project focused on the creation of a sensing system designed to detect changing pressure and send this information wirelessly to a computer. The system made use of three major functional components, including a pressure sensor, a microcontroller, and a wireless transmission device. The computer is programmed to accept information through the wireless transmission device and manipulate it to play a game of Pong in real time. The entire sensing system was encapsulated within a wooden board, and two such boards were used for the project. The game worked when participants exerted different levels of pressure on the wooden boards and correspondingly observed different results on the computer. The project team was divided into three major subsystems, with each subsystem dealing with a specific functional component. The sensor subsystem made use of a Flexiforce sensor to measure the change in pressure by changing their resistance and, correspondingly, changing the voltage across it. The microcontroller subsystem dealt with conversion of analog information from the sensor subsystem to digital information that could be understood by the computer. Xbee, a wireless transmission device, was used to transmit this digital information. The project significantly contributed to enhancing teamwork, project development, technical writing, and presentation skills of the team members in addition to improving their technical knowledge.

**Platforms for Studying Surface Topological and Mechanical Strain Effects on Neurogenesis**

Ouwen Liang, Derek Tam & Jonathan Yu  
*Mentor:* William Tang

The study of neurogenesis—how neurons differentiate from precursor stem cells—holds the keys to understanding the fundamental mechanisms of how unhealthy or damaged nerve could be therapeutically repaired. It has been shown that, in addition to biochemical factors, mechanical stimulation from the extracellular environment plays an important role in nerve growth. To further understand the mechanical cues that cause neurons to grow and differentiate, mouse neural stem cells (mNSC) were plated onto a geometrically patterned polydimethylsiloxane (PDMS) polymer to determine whether or not the stem cells’ growth or differentiation is favored on a certain area of the PDMS. The results did not show any significant clumping of neurons in any area, but that may be because of the high density plating. One aspect that will be changed in a following experiment will be a lower plating density so individual neurons stand out more. As a follow-up experiment, the mNSC will be plated on different geometrical shapes, such as triangles and circles. In addition to studying the effects of a static environment, an experiment was performed to study the influence from a quasi-dynamic mechanical stimulation. In this second study, a cell stretching and compression platform, made of PDMS bonded to glass, was designed and fabricated with the intention of determining what effects mechanical strain have on neuronal morphogenesis and differentiation. The platform contains a thin film of PDMS where neurons are cultured and placed under tensile or compressive forces, so their behavior can be studied optically. Observing how the cells behave in different topological and mechanical strain conditions will provide a better understanding of neural stem cell growth and differentiation.

**Social Influences’ Mediating Effect on Psychopathy and Offending Behavior**

Nathan Hadinata, Adam Malnove & Elizabeth Velaquez  
*Mentor:* Elizabeth Cauffman

Psychopathy has been found to be a critical factor in understanding incarcerated juveniles’ involvement in delinquency. However, recent theory suggests that individuals with psychopathic traits are emotionally affected by ostracizing relationships, which may cause them to satisfy their unmet needs with aggression toward others. We investigated whether social influences could explain the predictive power of psychopathy over offending behavior (i.e. mediation). Our study consisted of 355 incarcerated male juveniles whose personal characteristics were assessed using the Youth Psychopathic Traits Inventory and their self-report of offending. Their social influences consisted of parents, peers, and very important non-parental adults. The strength of the mediation was determined by the amount of significance lost between psychopathy and offending when social influence variables were present. As anticipated, psychopathy was a strong predictor of offending frequency and offending variety. VIP antisocial influences fully mediated the relationship between psychopathy and offending frequency, while parental warmth and hostility, peer antisocial influence, and VIP antisocial behavior partially mediated this relation. These results suggest psychopathic traits alone may not fully explain incarcerated juveniles’ involvement in delinquent behavior. The interaction of these social contexts may, for instance, be the difference between getting in a fight and walking away from one.
The Use of Ocular Ultrasound in the Diagnosis of Increased Intracranial Pressure
Michael Gragnani, Hemi Jung & Shane Mesko
*Mentor: John Christian Fox*

