Members of Parliament and the Passage of Special Interest Legislation in 18th Century England
Robert Oandasan
Mentor: Daniel Bogart
The Industrial Revolution, of which England was the main instigator, signifies an important economic event in history. By studying different political, economic and social aspects of the country in the years before the onset of the Industrial Revolution, we can extract important trends and lessons that may be used in today’s economic development. There is an ongoing debate about the importance and influence of 18th century English politics on the country’s economic development. Current research indicates that there are an increasing number of acts that Parliament passed after the Glorious Revolution in 1688. These acts were usually instigated by a specific individual or group of individuals to serve their own interest. Thus, they are considered to be special interest legislation. These acts also dealt specifically with altering property rights and encouraging the provision of public goods, which ultimately affected England’s economic development and the beginning of the Industrial Revolution. The goal of this study is to examine the individual Members of Parliament who guided the passage of these special interest legislations through Parliament and find specific patterns and characteristics that might have contributed to the passage of these legislations. The results will help us further understand the effect of politics on a country’s economic development.

Resistance to Cephalosporins in Environmental Bacterial Isolates
Laura Ortiz
Mentors: Luis Mota-Bravo & Toai Nguyen
Cephalosporins are a group of antibiotics, most commonly prescribed to prevent nosocomial infections. Since their discovery in 1945, four generations of cephalosporins have been developed. The first three generations have antimicrobial activities against Gram(+) bacteria. Subsequent generations of cephalosporins have increasing activities against Gram(-) and decreasing activities against Gram(+) bacteria. The fourth generation has the widest spectrum, with antimicrobial activity against both Gram(+) and Gram(-) bacteria. In this study, we tested the hypothesis that the incidence of antibiotic resistance in environmental isolates decreases with successive generations of cephalosporins. Environmental samples were collected from an urban creek, topsoil and potable water sources. Ninety seven bacterial isolates were tested against nine cephalosporins using the disk diffusion susceptibility test according to the standardized methods of the Clinical and Laboratory Standards Institute (CLSI). Results indicate that 76% (74/97) of the isolates are resistant to one or more of the cephalosporins tested and that the incidence of resis-

Chronic Microvascular Response to Photodynamic Therapy
Matthew Nudelman
Mentor: Bernard Choi
Port wine stain (PWS) is a skin birth defect that causes discolorations in the skin due to over vascularization and excessive blood flow. These disfigurements from the PWS have been shown to cause psychological problems. The current treatment is to selectively inflict vascular destruction using a pulse dye laser. However, even with multiple treatments, the PWS returns. A more effective treatment is required to permanently eliminate the PWS. Our study examines the effectiveness of photodynamic therapy (PDT) using the photosensitizer benzoporphyrin derivative monoacid ring A (BPD) and a continuous 690 nm laser light source as a means of causing permanent vascular destruction. For our experiment, a dorsal skinfold window chamber was installed surgically to a male C3H mouse. 1 milligram per kilogram of BPD solution was administered intravenously via a tail vein catheter. Evaluated interventions were: 126, 251, 960 seconds. To assess changes in microvascular blood flow, laser speckle imaging was performed before, immediately after, and two weeks post-intervention. BPD PDT can achieve selective vascular flow reduction. Our results suggest that BPD PDT should be investigated further to obtain optimal parameters for inflicting vascular permanent destruction without damaging the surrounding tissue.

Christina Nizar
Mentor: Judith Stepan-Norris
Prompted by the 1955 merger of American Federation of Labor and Congress of Industrial Organization, AFL-CIO mergers from 1955–2005 experienced accelerated union merger activity, while simultaneously membership sharply declined. Mergers served as a strategic tool, which unions were motivated to use by declining membership, desires to unite collective interests, financial difficulties, changes in industry, ineffective collective bargaining, and/or low strike funds. Yet, research focuses on frequency trends instead of the types of unions that engaged in mergers and their motivations for merging. The goal of this research is to identify patterns in the type of unions choosing to merge. Using their membership size, I categorized each union into small, medium or large focusing solely on AFL-CIO mergers from 1955–2005. The results generally show that small unions were the most frequent merger partners, regardless of the year. Additionally, starting in 1979, mergers between small unions and large unions became increasingly common and most prevalent.
tance appears to decrease with newer generations of cephalosporins. Seventy-three percent of the 97 isolates analyzed were resistant to two or more of the antibiotic tested, with a distribution of multiple resistances following a non-random pattern. There is no clear pattern of the differential incidence of resistance against Gram(+) and Gram(-) isolates except for cefamandole (2nd generation), cepodoxime, and ceftriaxone (3rd generation), which are more effective against Gram(+). This research shows that bacteria isolated from diverse environments have overall lower levels of resistance to recently developed antibiotics than those of previous generations.

**Does Gender Make a Difference in a Socially Evaluative Situation?**

Keara Osborne  
*Mentor: Sally Dickerson*

Women are faced with a myriad of different types of stressful situations every day. Situations that present a social-evaluative threat, such as presenting to an audience or being the recipient of a negative social comparison, are capable of eliciting large cortisol responses. However, research has not investigated whether the gender of the evaluators influences stress responses. In this study, female undergraduate participants delivered a five-minute speech in front of two evaluators. In some cases, the evaluators were both female; in others, there was one male and one female evaluator. Analyses will examine whether the gender composition of the evaluative panel is associated with differences in cortisol reactivity, and in participants’ perceptions of the stressor. Hypotheses predict that female participants will show a greater stress response when faced with a panel composed of a male and female evaluator versus a panel of two female evaluators. This study will help us understand the effects of gender on social-evaluative processes.

**Sex Determination of Young by Adult Zebra Finches, *Taeniopygia guttata***

Jenny Ouyang  
*Mentor: Nancy Burley*

Avian parents sometimes show preferential treatment toward offspring of one sex. They may, for example, feed offspring of one sex more, or even selectively evict offspring of a certain sex from their nest. The basis of recognition of offspring sex is not well understood. This study examined whether there is a difference between male and female chick begging calls in Zebra Finches, *Taeniopygia guttata castanotis*. Pairs of finches were allowed to breed in cages, and offspring begging calls were recorded to produce sound spectrograms. The spectrograms were examined to identify possible sex differences in calls. Early results indicate that offspring do not unambiguously signal their sex to parents, but parents may get clues to offspring sex from the peak frequency of certain calls made by 3-day-old young, and by the percentage of “fuzzy” calls made by 7-day-old young. A follow-up experiment is underway to further investigate parental feeding behavior in relation to offspring begging behavior when food quality varies.

**A Microfluidic Droplet Platform for Quantitative Nucleic Acid Assays**

Patrick Pan  
*Mentor: Abraham Lee*

Molecular beacons (MB) are molecules that can fluoresce upon hybridizing with a complementary DNA. They are often used as probes in detecting the existence of a certain sequence of DNA. A biological environment, however, usually has only low concentrations of DNA, which makes the detection and its corresponding kinetics hard to observe. In this study, we perform this MB-DNA hybridization in a microfluidic system that generates picoliter-sized (10⁻¹² liter) droplets. Molecular beacons and target nucleic acids are rapidly mixed in these tiny droplets and flown one-by-one through microchannels. With help of this microfluidic platform, a high signal-to-noise ratio is expected and detection of low concentrations is made possible. We further compare different DNA concentrations, as well as several non-specific DNAs, and their effects on signal-to-noise ratio. Signal-to-noise ratio is found to reach as high as 168 in this platform. In addition, MB-DNA hybridization is done in less than two seconds compared to several minutes in other reported microfluidic platforms. This paper presents a highly sensitive and selective technique to rapidly detect nucleic acids without requiring the immobilization of molecular probes and the 15 stringent washing steps. Furthermore, this design can be applied not only to DNA, but also to the analysis of RNA, protein, and cells, with short reaction times and only a few microliters of sample required.

**Amsacta moorei Entomopoxvirus Virion Proteome: Mass Spectrometric Analysis**

Joseph Park  
*Mentor: Paul Gershon*

Viruses are often regarded as highly optimized, packaging minimally sufficient material to impinge upon the host’s machinery and replicate. However viruses that encode for over 200 genes are not necessarily minimalist in nature. There are several classes of giant viruses that infect insects, including the *baculoviridae*, *ridoviridae*, African Swine Fever Virus, and poxvirses—the virion proteomes of any insect viruses are not known. Within the family, *Poxviridae*, representing giant DNA viruses, there are two subfamilies—*Chordopoxvirinae* (vertebrates) and *Entomopoxvirinae* (insects). The latter is further divided into three genera: A, B and C. *Amsacta moorei* (AmEPV) belongs to *Entomopoxvirus B* and
even though its genome has been sequenced (292 genes), nothing is known about the protein inside the virion. By using liquid chromatography-matrix assisted laser desorption/ionization tandem mass spectrometry (LC MALDI-TOF/TOF MS) on the cyanoen bromide/trypsin double digested AmEPV, 51 unique proteins were identified with a confidence interval greater than 95%. Xx were homologous to proteins known to be packaged in vaccinia and yyy were apparently unique to AmEPV. From correlating the virion proteome with ultrastructural work, we learn which structures within the virion make it poxvirus-like and which render it ultrastructurally unique.