The intention of this study was to test the ability and accuracy of ocular ultrasounds in measuring the optic nerve sheath diameter, and whether those measurements could be used to detect increased intracranial pressure proficiently. Previous studies indicated a strong correlation between an increase in diameter of the optic nerve sheath and the presence of increased intracranial pressure. Adult patients with invasive intracranial pressure monitors in the neurosurgical intensive care unit of a level-I trauma center were selected for additional ocular ultrasounds of each eye, from which the optic nerve sheath diameters were measured. Emergency physicians used a 10.5 MHz linear probe, 3mm behind the globe to obtain the diameter measurements. The mean binocular diameter was then compared to that of the intracranial pressure monitor, which measures the intracranial pressure within the skull. Using the set guidelines (15mm Hg normal pressure), the intracranial pressure monitors were used to confirm the presence of increased pressure and whether they correlated to the diameters measured. The linear regression analysis showed that there was no significant correlation between increased intracranial pressure and the optic nerve sheath diameter. The data indicated that the ultrasound showed poor sensitivity in measuring abnormal optic nerve sheath diameters in the setting of increased intracranial pressure. On the other hand, the data also indicated that the correlation between the optic nerve sheath and increased intracranial pressure is operator-dependent, and therefore an increase in exposure to ocular ultrasounds could lead to the improvement of the precision and accuracy in measuring the diameter.

The Effect of Demography, Body Content and Aging on Heart Function in *Drosophila melanogaster*
Jenny Chou, Alan Estero & Jacky Ip
*Mentor: Michael Rose*

The purpose of this study was to determine the effects of demography (generation cycle) and body content on the heart function of *Drosophila melanogaster* at different ages. It was hypothesized that if demography were the major factor in cardiac function and activity, then *D. melanogaster* selected for accelerated generation cycles would experience decreases at a faster rate. If body content was the major determinant, then flies with a higher fat content would experience decreases in function faster than those with normal body content. Three replicates of four experimental populations of *D. melanogaster* that are genetically differentiated and maintained in identical conditions were put through heart activity and electrical-induced pacing assays. The heart activity assays involved performing semi-intact heart dissections over a span of ten weeks of their adult life. The exposed *D. melanogaster* hearts were filmed and used to gather a number of quantitative measurements, such as heart rate analysis, cardiac irregularities like arrhythmia, and systolic and diastolic heart diameter. Electrical-induced pacing assays were conducted to measure immediate cardiac arrest rates and their subsequent recovery. The results from the first two replicates appear to demonstrate the greater effect of demography on cardiac function as the *D. melanogaster* age compared to body content. Results for the third replicate are still pending and are expected by late April. Future assays with other genetically differentiated *D. melanogaster* or ones placed in different environmental conditions may be performed to provide further insight into how factors such as demography can influence cardiac function with age.

UCI Satellite
Steven Chung, Allen Giragosian & Timothy Van Name
*Mentors: Manuel Gamero-Castano & Benjamin Villac*

The goal of the UCI Satellite (UCISAT) project is to design, build, and launch nano-satellites into Low Earth Orbit (LEO). UCISAT Satellite’s first project, UCISAT-1, is a 10cm x 10cm x 10cm cube satellite. The primary mission objective for UCISAT-1 is to capture images of the Earth and transmit them to the K6UCI ground station. The undergraduate team has spent the 2009-2010 school year assembling and testing the satellite for its orbital flight in December 2010. The UCISAT team has recently begun its second project, UCISAT-2, which will be a joint effort between the Civil and Environmental Engineering Department at UCI and the UCISAT student team. UCISAT-2 is currently in the research and development phase. The goal of the second satellite is to investigate water purification using high-energy solar radiation.

Advanced Structural Design
Eric Clough, Brandon Grant, Derek Gregoriev & Randall Schubert
*Mentors: Marc Madou & Lorenzo Valdevit*

The overarching goal of this research project was the development and characterization of a new category of composite materials and structures based on three-dimensional carbon architectures. The enabling technology is a novel manufacturing method based on the pyrolysis of pre-structured polymeric precursors, which enables precise dimensional control on the resulting carbon structures, ranging from the micro to the macro scale. Notably, any shape that can be imparted to a polymeric precursor is amenable to carbonization. The open pores within the carbonized backbone are subsequently infiltrated with a polymer (e.g., an epoxy resin), resulting in a composite material with 3-D reinforcement architecture. We anticipated that these novel materials would exhibit a unique combina-
tion of advantages not present in any other state-of-the-art solution, namely: virtually unlimited flexibility on the carbon backbone architecture, with associated design flexibility; ability to fabricate structures of virtually any shape and size without the weak interlaminar regions always present in conventional composite laminates; and potential to functionally grade the carbon architecture to optimize the weight efficiency of the structure without introducing large localized stresses at regions of discontinuity. Within the limited scope of this program, we focused on three different reinforcement architectures, based on natural wood, stochastic foams and rapid prototyped periodic trusses. We will demonstrate the fabrication approaches that we have developed (including optimal pyrolysis schedules and infiltration processes), and present the resulting microstructures of these novel composite materials systems. We will illustrate the mechanical characterization tools that we have used, and qualitatively and quantitatively demonstrate the reinforcement mechanisms that contribute to the strength of these materials. We conclude that optimized composite systems with 3-D reinforcement architectures have enormous potential in high-end applications which require superior stiffness and strength at low weight, possibly under complex multi-dimensional loading scenarios.

The Development and Analysis of Prokineticin 2 Antagonists
Andrew Gould, Amy Ngo, Dewey Nguyen & Josephine Vu
*Mentor: Qun-Yong Zhou*

Prokineticins 2 (PK2) is one of the newly identified regulatory peptides. In the central nervous system, PK2 is involved in controlling the circadian rhythms via activation of a PK2 receptor. Dr. Zhou’s laboratory has designed a family of PK2 receptor antagonists. This project involved one part of the structure-activity relationship studies. By using a three-step reaction of amide bond formation, deprotection reaction, and reductive amination, Andrew and Dewey synthesized about two dozen compounds. The potency of the compounds in antagonizing PK2 signaling was measured *in vitro* Ca$^{2+}$ mobilization assay by Amy using PK2 purified by Josephine. We found that halogenation in particular benzene rings greatly enhanced the potency of the compounds in antagonizing PK2 receptors.

Evolution of Physiological Changes in Late Life and Aging as Observed in *Drosophila melanogaster*
Keila Benjamin, Tra Duong, Maria Samson & Shane Seymour
*Mentor: Michael Rose*

Previous studies involving medflies, nematodes, yeasts, and humans have shown that mortality rates increase exponentially with age and eventually plateau in late life. The age at which mortality rates plateau is known as the breakday, and separates late life from aging. Previous studies have shown that aging and late life are different physiologically. This study tests whether physiological characteristics between aging and late life evolve according to the generation length and lifespan of a population. Two populations of *Drosophila melanogaster*, with varying demographic characteristics, were used to explore the differences between aging and late life. The populations were tested for four physiological characteristics: time in motion, negative geotaxis, starvation resistance, and desiccation resistance. Based on the demographic differences of the two populations and the data thus far, it can be predicted that physiological changes between aging and late life will occur earlier in the population with the accelerated life cycle compared to the longer lived population.

The GRILL Interface
Rowan Cannaday, Eric Middleton, Jessica Tang & Jonas Tsai
*Mentor: Mark Bachman*

The loss of fine motor skills has been a common occurrence in the elderly and recent war veterans. This loss of dexterity can be caused by any number of reasons, such as genetic disorder, cerebral palsy, arthritis or spinal cord injuries. While there are many rehabilitation programs available for the rehabilitation of fine motor skills, these programs are expensive and their results lackluster. The GRILL interface is a platform that creates an immersive environment that is designed for, but not limited to the rehabilitation of fine motor skills. The GRILL provides a tangible method of interaction between the user and a computer, using a sensor array and optional peripherals. Focusing on retraining dexterity, software was created that combines audio and video interaction with the tangible interface. This provides the user with sensory feedback from the device that motivates the user to carry out the retraining program. Unlike products currently on the market, the GRILL allows the user to interact with an audience or other users. This creates richer dexterity training because the user is creating something dynamic, rather than manipulating objects on a peg board. The GRILL can be modified easily by replacing its sensor panel or loading software for other applications such as a tangible educational game for children. The capability of this platform is endless and provides a exciting future for collaboration with software and hardware developers.