Screening HIV Infection in a Subtype Specific Manner Using a Pan-HIV Proteomic Chip
Amy Patel
Mentor: David Camerini
The human immunodeficiency virus (HIV) infection and its resulting deaths have become an increasingly global issue. Difficulties in creating a vaccine are partly due to the genetic diversity and rate of mutation the virus exhibits. Although the ELISA test adequately screens for HIV infection, screening for HIV-1 infection it is not in a subtype-specific manner. We hypothesize that an HIV-1 proteomic chip can account for these differences and help determine infections in a subtype specific manner. Significant genetic variability of the envelope variable region of subtypes A, B, C, and D of HIV-1 can help distinguish between the infection of the different subtypes. Creating the proteomic chip involves high throughput amplification of 23 genes using HIV 1 gene specific primers, followed by in vivo homologous recombination using a pXi vector. After recombination, the proteins will be expressed through in vitro transcription and translation, and the protein products of these reactions will be directly played onto nitrocellulose membranes. Eventually, a proteomic chip will be tested against serum and subtype-specific reactivity with envelope variable regions and cross reactivity with other proteins is expected.

Efficacy and Safety of Doxorubicin-Eluting Beads in the Treatment of Hepatocellular Carcinoma
Dharmi Patel
Mentor: David Imagawa
Conventional transarterial chemoembolization (TACE) has been one of few viable options for hepatocellular carcinoma (HCC) patients ineligible for transplant, resection, or ablation. The goal of this study is to assess tumor response to TACE with drug eluting beads (DEB-TACE), a treatment hypothesized to enhance response to chemotherapy while decreasing toxic side-effects. A retrospective review of 20 HCC patients (Childs A or B and Okuda 1 or 2) treated with this procedure at our institute over a 6-month period was done. CT scans, from before and after administration of DEB-TACE, were used to evaluate the subsequent change in lesion size. Patients were staged according to TNM criteria, Kaplan-Meier survival curves generated, and 1-year survival determined for each TNM stage. Safety was evaluated on the basis of post-procedural events. Overall, 76% of the total lesions treated showed a partial or complete response based on RECIST criteria. Mean follow-up was one year. In the nine patients who underwent DEB-TACE in conjunction with other treatment modalities, 90% of treatments produced at least partial response. In the 11 patients who underwent DEB-TACE alone, 69% of treatments produced at least partial response. Recurrence was seen in 42% of the patients at 2.5–10 months following initial diagnosis. There were no major complications and one perioperative mortality. One-year survival for Stage I, II, and IIIA patients was 50%, 78%, and 56%, respectively. Despite the small sample size, results indicate that DEB-TACE appears to be a safe and effective treatment for selected HCC patients.

Iraq’s Sectarianism and Threats to Democratic Security
Sarah Pauly
Mentor: Caesar Sereseres
In mid-2003, the National Democratic Institute found Iraq to be experiencing “an explosion of political parties” and a desire to create a unified secular Iraq. Unfortunately, the United States failed to capitalize on this situation. According to Dr. James Fearon of Stanford University, Iraq is now the ninth most deadly of 125 civil wars since World War II. The civil war has limited the government’s ability to maintain a monopoly over the means of violence. The political divisions are cemented in sectarianism, but it is not clear when political and sectarian identity become synonymous. An examination of early 2003 through that fall is helpful in answering this question. I evaluated the recent volume of study by scholars, journalists, military, and government personnel. Analyzing post-Saddam decisions reveal how orientation with Sunni, Shiite or Kurdish sects came to distinguish the new political infrastructure. My main finding is that—although it was evident before the war—sectarianism was advanced by the formation of the Governing Council. A sub-group of the Council, of whom only one was Sunni, consisted of expatriate elites known as the G-7. In response, President Bush directed Ambassador Paul Bremer of the Coalition Provisional Government to institute a religious/ethnic quota system in May of 2003. Subsequently, the cabinet ministers were chosen by this method. These decisions institutionalized political identification by sect, signaling to the emerging civil society that ethnicity matters in terms of political power. This perception, that political and ethnic power are intertwined has fueled the fighting. A broader complication of this Iraqi
Comparison of Fare Quotes Across Online Travel Agents
Marija Pejcinovska
Mentor: Volodymyr Bilokach
This study compares fares offered by the three major online travel agents—Expedia, Travelocity and Orbitz—to understand the role of ticket distribution agents in air travel industry price formation. We collected data on the top 100 US airport-pair markets over a period of four weeks and found that, of the three, Orbitz is the least likely to offer the lowest fare. In fact, it offers the lowest fare in only about 8.5% of the cases, even though the lowest fare quotes on Orbitz are often close to those found on Expedia or Travelocity. Preliminary data analysis also suggests that Expedia is most likely to offer the lowest fare, with Travelocity following closely behind. We also observed that, controlling for various market characteristics, both the lowest fare quote and the difference between the first and second lowest fare decreases whenever more than one search engine offers either of the fares. Our results suggest that the ticket distribution market structure is of non-trivial importance for understanding pricing in the passenger air travel industry.

A Windom into Community Health: Body Mass Index Assessment in Children
Marcos Pena
Mentor: Frank Zaldivar
In 2006, The American Dietetic Association, recognizing the increase in overweight children in the U.S., recommended community-based and environmental interventions as being among the most realistic approaches to support healthy lifestyles for the greatest numbers of children. The aim of our study was to observe the incidence of obesity in children ages 1 to 18. Furthermore, we wanted to educate children and parents about BMI and physical activity. A total of 816 children were assessed for BMI %.

Artistic Collaboration in Dance: Past, Present, and Future
Charlotte Perebinossoff
Mentor: Jennifer Fisher
Interdisciplinary artistic collaboration has produced many of the dance field’s major works of art. This research project examines both historically important collaborations and the current interdisciplinary landscape in dance to understand what factors contribute to successful cross-disciplinary endeavors and how these can be applied to future partnerships. It features interview findings from professionals in a variety of sectors in the dance and non-profit arts fields in New York, Washington D.C., Seattle, and Southern California. These interviews illuminate some of the current trends, approaches, and necessary elements that can contribute to rich, effective exchange between artists of different disciplines. Although my research confirms that there is no standard collaborative equation, since every situation is different, my findings show that the following factors tend to be present for a successful collaboration: enthusiasm for each others’ work, mutual respect, adequate funding and location, being “on the same page,” and combining business and dance skills. This paper draws upon these discoveries to propose concrete ways these research findings can be applied to the UC Irvine context.

Is There a Large Reservoir of Antibiotic Resistant Microbes in the Environment?
Zachary Perez
Mentors: Luis Mota-Bravo & Toai Nguyen
 Clinically used antibiotics come from soil-dwelling bacteria; however, little is known about the presence of antibiotic resistance among environmental isolates. The objective of this study is to analyze the diversity of antibiotic resistance present among environmental isolates collected from surface water, drinking water, restaurant ice, and soil. Ninety-seven isolates were collected, characterized by Gram stain, and tested for susceptibility to antibiotics belonging to the lincosamide, macrolide, and tetracycline families according to the procedure of the Clinical and Laboratory Standards Institute (CLSI). Lincosamide and macrolide bind to the 23S rRNA of 50S (large) ribosomal subunit, while tetracy-
Factors that Influence Patient Satisfaction of Ambulatory Care Services Among Latinos
Shellown Persaud
Mentors: Leo Chavez Ph.D., Samuel Gilmore Ph.D.
Studies have indicated that Limited English Proficiency (LEP) Spanish speaking Latinos have been significantly more dissatisfied with provider communication than English speaking Latinos and non Latino patients. As these patients encounter barriers within the healthcare system, a response is essential to address their unique needs. This is an exploratory and hypothesis generating study. As such, it seeks to explore issues that might inform future research rather than find definitive answers to questions. The principal issue guiding this research is Spanish-speaking patients’ perceptions of satisfaction with their medical encounters. The research will explore factors important in patient satisfaction related to language proficiency, as well as develop questions and hypotheses that may be useful in research regarding satisfaction of LEP patients. The participants were selected using the anthropological method of snowball sampling. Informants were identified in four cities in Orange County in areas where there is a high concentration of Spanish speaking residents. The initial contacts were asked to introduce the researcher to other possible individuals who might be willing to be interviewed. Several factors were identified by the informants as being critical in determining whether satisfactory care is provided. These factors include the healthcare providers’ level of competence in the patients’ native language, the patients’ perception of the healthcare providers’ understanding of their culture and/or background, the patients’ perception of the health care providers’ ability to communicate medical information in a manner that patients are able to comprehend, and the comfort level of the patients during consultations.