UCI Stirling Engine
Megan Campbell, Justin Carter, Mehernosh Gundevia & Daniel Rodriguez
*Mentors: John LaRue & Farghalli Mohamed*

As global warming continues to threaten and damage ecosystems, innovative approaches must be taken to reduce the amount of emissions from power sources. The goal of
this project is to develop an engine to run on a renewable energy source such as solar thermal. The simple Stirling Engine consists of two reciprocating pistons at a 90 degree phase angle. To power the Stirling engine, an external heat source on one piston is used, creating a temperature gradient through a heat exchanger called a regenerator that drives each cycle. The regenerator preserves the gradient between the two pistons by absorbing heat as the working fluid travels to the cold cylinder and returning the energy as the fluid flows back to the hot cylinder. Solar collectors harness solar thermal energy by employing reflective mirror arrays to collect sunlight over a large area and focus it over a smaller one. Because solar collectors produce zero emissions, it is an ideal source of renewable energy for Stirling engines in areas with climates conducive to solar collection.

UCI Steel Bridge
Wendy Bang, Victoria Espinoza, Vilong Truong & Jun Yeung
Mentor: Ayman Mosallam

Each year the American Institute of Steel Construction (AISC) hosts the AISC Student Steel Bridge Competition, a national competition in which participating American Society of Civil Engineers (ASCE) student chapters participate. The AISC presents a problem statement for the construction of a structural steel bridge and students are given the opportunity to bid on a project by designing and fabricating a scale model of their design. Bridges are scored on the estimated costs of a full scale serviceable bridge. The final cost of a full scale bridge is determined by how well a bridge meets design constraints and its performance in terms of weight, construction speed and deflection. A main goal of the team was to lower construction times for its bridge without sacrificing the stiffness of a bridge composed of many pieces. A truss bridge was chosen as the main structural feature, and its connections became a main focus in design because construction speed is heavily reliant on how quickly the separate members can be constructed into a standing structure. Although we were able to build the bridge with existing equipment in the structural labs, fabrication ran into many challenges that had to be solved while satisfying AISC rules and constraints. The loaded bridge held the required 2,500 lb. load in competition and deflected according to values calculated during design while achieving lowered construction times due to the improved connection pieces that were designed.

Energy Conservation in the Home: Trends and Misconceptions
Jessie Baker, Samantha Bondi, Katrin Escobar, Kristen Figueira & Isabel Wang
Mentors: David Kirkby & Daniel Stokols

Scientific evidence overwhelmingly points to carbon emissions caused by residential energy use as a leading cause of climate change. As a result, there is a need for greater understanding of how residents use energy and whether they are actively attempting to conserve. According to Black, Stern, and Elworth, there are two main types of energy conserving behaviors: curtailment and efficiency. They defined the former as an act performed routinely to reduce the consumption of energy, such as turning off lights or appliances. The latter was characterized as a usually one-time-only act performed for the same reason, such as purchasing or installing newer appliances that use less energy than their older counterparts. While public service announcements and magazine articles have disseminated information to the general public about ways to reduce energy use, they have often only encouraged curtailment behaviors, underestimating the fact that efficiency behaviors typically yield far greater reductions in energy consumption. The focus of this project is to identify how people self-report the ways in which they both conserve and waste energy in the home. Survey data was collected from 838 adults and included both open- and closed-ended questions about their energy behavior as well as perceptions of what used the most energy in the home. We will present the results of a content analysis on self-reported behaviors and perceptions as well as any implications for future research.

Catalyst
Corinne Chan, Joann Hockersmith, Mitchell Klein, Kelly Mayfield & Chris Morales
Mentor: Daniel Martinez

The student operated art gallery known as Catalyst has continued to see strides in its original goal of proliferating interaction among student artists and faculty while providing gallery experiences on multiple levels. Catalyst provides crucial curating training that allows artists to participate on aspects such as marketing, installation, proposal writing, finances, and networking; along with an avenue to receive feedback on current work. With the support from Daniel J Martinez, Catalyst has branched out by creating a forum for peer review on installed work, which stimulates proactive learning. This year has also seen the fruition of student run workshops that allow fellow artists to provide hands-on training on more technical skills not otherwise found in classes. Catalyst aims to nurture the skills needed to pursue a serious career in the arts.
Reading in Motion
Sonia Ganju, Jessica Haugen, Elizabeth Mour, Rebecca Wang & Yuh Shin Wang
Mentor: Liane Brouillette

Reading in Motion (RIM) builds literacy and socio-emotional skills by integrating music and movement into the regular classroom curriculum for English Language Learners and special needs students. Implementation of the RIM curriculum for kindergarten was carried out by UCI undergraduate students in an elementary school in Irvine. Originally created in Chicago, RIM has recently been implemented in several school districts across the nation. The RIM music activities help to develop children’s focus, phonemic awareness, memory, and oral literacy skills. Although the original intent was to enhance literacy development, students progressed in socio-emotional development as well. Whole class music activities helped to build confidence, verbal expressiveness, ability to focus attention, engagement with visual aids, and motor skills. Benefits of implementing RIM included increasing/improving state and in-class test scores, integration of the arts with the academic curriculum, and flexibility of curriculum implementation. RIM may be applied easily to any educational environment. Implementation of RIM involved teaching in the classroom for 30-45 minutes once a week, debriefing meetings of UCI teaching artists and observers, and coding and analysis of data. Preliminary results showed that both classes where RIM was implemented were developing socio-emotionally, academically, and cognitively.

Autonomous Control System in Underwater Environments
Brian Eastman, Kelsey Hakes, Yuri Kapustin, Gia Nguyen & Ellingwood Stephanie
Mentor: James Bobrow

The Autonomous Underwater Vehicle competition challenges students to design a robust autonomous underwater vehicle to perform several missions, such as going through a gate, hitting a buoy, shooting a torpedo, and surfacing within an octagon. The project requires high-level cooperation among computer scientists, electrical and mechanical engineers. It also creates room for the engineers to experiment with a large playing field of creativity and innovation. The Autonomous Underwater Vehicle research team at UC Irvine has been recognized at various technical events for its reputation to innovate and advance rapidly within a short time span. In this project, engineering students showcase their talents in design, manufacturing, and management. At the end of the first quarter, we built the first prototype and tested in pool the mechanical, electrical, and computer systems. At the end of the second quarter, we finished the mechanical design of the second frame, implemented the vision algorithm in C programming language, and successfully interfaced compass and pressure sensors for navigation purposes. Our computer program is able to identify a gate, recognize a buoy, and control the thrusters for appropriate movement. This quarter, our goal is to fully integrate the electronic sensors, computer, with the mechanical systems. Thus far, the project has provided students with hand-on experience on water sealing techniques, power and propulsion, image-processing algorithms, and control engineering.

UCI Rocket Project
Pak-Too Chan, Tony Co, Melissa Holm, Mahmoud Kakavand, Travis Van Den Vlekkert & Stephanie Wong
Mentor: Kenneth Mease