Monitoring of Chemical Diffusion within Biological Samples Through CARS (Coherent Anti Raman Spectroscopy)
Ameya Phalke
Mentor: Eric Potma
Hair is primarily composed of a thick structural protein known as Keratin. In modern society, a large emphasis is placed on one’s hair, and this has made hair care a multi-billion dollar industry. Manufacturers claim that their products wash out excess oil and add shine to the hair. However, the efficiency of these products has not been tested or observed at a molecular level. Using CARS (Coherent Anti-Raman Spectroscopy), we attempted to study the diffusion of chemicals in hair samples. The threshold of hair had to be determined to ensure success of CARS spectroscopy and to acquire meaningful data and images. This was achieved by exposing a sample of hair to a laser of increasing intensity. The sample was able to withstand 1600 watts of energy without showing any signs of damage. This demonstrates that CARS can be successfully used to image samples of keratin and hair. We then monitored the diffusion of molecules within the sample. Various chemicals had to be flushed through a hair sample while it was fixated on a microscope slide. To achieve this, an apparatus was designed by creating a flow cell that would host a hair sample within a glass chamber and simultaneously allow the flushing of chemicals and imaging of the hair. We were successful in imaging the sample and monitoring the diffusion of molecules. The next step in this process is to gather data through extensive imaging with various substances.

Effect of a Methane Inhibitor, Sodium 2-Bromoethanesulfonate (BES) on Hydrogen Production in Primary and Secondary Sludge Batch Reactors
Amie Pham
Mentor: Betty Olson
The production of hydrogen was studied in the presence and absence of methane inhibitor, sodium 2-bromoethanesulfonate (BES), over 54 hours in unamended sludges. Batch cultures were flushed with nitrogen containing 50 ml of sludge (wt/wt) and a final concentration of 0.1M BES to determine if methanogens were completely inhibited in treated batch reactors. Methanogen concentrations were measured using qPCR primer and probe sets for the orders Methanobacteriales (MBT), Methanomicrobiales (MSL), Methanococcales (MMC), and Methanosaetales (MCC). Hydrogen producing bacteria were measured using qPCR primer and probe sets for the hydA gene based on Closstrium sp., the hydG gene associated with hydrogenase IV system, as well as the 16S rDNA of Closstrium, Archaea, and total bacteria. The results showed that both methane inhibited and uninhibited cultures approximately equal the
amounts of total bacteria and archaea present. Methano-
gens were present in all samples over the 54-hour test pe-
period and the types of organisms fluctuated over time.
Hydrogen production was approximately 3–5 fold less
than when glucose was added to the same sludge mixtures,
and CO₂ production was less in the unamended cultures
over the first 12 hours of the study, after which no statisti-
cal difference in production was noted. Without methane
inhibition, no hydrogen was produced. These experiments
show that, if hydrogen were to be produced in anaerobic
digestion, an additional reactor would be required with
a short residence time; heat shocked or treated sludge to
inhibit methanogens would also be required. Augmenta-
tion of human waste digestion with agricultural or other
wastes containing carbohydrates that break down into glu-
cose or sucrose would also increase hydrogen production.

Agrin’s Role in Cardiac Function
Bryan Pham
Mentors: Lutz Hilgenberg & Martin Smith

Agrin, a large proteoglycan, has been shown to bind to α3-
Na+/K+-ATPase in neurons, and thus regulates neuronal
activity. The heart, another excitatory organ like the brain,
also expresses agrin and α3-Na+/K+-ATPase, suggesting
that agrin may play a similar role in regulating cardiac mus-
cle function. I propose a two-pronged approach to test this
hypothesis. First, a pharmacological approach in which the
effects of small fragments of agrin previously shown to
regulate α3Na+/K+-ATPase activity in neurons are tested
on cultured cardiac myocytes to determine if agrin modu-
lates cardiac myocyte function. Second, to use cardiac
myocyte cultures prepared from hearts of agrin mutant
mice and compare those with wild-type littermates. My
myocyte cultures prepared from hearts of agrin mutant
mice and compare those with wild-type littermates.

Systemic Effect of Glutamate Receptor Antagonists
on Ca₃δ₁ Subunit Mediated Behavioral
Hypersensitivity
Kevin Pham
Mentor: Z. David Luo

Peripheral nerve injury can lead to chronic neuropathic
pain states, in which patients report painful sensation to
stimuli that are normally innocuous (allodynia), or en-
hanced pain response to suprathreshold stimuli (hyperalge-
sia). Mechanisms underlying neuropathic pain are poorly
understood, and target-specific, safe medications are unsat-
sfied medical needs for neuropathic pain management.
Data from previous studies have indicated nerve injury-
induced over expression of the voltage-gated calcium
channel (VGCC) α₂δ₁ subunit (Ca₃α₂δ₁) in sensory neu-
rons and spinal cord that mediates neuropathic pain devel-
opment. Over expression of the Ca₃α₂δ₁ gene in neuronal
tissues of transgenic mice confirmed that elevated neuronal
Ca₃α₂δ₁ proteins mediate behavioral hypersensitivity. Since
activation of spinal glutamate receptors is a critical step in
central sensitization, leading to spinal hyperexcitability in
pain processing, I studied whether activation of glutamate
receptors is required for the Ca₃α₂δ₁-mediated tactile allo-
dynia in the transgenic mice. To address this question, I
administered three different glutamate receptor antago-

The Global Sex Trade: Understanding Women
and Children in the Moral, Racial, and Gender
Dimensions of Trafficking
Jessica Pham
Mentor: David Theo Goldberg

Every year, thousands of women and children are traf-
ficked within and across borders for the purposes of sexual
exploitation due to force, false promises, economic distress,
political chaos, and/or sociocultural disorder. While
some individuals choose to sexually exploit themselves,
other women and children are sexually trafficked for prosti-
tution, pornography, sex tourism, marriages, and a mail-
order bride trade. Moreover, they are subject to psycho-
logical threats, violence, risk of HIV/AIDS and other dis-
cases, and local corruption. Through the examination and
analysis of government documents, other case studies, and
newspaper articles, it can also be noted that both racism
and social construction of morality and gender discredit
and undermine women and children. This work is impor-
tant because trafficking violates the most basic of universal
human rights; it is a direct tie to a notion thought by most
people today as a long gone human tragedy. Human traf-
ficking, simply put, is a modern form of slavery. Whether
an individual voluntarily or involuntarily sexually exploits
himself or herself, from any perspective, trafficking for the
purposes of sexual exploitation denies the fundamental
right an individual has to decide what happens to his or her
own body. To treat an individual as a commodity, a sex
toy, a slave, while deeming them racially and sexually infer-
ior, is to trample over their inherent rights. As a society
predicated on equality, it is only right that we ensure these
privileges and rights for every individual.

Dimensions of Trafficking
Children in the Moral, Racial, and Gender
The Global Sex Trade: Understanding Women and

Agrin fragment C-Ag20, an agonist of the
ous contraction frequency in cultured cardiac myocytes.
preliminary results demonstrate that agrin alters spontane-
mates and compare those with wild-type littermates. My
myocyte cultures prepared from hearts of agrin mutant
mice and compare those with wild-type littermates. My

AP3 (a metabotropic glutamate receptor antagon-
insts, namely memantine (a N-methyl-D-aspartate
(NMDA) receptor antagonist), DNQX (a non-NMDA
receptor antagonist for the AMPA/kainate receptors), and
AP3 (a metabotropic glutamate receptor antagonist) in-
traperitoneally into wild-type and transgenic mice followed
by behavioral testing. I found that memantine significantly reversed the allodynic state in a time-dependent manner. On the contrary, DNQX and AP3 did not show a significant reversal of tactile allodynia up to the maximum usable dose reported. These data suggest that activation of selective NMDA receptors at the systemic level may play critical roles in mediating the hypersensitive state induced by Ca\textsubscript{\text{2}},\alpha\textsubscript{2}\delta\textsubscript{1} over expression.

**Optimization of a Gurney Flap on an S1210 Airfoil**

Michele Pham  
*Mentor: John LaRue*

One of the simplest lift augmenting devices that can be installed onto a wing is the Gurney flap, consisting of a small strip of material installed span-wise on the wing towards the trailing edge. Previous research on the subject has narrowed the flap’s efficient size to a range between 1% to 3% of the chord length, and its location to be at the trailing edge. Consequently, the Gurney flap size and position need to be tailored for each application. To appropriately size the flap to the Selig 1210 airfoil, wind tunnel tests were carried out by varying the flap size from 1.5 mm to 3.5 mm. Data gathered shows that the Gurney flap successfully increases the lift capacity of the airfoil by 5% over the lift capacity of the airfoil without the flap. The Gurney flap was successfully installed on the radio controlled aircraft built by UC Irvine for the SAE Aero Design competition.

**Goal Selection and Goal Striving Among Adults with Orthopedic Conditions**

Phung Pham  
*Mentors: Susan Charles & Jutta Heckhausen*

Major life goals help people actively influence their own personal development as they respond not only to opportunities, but also to constraints, such as health afflictions. The purpose of this study was to examine the personal life goals (goal selection) of adults with orthopedic conditions, and how these conditions affected their ability to work towards their goals (goal striving). Questionnaire data were collected from outpatients of an orthopedic clinic. The outpatients’ ages ranged from 25 to 84 years. Results showed universal goal concerns as well as functional goal selection and goal striving abilities, despite orthopedic constraints. This study contributes to the research on the psychological functioning of individuals with health constraints and on life goals across adulthood.