The primary objectives of the UCI Rocket Project are to design, construct, launch and recover a rocket carrying a 10 pound payload that is capable of reaching a minimum height of 10,000 feet using a Loki Research N3800 solid propellant motor as a baseline. An experimental liquid bipropellant motor will also be designed, constructed and ground tested to meet the thrust requirements of the rocket for possible implementation in flight. The Experimental Propulsion System (EPS) subteam has conducted combustion analysis using FORTRAN to design a monocoque liquid bipropellant motor using the solid propellant motor as a benchmark. The Airframe System (AS) subteam has used CAD modeling and finite element analysis (FEA) software to design the external and internal rocket structure. The Recovery System (RS) has analyzed configurations for the reusable parachute system to allow a safe descent rate for recovery. The Flight Dynamics and Data Acquisition (FLDAS) subteam has performed flight simulation to evaluate aerodynamic efficiency and thrust capabilities as well as set up avionics for data acquisition. Design tradeoffs were mitigated in weekly meetings so finalized rocket components could be approved by all affiliated subteams. Flight data collect by onboard avionics will be analyzed to reconstruct the trajectory of the rocket and evaluate aerodynamic forces for design assessment. A test launch and ground test has been schedule for May 1, 2010 at the Friends of Amateur Rocketry facility in the Mojave Desert.

Design/Build/Fly
Calvin Nguyen, Kamil Samaan, Sothea Sok, Dennis Tam, Giuseppe Venneri & Chen Weng
Mentor: Robert Liebeck

The Design/Build/Fly Competition is an AIAA sponsored annual and international event that allows undergraduate college students to gain hands-on experience. The goal is to design and fabricate a remote-controlled model aircraft to complete assigned missions and fly on a specified flight course while carrying assigned payloads. The payloads for this year are softballs and “bats,” which are actually 30-
inch long 2-inch diameter PVC pipes. It was UCI’s sixth year in the competition, and the team learned new ways of manufacturing the aircraft using composite materials. The wings, tails, and landing gear can be fabricated much lighter than with the previous method and still withstand the necessary loads. The data from the test flight can be obtained from a programmable speed controller, which logs current draw, voltage, temperature, rpm, and throttle. The team placed 19th out of 69 teams overall.

**Ensemble Thinking: The Creation of DTM2 Improvisation Ensemble**
Lindsay Berliner, Rachel Berman, Marissa Brown, Natalie Johnson, Katrina Muffley, Jason Poullard & Alysha Shroff
*Mentor: Lisa Naugle*

In the summer of 2009, under the direction of Professor Lisa Naugle, twelve students from the Claire Trevor School of the Arts participated in the International Festival of Composers in Andalucía, Spain. As Resident Choreographer for the festival, Professor Naugle established a research project for students to create dance events in collaboration with professional composers who specialize in the art of improvisation. The research was grounded in the formation of DTM2 Improvisation Ensemble and furthered the theory and practice of ensemble thinking in performance. Ensemble thinking is the collective understanding of sequence organization while creating individual/original movement in performance. During the two-week period, DTM2 created more than twelve new works for the stage. We premiered at the Jardín Botánico Finca de la Concepción as part of the World Congress on Research in Dance, sponsored by the United Nations Educational, Scientific and Cultural Organization. We also premiered at the Casa de la Cultura in Frigiliana and the Conservatorio Superior de Música in Seville. Our performances ranged from group choreography set to music by internationally recognized composer Jesús Villa-Rojo, to solo dance with solo musician on trombone, as well as “spontaneous events” in the streets of Malaga. We will perform three structured improvisations, deliberately leaving some sections open while other sections are predetermined. This international artistic collaboration allowed us to experience the depth of improvisation and value of ensemble thinking as a necessary aspect of performance. The works performed will be *You And Me, Thermodynamics* and *Lament*. In addition, we will give a brief oral presentation with still video images.

**Wireless Magnetic Stripe Scanner**
Ahmad Abiri, Wesley Cheng, Franklin Jeng, Justin William Jones, Derrick Lo, Don Nguyen & George Yameen
*Mentor: Pai Chou*