**DNA Binding Specificity of the Transcription Factor p63**

Van Pham  
*Mentor: Rainer Brachmann*

One of the main players in the apoptosis pathway is the transcription factor p53, also known as the guardian of the genome, which serves as a tumor suppressor to prevent uncontrollable cell proliferation. There are two additional family members, p63 and p73, which have appeared to have very similar protein structures. Since its discovery in 1997, p63 is still not very well known, and only a handful of its functions have been identified. Due to the differences in the core domain, p63 binding specificity and function can be different from p53. Therefore, to further understand p63 functionality, we constructed an assay to study p63. First, I cloned the myc-tagged p63gamma and myc-tagged p63alpha genes in yeast expression plasmids to perform yeast mating and screening. The p63 yeasts were mated with yeasts containing genomic DNA fragments, which were cloned upstream of URA3 reporter gene. We observed a high number of Ura\textsuperscript{+} colonies on p63gamma yeasts indicating p63 binding to DNA genomic fragments. In contrast, p63alpha showed very little activity, possibly due to binding inhibition caused by the SAM and TID domain. I also tested the binding of p63 isoforms against four known p53 binding sites; only the RGC gene showed positive binding with p63gamma, which suggests that p63 indeed has different binding specificity than p53. Future work includes colony PCR and sequencing to confirm p63 binding specificity to DNA sequences.

**Comparative Study of Bird-Like Flaps**

Catherine Phan  
*Mentor: John LaRue*

The flow around the trailing edge of an airfoil is of interest in the field of aerodynamics. While man has designed conventional aircraft to have fixed rigid wings with straight-lined trailing edges (TE), bird wings are composed of flexible porous feathers with variable shaped TE. A low-speed wind tunnel experiment will explore the flow around a solid wing with two flaps: one conventional (solid and smooth TE), and one of bird feathers (porous and variable TE). The wing will span the entire wind tunnel test section to simulate a two-dimensional infinite wing. Flow visualizations will be performed, and lift and drag characteristics will be measured for both wings with flap deflections of 0\textdegree, 5\textdegree, 15\textdegree, 25\textdegree, and 50\textdegree at angles of attack from -2\textdegree to 12\textdegree. It is hypothesized that the flexibility and porosity of the feathers will keep the flow attached up until the TE, and the variable shaped TE will create vortices between the feather intersections, which may indicate a decrease in induced drag for a finite wing.

**A Smaller Homologue of a Cyclic Modular β-Sheet**

Long Phan  
*Mentor: James Nowick*

This project seeks to synthesize and study the conformation of a peptide macrocycle that is a smaller homologue of a cyclic modular β-sheet previously developed in the Nowick lab. Small peptides that adopt this β-sheet con-
formation can interact with other protein structures. The cyclic modular β-sheet system previously developed adopts a β-sheet conformation in water, and has shown some tendency to inhibit β-amyloid aggregation in vitro. This homologue uses fewer amino acid residues to create a smaller macrocycle. This presentation will compare the conformation of the smaller homologue with a control peptide.

Gaming and Real-Money Trade: Gray Market Analysis
Nathaniel Pope
Mentor: Peter Krapp
Controversy has recently arisen surrounding massively multiplayer online role-playing games (MMORPGs), especially the emerging practice of real-money trade (RMT) whereby gamers buy and sell virtual in-game assets such as items, coin, and characters for real money. Edward Castronova has used Pigouvian welfare analysis to show that there are macro level social and economic consequences that affect the non-participating gaming community. This study investigates potential social and economic benefits by examining player and developer strategic responses to RMT involving World of Warcraft, Everquest II and Second Life. Using Coasian economic theory, this piece applies anecdotal and empirical evidence from abstracts, conferences, legal proceedings, white papers, books, interviews, and first-hand experience to qualitatively examine player demand for economic tools to facilitate RMT transactions, followed by a similar evaluation of the tools embodied in developer responses: prohibition, market segmentation, and absolute integration. Results suggest the problem is complex, showing that negative externalities are tied to post-game design business models and decisions directly controlled by game companies. Interpreting these results suggest that, were game companies to deregulate, lifting various trade barriers, RMT could provide an additional source of revenue by eliminating the deadweight cost of minimizing it. The study concludes that RMT maximizes financial and social benefit to the whole of the gaming community when properly harnessed, and suggests that the tools required for RMT be provided free from systems of exploitation.

Using Irrigation Tools to Assist Coupled Atmosphere-Land Modeling Studies of Hydrometeorology Impacts of Irrigation
Erin Pritchard
Mentor: Bisher Imam
The Central Valley contains three-quarters of the irrigated land in California. The UCI Center for Hydrometeorology and Remote Sensing (CHRS) is using coupled atmospheric-land surface models to investigate the impacts of Central Valley irrigation practices on the region’s hydrometeorological variability. An element of the study is realistic simulation of irrigation scheduling. Because of the complexity of coupled models, incorporating an irrigation management component into such models is rather difficult and may in fact increase the uncertainty associated with the model results. This poster presents an alternative approach that utilizes existing irrigation scheduling tools to provide the required information so that the modelers can adjust soil moisture according to realistic irrigation practices. However, farmers rely on both their own experience and to some extent irrigation scheduling models. In this study, the Consumptive Use Model (CUP), which is developed by the California Department of Water Resources (CDWR) for use by the state’s farming community, is used to calculate the crop demands and irrigation schedules under two scenarios. The first scenario assumes default allowable soil depletion. The second scenario will incorporate expert opinion on soil depletion obtained from growers information exchange platforms (e.g. internet forums). The resulting differences between the two scenarios indicate that time varying allowable soil depletion is more realistic than constant crop based values, will be illustrated with respect to a hypothetical vineyard in Fresno County.

Treatment of Hippocampal Slices with Ampakine CX614 Elevates Levels of the Brain-Derived Neurotrophic Factor and Provides Neuroprotection from Ischemia In Vitro
Mohammad Qazi
Mentor: Christine Gall
Several studies have shown the neuroprotective effects of BDNF following ischemia. The ampakine CX614, a positive modulator of AMPA receptors, has been shown to increase the BDNF mRNA expression in cultured hippocampal slices. We hypothesized that pretreatment of hippocampal slice cultures with CX614 would elevate the levels of BDNF and curtail cell death following ischemia. Fluoro-jade staining, a technique that marks degenerating neurons, was used to observe and quantify cell death. We determined an insult duration that produced significant cell death in CA1 pyramidal cell neurons of the hippocampus, which have been shown to be especially sensitive to ischemia. Pretreatment of cultured hippocampal slices with CX614 produced a significant increase in BDNF protein levels. Furthermore, Ampakine pretreatment led to a significant decrease in neuronal cell death in CA1 neurons after an ischemic insult. These results show that ampakine treatment can be used to upregulate BDNF and provide neuroprotection from ischemic insult.
Assessment of Climate Change Mitigation in Brazil: A Case Study
Shyla Raghav
Mentor: Joseph DiMento

Projects such as the ethanol production (PRO-ALCOOL) project have reduced Brazil’s dependence on petroleum, and have assisted Brazil in acquiring a large percentage of their energy from renewable sources. Such projects have resulted in a 10 million ton abatement of carbon emissions. The little-known fact remains, however, that most of Brazil’s carbon emissions do not result from burning fossil fuels, but rather from land-use change and deforestation. An important question is whether projects such as PRO-ALCOOL have, in fact, improved the environmental situation in the Amazon. This study explores the trade-off between land conservation and economic development in Brazil through a case study of the PRO-ALCOOL project. The study examines whether the production of biofuels promotes deforestation, the amount of greenhouse gas emissions offset by the use of biofuels, and the specific degree to which “land use changes” impact greenhouse gas emissions. The available data suggests that increased production of biofuels could increase deforestation pressure in the Amazon, thus, negating the emissions reductions achieved by the increased use of biofuels instead of petroleum products. The results provide general support for the suggestion that resource and land-use management in Brazil will prove beneficial in terms of climate change effects to the economy and environment in the long term.

Investigation of Neuronal Abnormalities due to Dosage Alterations of Intersectin (ITSN) as a Result of Trisomy on Chromosome 21 in Down’s Neurons
Ardeshir Rahman
Mentor: Jorge Busciglio

Down’s syndrome (DS), or trisomy 21, is the most common aneuploidy in humans, having an occurrence of approximately 1 in 800 live births. The neuropathology of DS includes reduced brain weight, decreased neuronal number, abnormal neuronal differentiation, and structural changes in dendritic spines, all of which may contribute to mental retardation. Overexpression of certain genes on chromosome 21 may be detrimental to normal cell function. To test this hypothesis we focused on intersectin 1 (ITSN), a multi-modular adaptor protein located on chromosome 21, which has been shown to be directly involved in dendritic spine morphogenesis. The objective of this project is to analyze ITSN expression in DS neuronal cells and compare it to that in normal neurons. Subcellular localization and expression levels of ITSN in normal and DS neurons were assessed by immunofluorescence and Western Blot respectively. Our results suggest that ITSN can be detected in human neurons in vesicular structures, some of which colocalize with dendritic spine markers, and that it is upregulated in DS neurons. To further investigate the role of ITSN overexpression on neuronal function, we are studying the effect(s) of ITSN overexpression in normal human cortical neurons after transient transfection.

Differential Response of Cervical Cancer Cell Lines to Platinum versus Oxaliplatin In Vitro
Shenila Rajani
Mentor: John Fruehauf

The objective of this research is to determine the in vitro sensitivity of cervical cancer cell lines to cisplatin versus oxaliplatin. Cervical cancer cell lines, CaSk (HPV 16/18+) and C33A (HPV-) were treated with cisplatin and oxaliplatin for 72 hours. Cell survival was measured by XTT metabolic assay and results reported as fraction of untreated control (FC). C33A cells were more sensitive to both platinum compounds than CaSk cells with cisplatin IC50 1.871±0.083 µM for C33A versus 6.214±0.104 µM for CaSk and oxaliplatin IC50 1.168±0.636 µM for C33A versus 14.330±2.772 µM for CaSk. At in vitro drug concentrations approximating in vivo peak plasma concentrations (cisplatin=1.670 µM and oxaliplatin=2.783 µM), the FC of C33A cells were 0.6 and 0.25 and for CaSk were 0.8 and 0.8, respectively. The ratio of drug concentration required to achieve an IC50 to the in vivo peak plasma concentration for cisplatin was 1.12 for C33A and 3.72 for CaSk. These values for oxaliplatin were 0.42 and 5.15, respectively. Cisplatin is currently the most active cytotoxic agent in both primary and recurrent cervical cancer. However, resistance to cisplatin is a relevant and significant clinical problem. This study suggests that HPV+ and HPV- cell lines exhibit significantly different sensitivity to both cisplatin and oxaliplatin. Potential mechanisms for this difference are being investigated.

Local Motion: The Dynamic of San Bernardino's Ethnic Enclaves
Pedro Ramirez
Mentor: Caesar Sereseres

This study focuses on Mexican immigrants and their impact on the economic development of present day San Bernardino, California. The research aims to shed light on the Mexican immigrant experience, and specifically on the economic push and pull factors that brought and retained these immigrant laborers. Spread of the Santa Fe Railroad and the growth of the citrus industry sprouted Mexican barrios and colonias, which have developed into present day neighborhoods inhabited by 2nd-, 3rd-, and 4th-generation Mexican Americans. The growth and the maturation of these barrios began to generate citizens who moved from the unskilled and semi-skilled workforce reserved for their progenitors, and into professional vocations that required college level education and training. This case study looks to present a deeper understanding on
how the American immigrant is often used as a cheap labor source, marginalized, yet still able to produce cohorts of successful individuals. This study also raises discussion on the development of present and future immigrant enclaves in the United States and their outlook in regard to the current immigration debate.

**Optimization of Short Take Off and Landing Airfoils**

*Kia Ravanfar*  
*Mentor: John LaRue*

The goal of this research project is to optimize an airfoil to attain the shortest runway length required for take off and landing. This performance is made possible by designing the wings to create the highest amount of lift possible at low airspeeds. Large aircraft, such as commercial airliners, have wings that are equipped with high lift devices. These are called leading edge slats and flaps. They essentially modify the airfoil to provide higher lift and, consequently, better short take off and landing performance. Specific aircraft are designed with these short take off and landing (STOL) capabilities. When smaller two to four seat aircraft are engineered with wings that have fixed leading edge slats and flaps they are able to take off and land without thousands of feet of runway. Some STOL aircraft are able to become airborne in as little as 60 ft. The primary benefit of such aircraft is their versatility, which allows them to reach remote areas of the globe, providing emergency support when only a small clearing is available for landing and take off—no runways are needed. This research project involves modifying the Selig 1210 airfoil (which is already a high lift airfoil) to be fitted with leading edge slats and flaps for even higher lift. Wind tunnel testing has been carried out to measure the amount of lift for the airfoil design. Flight tests of a model aircraft outfitted with this airfoil were conducted to validate and verify the airfoil’s short runway performance.

**Analysis of the Behavior of Particles in Various Quantum Mechanical Wells**

*Krishanu Ray*  
*Mentor: Kieron Burke*

This work is theoretical in nature; it is a preliminary step for further research into Density Functional Theory. This theory is a powerful approach towards calculating the properties of normally complex many-body systems on a quantum scale. However, because of Density Functional Theory’s difficulty with modeling certain kinds of interactions, such as van der Waals forces, its improvement has become a goal of research. For this project I consider a range of quantum mechanical wells, including a particle in a box with a square bump, and explore the behavior of the kinetic energy as a function of $N$, the number of particles, for large $N$. The procedure involves solving the Schrödinger equations for various systems and determining their properties, such as the energies, wave functions, and symmetries. Exploration of this will aid in the study of the non-interacting kinetic energy functional for electrons in real systems (atoms, molecules, solids, etc.), a holy grail of density functional theory.

**Conformational Investigation of Structures Relating to Fused Cyclopenteno-1,2,4-trioxacyclohexane Antimalarials**

*Zhongwei Ren*  
*Mentor: Fillmore Freeman*

Owing to the reemergence of widespread malaria infections in Third World countries, considerable experimental and theoretical research efforts are being directed toward easily synthesized, inexpensive, orally antimalarial agents with structures similar to but simpler than those of artemisinin and its derivatives. In this research project, I am studying the relative energies of conformations, geometrical parameters, and the mechanisms of the conformational interconversions of *cis*-fused cyclopenteno-1,2,4-trioxacyclohexanes and their derivatives, since simpler related structures display substantial artemisinin-like activity in different *in vitro* and *in vivo* models. Since it is known that different isomers and conformations may exhibit substantially distinct activities, this study is being undertaken to use molecular orbital theory to calculate relative thermodynamic parameters, mechanisms of conformational interconversions, the geometry optimized structures of the chair, half chair, sofa twist, and boat conformers, conformations, and transition states of *cis*-fused cyclopenteno-1,2,4-trioxacyclohexanes and their derivatives. The calculations are being performed with the Gaussian 03 suite of computational programs using density functional models (B3LYP, B3P86, B3PW91) with the 6-31G(d), 6-31G+(d,p), 6-311+G(3d,2p) basis sets. It is important to study the conformation of the trioxacyclohexane ring and its electronic and steric environment because these are significant factors that will influence the activation of the peroxide linkage by the Fe(II)-heme or other Fe(II) species, a step that is critical in forming the radicals that will play important roles in killing the parasite responsible for malaria infections. The data obtained will be helpful in determining the approach the Fe(II)-heme or other Fe(II) species to the peroxide linkage in the antimalarials and the mode of action.

**Sampling the Resistome: Are Environmental Isolates More Susceptible to Medically Relevant Antibiotics?**

*Rafael Renteria*  
*Mentors: Luis Mota-Bravo & Toai Nguyen*

Antibiotic resistance can be found in a wide variety of environments. As the incidence of antibiotic resistance in the environment increases, so does the risk of antibiotic resistance among pathogenic bacteria. In this study, we investi-
tions by which to talk about or understand an issue. My which is useful for determining the boundaries or defini-
tion through the collective action framing perspective,

race in California. I examin e media coverage of Proposi-
tion 187; specifically interested in how Proposition 187 was defined,

The campaign for passage was heated and divisive. I am

results show resistance to many of the common clinically

 lied antibiotics. Penicillin, which is used for the broadest

spectrum of diseases, had a 54% occurrence of resistance.

Vancomycin had 44% resistance, and ampicillin, with 35%

resistance, was slightly more effective. Although many of

the environmental samples may not be pathogenic, there

exists the possibility of transferring resistance to patho-

genic species that may be harmful to humans.

Tracking Collective Action Frames in Media Coverage of California’s Proposition 187
Sheilamae Reyes
Mentor: David Meyer

California’s 1994 Proposition 187 sought to curb illegal

immigration through denial of tax-funded services such as

welfare and public education to undocumented persons.
The campaign for passage was heated and divisive. I am

specifically interested in how Proposition 187 was defined,
as reflected by newsprint media coverage of campaign
events, and of the tightly intertwined 1994 gubernatorial
race in California. I examine media coverage of Proposi-
tion 187 through the collective action framing perspective,
which is useful for determining the boundaries or defini-
tions by which to talk about or understand an issue. My

study examines the trend of dominant frames from August

through December 1994, which yielded high-frequency

media coverage, as is evident from database searches of six

California daily newspapers and the New York Times. I

systematically drew a random sample of 100 articles from a

pool of 1,920 articles regarding Proposition 187 from the

seven newspapers, with my sample proportionally repre-
senting coverage from each newspaper by month. I con-
ducted content analysis to account for prominent actors
involved in the Proposition 187 debate, frequently occur-
ring types of events newspapers covered, article dates, and
evident frames. I suggest that particular frames that
emerged as dominant are explained by factors such as ac-
tors involved, events covered, and events’ proximity to

election date.