The ability to electronically document, store, and aggregate the number of people attending a school event has not been as prevalent as one would expect. It is extremely hard and expensive to buy commercial systems that do not perform every function that suits an academic setting. A specifically built wireless scanner would not only be more economical but more beneficial to the user. It would be able to accept a variety of attachment scanners, allowing it to be more versatile, and include an LCD and keypad for easier user interfacing. The unit would also be able to take advantage of a USB flash drive as local storage. Universities all across the nation still rely on paper and pen sign-in sheets to keep track of students’ attendance in lectures and discussions. With the help of our Synchronous Wireless Scanners, taking attendance in class will be simple, and most importantly, in a digital format that is highly portable and manipulatable. Once attendance is taken, our Application Server will have the ability to automatically update class attendance lists and email the Professor the data. The scanners will be portable hand-held devices, making them easier to set up anywhere that wireless Internet is available. Attendance will be easily tracked anywhere large crowds are present—sports events, concerts, and even dining halls will be simple to monitor. In addition, the design will allow multiple scanners to be linked with the server, which will reduce the time that people will have to wait in line.

**What are the Differences Between an Employee Health Promotion Program that Rewards Employees Based on Attendance and a Program that Rewards Employees Based on Received Knowledge?**
Farzad Alikozai, Kristall Lee, Lesley Nguyen, Randy Popiemlarp, Gunbir Rana, Rose Raymond & Hamza Siddiqui
*Mentor: Zuzana Bic*

Companies are increasingly turning to employee health promotion programs as a way of reducing health insurance costs. Previous studies have shown that when incentives and/or some sort of competition are introduced, employee health promotion programs become more effective. In this study we are comparing two programs (A and B) that only differ in the type of competition used. Both programs are five weeks in length and consist of weekly one-hour health education classes, followed by a quiz on the information covered in the class. In program A participants will be competing for prizes based on their attendance. In program B participants will be competing on the score received on the quizzes. In addition changes in lifestyle...
Development of Neurotrophic Keratopathy in a Rat Model
Zixin Deng, Chris Ju, Mark Li, Michael Lim, Amy Ngu, Timothy Nguyen, Long Tran, Stephanie Tran & Krystal Vanichsarn
Mentor: Edward Wong

Neurotrophic Keratopathy (NK) is a corneal degenerative disease with symptoms that consist of, but are not limited to deterioration of the cornea, corneal ulcers, impaired corneal regenerative properties, and decreased corneal sensitivity. If left untreated, the eye will develop chronic infections that may lead to functional blindness. The purpose of this study is to develop an animal model in rats that can be used as a reliable source for information on NK. To produce an accurate model, the rats undergo surgery in which they lose their blink reflexes by lesioning the left trigeminal nerve using a stereotaxic unit, developing symptoms in the left eye that would mimic those of NK. After successful surgery, the rats undergo femtosecond laser surgery, which is a technique that uses pulses of light to damage the cornea, followed by Optical Coherence Tomography (OCT) imaging, which is a method that produces cross-sectional images of living tissue at high resolution. Our results have shown that the left eye will exhibit a decreased rate of wound healing compared to the right eye (control). This is consistent with the symptoms of NK, demonstrating that our rat model can be used for future studies on treatments for NK.

SineQuanon Theater Project
Skyler Gray, Rachel Gross, Tatiana Kuilanoff, Lauren Mack, Ian Parmenter, Claire Perry, Soren Santos, Joel Shura, Victor Vasquez & Marlene Yarosh
Mentor: Don Hill

At its center, the SineQuanon Theater Project is a UCI-based ensemble and company of artists committed to creating supplementary opportunities for actors, designers, writers, directors, musicians, and several other artists at the University of California, Irvine. In our first year we created three performance projects, hosted guest artists, and created opportunities for more than 30 undergraduate performers and designers. Our objective is to instigate and nurture the creation of more projects and more opportunities in the Arts for students, the university, the city, and its neighboring communities. The SineQuanon Theater Project is therefore an essential project, a solution that is absolutely necessary to enhance opportunities in the diminishing Arts. As our first year draws to a close we now know how to run a theater company and how we will continue to allow SineQuanon to grow and flourish to create even more art for UC Irvine and the community.