Converting BMP4 Gradient Information into a Msx1 Threshold Response in Mouse Neural Stem Cells
Justin Rheem
Mentor: Edwin Monuki

Bone morphogenetic proteins (BMPs) control many steps

in the formation and the differentiation of the central nervous system. Msx1, a direct downstream target of

BMPs, is expressed at the dorsal midline of the cerebral cortex with a sharp border. How BMPs create a distinct

boundary is unclear. To characterize the phenomenon, the

Msx1 response to varying BMP4 concentrations was ana-

alyzed in mouse cortical precursor cells: (1) at a population

level using quantitive real-time Polymerase Chain Reac-
tion (qRT PCR), and (2) at a single cell level using Immuno-
cytochemistry and X-gal Cytochemistry. The single-cell

analysis revealed a higher Hill’s coefficient than the popu-

lation level analysis suggesting that cells respond to BMP4

in an ultrasensitive fashion and cells autonomously convert

BMP4 information into an all-or-none response. These

findings were confirmed by early roof-plate ablation and

BMP4-bead explant studies. This study reveals a novel

mechanism on how cells interpret a morphogen gradient

via ultrasensitivit. Such a sharp pattern can affect the pat-
terning of other transcription factors in the development

of brain.

P50 Sensory Gating and Reports of Perceptual Anomalies in Schizophrenia
Alexander Ring
Mentor: Julie Patterson

A hypothesis proposed to account for information and

attention deficits in schizophrenia is that individuals can-

not physiologically inhibit, or “gate,” irrelevant sensory

input, resulting in sensory overload. In McGhie and

Chapman’s 1961 article, a central filter was described that,
in control individuals, screens irrelevant stimuli. Schizo-

phrenic patients reported experiences describing impaired

internal gating. Phenomenological and physiological analy-
ses of these experiences could provide convergent valida-
tion of the sensory gating deficit hypothesis in schizophre-
nia. Evoked brain potentials (EP) were derived from the EEG using an auditory dual-click procedure. The

EP to each of two paired clicks separated by 500 ms (10

sec inter-pair interval) is recorded, and the amplitude re-
duction in a wave occurring 50 ms (P50) after the second

click (S2) compared to the first (S1) is quantified using the

sensory gating ratio (S2/S1). The relationship between our

Structured Interview to Assess Perceptual Anomalies (SIAPA), and P50 sensory gating was examined. Age-
equivalent control (n=37), chronic paranoid schizophrenia
(SCPT, n=67), and schizoaffective (SAD, n=57) groups

were tested. The SIAPA addresses 15 items testing sensory

perception and attention (hypersensitivity, flooding, selec-
tive attention) on a 5-point Likert scale in each of the five

undergraduate research: focus on excellence
will aid practitioners in understanding Chileans’ utilization patterns, main personal challenges and reasons for not seeking treatment. Results from this study will provide insight into the concerns and apprehensions of these individuals and will direct practitioners toward a more effective practice addressing issues of outreach, psycho-education, and effective delivery. Given the influx of Latina/os into the U.S., the results could also have practical implications for psychologists working with Chileans in the U.S.

**Strategies Motivating Presidential Appeals to the Public**

**Austin Rogers**

*Mentor: Matthew Beckmann*

A large part of presidency scholarship focuses on the president’s ability to pass his legislation in Congress. We know that presidents are increasingly going public to cultivate public support, but more specifically to pressure lawmakers into supporting their legislation. While this activity has been identified, it is important to identify the strategic considerations that motivate these “going public” campaigns. My research will provide a strategic logic of states chosen—emphasizing which counties should be visited by the president in targeting key lawmakers. The bulk of my data was collected by Professor Beckmann through congressional surveys and interviews during President Bush’s 2001 tax reform campaign. Preliminary data testing identifies key states for going public as those represented by members sitting on a targeted congressional committee. Further analysis will focus on where to visit within these states based on size and support of constituencies. My results will give fellow political scientists an alternate way of analyzing the dynamic relationship of leadership through public relations and passing legislation in Congress.

**In Vivo Analysis of Peripheral Nerve Regeneration Through Delivery and Regulation of NGF by Transfected Human Embryonic Kidney Cells**

**Jason Rogers**

*Mentors: Sanjay Dhar & Gregory Evans*

Previous studies have shown that HEK-293 cells can be triple transfected with regulator vector, NGF, and HSV-TK genes to generate a stable cell line (hNGF-EcR-293-TK) that can be regulated to produce NGF upon induction with Ponasterone A, and cease NGF production upon ganciclovir treatment as the cells die. This study investigates the use of this cell line on a 15 mm sciatic nerve injury gap to determine the effects on nerve regeneration and functional recovery in rats. The nerve was severed and sutured into a silastic conduit, leaving a 15 mm distance for regeneration. Each conduit contained 104 hNGF-EcR-293-TK cells undergoing different treatment. Group I had cells in regular culture media, and the rats were harvested on days 1, 3, 5, 7, 14, 21, and 28. Group II had cells that
were induced with PonA before surgery and then harvested at similar time points. Group III had five rats that were induced and boosted differently on days 7, 14, and 21, and harvested at various time points. Group IV had seven rats that were induced and either boosted and/or treated with PonA and/or GCV on days 7, 14, and 21, and harvested at various time points. Walk track analysis measured the functional recovery. Also, the harvested media evaluated NGF expression and bioactivity by ELISA and PC-12 cell assay, respectively. Finally, each nerve underwent histophometry to establish the nerve fiber density. Data revealed that there was complete nerve regeneration using cells induced and boosted with Ponasterone A, and complete functional recovery. This is the first gene therapy model to demonstrate that NGF can be regulated in vivo to help bridge the functional nerve gap.

Topography of Liquid Lenses
Dylan Rogerson
Mentor: Peter Taborek

Pinch-Off is the separation of one mass into two separate masses. Coalescence is the opposite process, and both phenomena are fundamentally different processes than in their three dimensional unconstrained counterparts. To describe fully the phenomena of pinch-off and coalescence in these lenses one needs to know their height profiles. Previous work done by Peter Taborek’s lab has only yielded top down two-dimensional high-speed videos of the dynamics of pinch-off and coalescence of liquid lenses. The techniques of Moire Imaging and direct laser imaging allow one to examine the topography of extremely thin liquid lenses, such as decane, on the surface of water. By examining the pattern of laser light after it has passed through Ronchi rulings and the liquid lens, a height profile can be extracted, accurate to within microns. While these profiles give the topography of the liquid lenses, there are several drawbacks to using such a technique, and I pursued other techniques, such as direct laser imaging to compare the utility of Moire Imaging. The result is that Moire Imaging fails near the edge of the droplet, and direct laser imaging is needed to capture the height profile there. In the future, Moire Imaging and direct laser imaging can be extended to high speed videography to partially map the three dimensional topography changes during pinch-off and coalescence of alkane lenses on the surface of water.

Parental Divorce and Child Externalizing
Anthony Ruffolo
Mentor: Alison Clarke-Stewart

Child externalizing refers to a child’s outwardly directed psychological problem behavior (hitting, yelling, acting defiant, etc.). Research indicates that one million children in the U.S. experience their parents’ divorce each year. This study examined the variance of children’s externalizing behavior accounted for by divorce. This secondary analysis of data from the 15-year longitudinal NICHD Study of Early Child Care and Youth Development expands on past research by controlling for many of the children’s pre-divorce variables. Children who experienced a parental divorce between six months and 6th grade were found to have significantly greater externalizing behavior at 6th grade than the children who did not experience a divorce. Neither a secure mother-child attachment at twelve months nor high family SES (income, ethnicity, parents’ education, income-to-needs ratio) were found to be protective factors against the significantly increased externalizing behavior for the children who experienced a divorce. This study also showed no significant gender or age differences within the divorced group for externalizing behavior.

Elucidating the Roles of BH Domains in the Function of the Pro-Apoptotic Bcl-2 Protein Debcl
Amanda Ruiz
Mentor: Carrie Brachmann

Bcl-2 proteins are known to have apoptotic properties, but not much is known about this family of proteins in Droso-phila melanogaster. To find out which domains are crucial for the killing ability of Debcl, a pro-apoptotic Bcl-2 protein, Debcl mutants, each with different domains deleted, were subjected to a death assay. Using S2 cultured cells, it was possible to determine which mutants allow Debcl to continue to be pro-apoptotic and those that are crucial to Debcl’s killing ability. Mutants that had domains BH2 and BH2,4 deleted and an amino acid substitution at E151A were tested. The Debcl mutants that failed to kill were the BH 2 domain deletion and the E151A amino acid substitution, each with about 100% survival rate compared to the vector control. The BH 2,4 domain deletion mutant retained the killing ability comparable to full length Debcl. BH2 and E151A mutants are the ones we will examine more closely, because these are the domains that are important for Debcl’s pro-apoptotic abilities.