Wind Energy for Regions with Low-Velocity Winds
Gary Le, Khoi Le, Kersey Manliclic, Ka Ng, Sarah Oliver, Phong Phan, Duy Nam Ton, Ryan Wong, Matthew Woo & Zhiou Yang
Mentor: Yun Wang

A wind turbine captures the energy of the wind to spin an electric generator in order to produce electricity. However, traditional horizontal-axis wind turbines can only function in areas with high-velocity winds. Fortunately, for areas with low wind speeds, using vertical-axis wind turbines (VAWT) is an alternate option, since those do not require strong winds. Our goal was to investigate the potential use of wind energy in areas with low-velocity winds. First, we designed a 2-meters-tall VAWT with emphasis on its wind capturing ability; this process also took budget constraints and material considerations into account. Next, we machined and fabricated every necessary components of the turbine, and assembled them together. Finally, we tested our finished product under wind speeds of approximately 10 mph to determine how much voltage and power our turbine can generate. Our wind turbine was able to produce 6–12 volts with a power output ranging from 10 to 40 watts. These results suggest that our wind turbine can produce enough electricity to be used for small applications.

Can Public Health Education, with Focuses on Physical Activity, Nutrition, Stress Management and Coping with Financial Burden, Improve the Quality of Life among Adolescents and Young Adult Cancer Populations?
Erica Fernandez, Toni Geronimo, Roukaya Hassanein, Omeid Heidari, Mark Ilarina, Tina Jagtiani, Nima Khoobiyary, Michael Nguyen, Phuong Nguyen, Nabeeha Siddiqui & Shahrzad Yavari
Mentor: Zuzana Bic

This study seeks to increase the levels of public health literacy and awareness about cancer/cancer-related issues that will help individuals ages 19–29 cope better with their diagnosis, treatment, and remission—allowing them to integrate effectively back into society. The main topics included: nutritional education, stress management, physical activity, educational integration, and additional resources to improve quality of life. After considering various hospital sites within Orange County, California, the Cancer Center at Hoag Memorial Hospital Presbyterian in Newport Beach, California, has been determined to be the study location to create and/or improve the existing level of support groups offered for these individuals diagnosed with cancer. Also, this study seeks to use the acquired results to develop an essential pilot public health cancer resource website. The researchers have recorded a total of five, 1-hour presentations which correspond to the topics mentioned above, to be uploaded to a future section of
Hoag Hospital Cancer Center’s official website. The pilot study, which will incorporate an online evaluation method that will consist of a pre- and post-survey, will determine whether involvement in this study increased the knowledge and adherence among participants. This study is anticipated to continue into Fall, 2010, and seeks in the future to show how information found on the website can be used by cancer patients to instill lifestyle modifications for improving quality of life from the comfort of patients’ own homes.

**UC Irvine-UC Santa Barbara Dance Exchange 2010**

Jeanette Abell, Sarah Alaways, Rachel Berman, Julian DeGuzman, Kayla Garton, Alyssa Junious, Justin Keats, Madison Krekel, Phillip Lu, Crystal Norbut, Amy Quanbeck, Kari Richardson, Shane Scopatz, Kellie St. Pierre, Robyn Wallace, Ching Ching Wong & Andrea Yorita

*Mentor: Donald McKayle*

The goal of the Dance Exchange is to foster and promote creative, artistic and academic dialogue between emerging and imminent university dancers. In its fifth year, the Dance Exchange will reunite the UCI Etude Ensemble with the UCSB Dance Company for another exciting collaboration in dance. The two-day format (Spring 2010) of the Dance Exchange will allow each company to experience the educational and artistic environment of the other. The Etude Ensemble will host the UCSB dancers during their day-long visit to our campus. Both companies will be able to share a deepening of their craft, both artistically and academically; highlights of the program will include technique classes, an evening performance showcasing both companies’ unique repertories and an open question and answer session for the audience with directors and dancers from both companies. The performance will feature a reconstruction of Professor Donald McKayle’s *Midnight Dancer* (2003), as well as new works by undergraduate choreographers within the Ensemble. The Etude Ensemble will have an opportunity to experience company life by traveling to UCSB to complete the second leg of the exchange. The Dance Exchange, ultimately, will allow both students and educators a larger perspective on the validity of dance as a worthwhile academic pursuit in a university setting.