Thermal Stability and Structure Analysis of the E2 Component of the Bacillus stearothermophilus Pyruvate Dehydrogenase Complex
Cesar Ruiz
Mentor: Szu-Wen Wang

The E2 component of the Bacillus stearothermophilus pyruvate dehydrogenase complex can potentially be used as a scaffold to create a targeted drug delivery system. It is capable of assembling into a 60-mer unit dodecahedron with icosahedral symmetry, even with the addition of peptides on the surface. Circular dichroism (CD) and differential scanning calorimetry (DSC) were used to determine the thermostability of the E2 complex. This protein scaffold has been shown to be stable at temperatures up to ~80°C. When subjected to ~80 °C incubation, precipitation was
observed, indicating that the thermal unfolding of the protein was irreversible. The dependence on scan rate and concentration of the DSC scans indicates that the unfolding process is kinetically controlled. Secondary structure analysis with CD and K2D software estimates that E2 is composed of ~41-45% α-helix and ~18-23% β-sheet, which compares well with crystallographic data. A thermal transition scan with CD shows that the melting temperature, 

\[ T_m = 83 \, ^\circ\text{C} \]

which is consistent with the DSC data. Mutagenesis on E2 was done, and thermal scans show that these mutants are also stable at high temperatures. The high thermal stability exhibited by the wild type and mutant protein assemblies suggests that this protein would be a good scaffold for molecular encapsulation in drug delivery.

Self-Esteem and Negative Responses to Acute Laboratory Stressors

Roxanna Salim  
**Mentor:** Sally Dickerson

Daily life presents an array of stressors that are difficult, if not impossible for people to avoid. People respond differently to stress, and those with strong negative reactions have been shown to be more susceptible to disease. Self-esteem may be one personality factor associated with how people respond emotionally to stress. This study tested whether self-esteem predicts how people evaluate their abilities in the face of stressful situations. Undergraduate participants delivered a speech in front of an audience; self-esteem was assessed before the stressor, and appraisals of performance were assessed immediately after the speech. Analyses tested whether those with higher self-esteem had lower perceptions of threat and more appropriate coping capabilities. It is important to study factors such as self-esteem that lead to negative appraisals following stressors, as these appraisals can determine the physical and emotional reactions to stressful experiences.

Mexico’s Economic Development: Assessing Methods to Increase Mexico’s Competitiveness in World Markets

Denise Sandoval  
**Mentors:** Raul Fernandez & Caesar Sereseres

The purpose of this study is to better understand the Mexican economy and its economic development potentials by assessing how the country may become more competitive. This qualitative research project analyzes how Mexico may increase its labor productivity and infrastructure, and reform its energy system, to increase its competitiveness in the global economy. The study also evaluates the possibilities of Mexico’s becoming more competitive under Felipe Calderon’s new presidency. Despite Mexico’s large economic potential, it continues to have astonishing poverty rates, one of the largest unequal distributions of wealth in the world, and severe underemployment conditions. A stable economy in Mexico would promote social stability, poverty alleviation, and curb immigration. Furthermore, as one of Mexico’s neighbors, it is in the best interest of the U.S. to assist in Mexican development to gain economic advantages from a geographically strategic trading partner. This study found that education and training programs are crucial in increasing labor productivity and, thus, market efficiency. Mexico lacks strategic infrastructure development and must invest in this sector to increase competitiveness in the country. The government must reform the energy sector, specifically Pemex the national oil company, to increase competitiveness, because it is both the government’s largest revenue provider and the largest economic sector in the country. President Calderon has stressed the importance of increasing labor productivity, infrastructure development, and energy sector efficiency to achieve economic sustainable growth in Mexico. However, it is still ambiguous if Calderon’s cabinet’s agenda will be the most beneficial for the majority of the Mexican population and if serious collaboration and cooperation will be accomplished among Mexican policymakers under his presidency.

A Study of Social Control Among Shelter and Street Homeless

Eric Saprid  
**Mentor:** David Snow

A collection of homeless people occupies the shelters and streets of Orange County. In response to the growth of homeless in cities, various institutions are confronted with not only servicing the homeless, but controlling them as well. Along with law enforcement on the streets, shelters enforce rules to regulate the presence and behavior of the homeless. Looking at the attitudes and behaviors of the homeless toward available institutions brings to light social processes that occur and whether they facilitate a transition from the streets into mainstream society. This study is intended to investigate the homeless’ responses to rules in particular institutions, and whether those institutions meet their needs. Through a qualitative analysis of 30 in-depth, semi-structured interviews of both shelter and street homeless, an elaborate typology gives details on the reasons people choose a shelter or the street. The findings suggest a variety of answers, and multiple variables explain the decisions. Moreover, with more practice and participants for research, a comprehensive study should examine other institutions that service the homeless.
A Prospective Evaluation of Emergency Department Performed Ultrasound Diagnosis of Cholelithiasis and Cholecystitis vs. Diagnosis by Radiology Ultrasound
Allison Sarff
Mentor: John Christian Fox

Through comparing the accuracy of emergency department performed sonography (EDPS) against radiology department performed sonography (RDPS) of the gall-bladder for diseases such as cholelithiasis and cholecystitis, it can be shown that requesting an RDPS is an unnecessary step in the confirmation of a healthy individual suffering from right upper quadrant and/or epigastric pain. Assessing complications such as gallstones, thickened gallbladder wall (>3 mm), dilated CBD (>8 mm), and pericholecystic fluid (PCF) can aid in the diagnosis of cholelithiasis and cholecystitis (along with blood work-up and medical history). Over a nine-month period, 115 patients with typical cholelithiasis and cholecystitis symptoms, 57 of whom went on to receive a formal radiology ultrasound, were examined by emergency department attending and resident physicians at the University of California, Irvine. From these 57 patients, there were 42 true positives and 11 true negatives, yielding sensitivity and specificity of 100 (95% CI 0.89-1) and 73 (95% CI 0.44-0.91), respectively. These results indicate that all patients with abnormal EDPS should still be required to undergo RDPS. However, the low specificity prevents conclusions regarding further evaluation of patients with a negative EDPS. Although the study displayed good sensitivity, we felt that there was too little data to propose a change in the traditional procedures involved in the diagnosis of cholelithiasis and cholecystitis.

Old Traditions as New Resistance: Jarocho Culture as a Tool for Community Development
Luis Sarmiento
Mentor: Leo Chavez

In spite of the global economic and political forces that are destroying local communities’ forms of economic and social survival, the Movimiento Jaranero, or Jaranero Movement, has been impelled by community grass-roots efforts in southern Veracruz and in Mexico City. In five such communities—Coatzacoalcos, Chacalapa, Jaltipan, Xalapa, and Mexico City—century-old Son Jarocho music has been used to strengthen individual identity, community solidarity, and cultural and economic resources for community development. These communities empower themselves culturally and economically, particularly in the organization of musical groups, community centers, and events, and in the production of CDs, instruments, and handicrafts. Moreover, the formation of support networks between these communities has made it possible to effectively resist the socio-economic forces that have pushed community members to migrate.

Mentor:
Luis Sarmiento

Hypermethylation of the KLF4 Promoter in Acute Lymphoblastic Leukemia
Vanessa Scarfone
Mentor: David Fruman

KLF4 is a transcription factor that participates in cell cycle control and has been identified as a tumor suppressor gene in colon and gastric cancer. Previous results from our lab have implicated KLF4 as a potential tumor suppressor in B-cell malignancies. Using a microarray database we identified a low abundance of KLF4 expression in a variety of B-cell leukemias and lymphomas, and ectopic KLF4 expression induced apoptosis in a variety of transformed B-cell lines. To further identify the mechanism of KLF4 silencing in B-cell leukemias and lymphomas we assessed DNA methylation. Previous reports have shown hypermethylation of the KLF4 promoter as a mechanism for silencing in colon cancer. Here we show, using methylation-specific PCR, that the KLF4 promoter is methylated in human ALL and CML patient samples, but not in peripheral blood cells from normal donors. Our findings suggest that the KLF4 promoter methylation is specific and may account for the low abundance of KLF4 in leukemias and lymphomas.

Characterizing Direct Responses to BMP in the Developing Mouse Cortex
Rachel Schreyer
Mentor: Edwin Monuki

Bone morphogenetic proteins (BMPs) are essential in many developmental processes throughout the embryo. Studies on the effects of BMP signaling suggest that changes in BMP signaling can lead to abnormalities in the patterning, proliferation, and differentiation of neural cells in the central nervous system. BMPs signal through Smads and initiate transcription of downstream target genes, such as Msx. Msx is a transcription factor that plays a role in the developing nervous system by activating the transcription of numerous other genes involved in the regulation of neural cell fate. By looking at the relationship of BMP, pSmad, and Msx levels, I hope to further understand how varying levels of BMP could affect cell fate choices. Based upon previous data, I expected that BMP levels would have a linear relationship with pSmad levels, whereas Msx1 would show a threshold response to BMP. Our results did show a threshold response of Msx1 to BMP, and we would like to further study the factors causing the Msx1 to respond to BMP in this way.
Attitudes Toward Utilization of Professional Psychological Services Among Filipino/a American Undergraduates
Christopher Schruth
Mentors: Jeanett Castellanos, Alberta Gloria & Caesar Sereseres
Research has consistently shown that Asian Pacific Islanders (APIs) underuse mental health services and prematurely terminate treatment at a much higher rate than other non-minority and minority groups. Studies that examine API subgroups reveal that Filipino/a Americans are less open to using mental health services than other API subgroups. Considering that Filipino/a American undergraduates experience the highest levels of college stress among APIs, their unique experiences in the university need to be examined. Given the lack of traditional barriers (i.e. income, language) to psychological services found on campus, examining the factors that influence attitudes towards these services is imperative. Although Filipino/a Americans are the second largest API subgroup, they are not often included in psychological research regarding APIs. The goal of this study is to thoroughly examine the factors that influence Filipino/a American undergraduate attitudes towards using mental health services, using the psychosociocultural (PSC) framework as a guide. Through survey methodology, acculturation, ethnic identity, colonial mentality, internalization of the model minority myth, social support systems, religiosity, spirituality, and cultural congruity were examined. Results are ongoing. Findings will provide empirical evidence to expand on Filipino/a American mental health research. These results can also be applied clinically when providing Filipino/a American undergraduates with counseling, and in directing outreach toward this population.

At the Tipping Point: An Assessment of Civil-Military Counterinsurgency Structures in Afghanistan
Todd Schweitzer
Mentors: Patrick Morgan & Caesar Sereseres
More than five years since the ousting of the Taliban regime, Afghanistan is as unstable as ever. Opium production is steadily replacing the licit economy, insurgent attacks in the last year have increased three-fold, and Afghans have seen negligible change in their standard of living. This study argues that efforts by the Afghan government and the U.S. and its NATO allies to quell the insurgency are significantly hindered by two strategic flaws: a conventional war method that prescribes a military solution and regards political and economic development as secondary objectives, and the lack of a command structure that fosters civil-military coordination at every level. Drawing from classic counterinsurgency (COIN) theory, case studies from the British experience in Malaya and the Americans’ experience in Vietnam, as well as the author’s own experiences in Afghanistan in mid-2006, the study assesses the COIN civil-military structures currently in place. It provides a set of guidelines for implementing a more effective COIN strategy, including expansion of the Provincial Reconstruction Teams to the district level, institutionalized Afghan involvement at the strategic, operational, and tactical planning stages, and a reorganization of the COIN command structure.

Analysis of Mitochondrial Function in DS Lymphoblastoids and DS β-Cells Shows Deficiencies in Metabolic Activity
Jacqueline Seiglie
Mentor: Jorge Busciglio
The neuropathology of Down’s syndrome (DS), caused by an extra chromosome 21 (trisomy 21) is very complex. Besides a reduced neuronal number and decreased brain weight, DS patients show increased susceptibility to various medical problems, including obesity and a very high prevalence of Alzheimer’s disease (AD). Most relevant to this paper is decreased resting metabolic rate and increased frequency of diabetes in DS subjects. Importantly, previous studies indicate that mitochondrial dysfunction is a critical element in both DS neuropathology and the pathogenesis of type 2 diabetes. Relevant to this, findings have shown that energy production is impaired in several DS cells and tissues, including DS fetal pancreatic cells and DS lymphoblastoids. In this study, three objectives relevant to mitochondrial function were assessed in two DS cell types. First, we assessed whether mitochondrial co-factors could revert the metabolic deficiencies observed in DS lymphoblastoid cells. Three parameters directly related to mitochondrial activity were analyzed. Secondly, we assessed whether mitochondrial redox activity was altered in DS islet-like cell clusters (ICCs). Thirdly, the functional consequences of these metabolic deficiencies were analyzed by measuring basal insulin and proinsulin secretion in DS ICCs. Results after creatine treatment in DS lymphoblastoids show increased ATP production and increased oxidoreductase activity, suggesting a strong effect of creatine on mitochondrial metabolism. DS ICCs show reduced oxidoreductase activity and decreased basal insulin/proinsulin secretion. Characterization of the role of mitochondrial dysfunction in DS may lead to a better understanding of the molecular mechanisms relevant to mental retardation and the development of diabetes type 2 in DS individuals.
The Effect of Curcumin Pre-Treatment on *Drosophila melanogaster* Fecundity and Ovary Impairment when Exposed to Methotrexate

Sahar Semnani
*Mentor:* Mahtab Jafari

The intent of this study is to determine if pre-treating *Drosophila melanogaster* with a botanical, curcumin, will decrease the adverse effects that Methotrexate (MTX), a chemotherapy drug, has on ovaries, fecundity, and number of developing progeny. Chemotherapy is a necessary treatment option for many cancer patients. However, this method of treatment comes with many side effects, including infertility and damage to reproductive organs. Curcumin, a botanical from the root of turmeric, is known to have anti-oxidant, anti-aging, and anti-cancer properties. We first pre-treated half of the *D. melanogaster* population with curcumin for four consecutive days while the other half received no exposure to curcumin. After the pre-treatment phase, MTX was administered to the entire population for the next four days. Fecundity was recorded daily during the period of MTX exposure. Ovaries were dissected before and after MTX administration. Ovaries treated with curcumin prior to exposure of certain doses of MTX were observed to have longer and less aberrant ovarian follicles than the group that was not treated with curcumin. The better-sustained ovaries support the fact that pre-treated flies had increased fecundity compared to the non-treated group when exposed to MTX. According to these findings, curcumin can be administered prior to chemotherapy treatment with MTX to help alleviate the negative impact it has on ovaries.

Actin Polymerization is Necessary for the Stabilization of LTP

Anupam Sharma
*Mentor:* Christine Gall

Long term potentiation (LTP) is an increase in the strength of synapses which can be measured by an increase in the amplitude or the slope of an excitatory post synaptic potential (EPSP). LTP is considered to be a possible elementary basis for learning and memory in the brain. Learning the pathways that modulate LTP can help us understand the mechanism behind memory. LTP shows time-dependent vulnerability to disruption. The role of adenosine A1 receptors was tested in the depotentiation of LTP at separate time points. Depotentiation was observed when adenosine was infused 30 seconds post TBS but not at later time points after the induction of LTP, indicating that adenosine A1 receptors suppress LTP soon after its induction. In addition, the involvement of actin polymerization in consolidation of LTP was tested independently from the role of adenosine. To investigate the role of actin polymerization in stabilization of LTP, Latrunculin-A was used to block the polymerization following the induction of LTP. Latrunculin-A disrupted the consolidation of LTP in a similar manner to adenosine. These results led to the conclusion that blocking actin polymerization following LTP has obvious effects on the stabilization of LTP. Here we show two independent pathways that modulate LTP consolidation and discuss further experiments that could test if the two pathways have a causal relationship or act independently of one another.

Auditory Evoked Responses to Sinusoidally Amplitude Modulated Tone and Noise

Allison Shim
*Mentors:* Bruce Berg & Ramesh Srinivasan

Many psychophysical studies have been conducted on the temporal processing capabilities of the human auditory system. The results have been modeled by the Temporal Modulation Transfer Function (TMTF), which is derived from estimated thresholds for amplitude modulation (AM) detection as a function of modulation rate. Research using EEG to explore auditory temporal processes has revealed cortical responses that modulate at the same frequency as the stimulus, with the magnitude of the response being greatest around 40 Hz. While these results provide sufficient evidence for a distinct temporal processing mechanism, no model has been able to completely satisfy the data without significant consequences. The purpose of this study was to observe the auditory evoked responses to sinusoidally AM tone and broadband noise across modulation frequencies (f_m) ranging from 2–50 Hz, to determine any significant differences between tone and noise, and detect possible individual differences in subjects’ ideal response frequency. Results from this study contributed to the current follow-up psychophysical and EEG study on modulation detection in notched noise, which will provide information on the filtering and receptive properties of temporal stimuli.

An Exploration into the Choreographic Process

Kimberly Shimasaki
*Mentor:* Janice Plastino

A dance is defined as movement that accompanies a rhythm or piece of music. It can be created on the spot as improvisation or it can be developed over time through rehearsals. There is no single way to create a dance, but instead many ways a single dance can be born. To better understand the life of a dance from creation to its final steps on the performance stage, I explored different techniques of dance choreography from improvisation to phrase making. With my dancers, we tried our hand at improvising to silence, conceptual ideas, and to the written word. Though we did not use any of the material that came from the improvisation, it gave my dancers a chance to practice making artistic decisions on the spot, which was useful later in the process. We then moved on to the idea
of phrase making, in which dancers were given a set of steps they were asked to dance to different songs and styles of music. The dancers made artistic choices as to the tempo they danced in and had the option to repeat phrases, turn movement, change direction, and change their pathways. As the choreographer, I used this inspiration to construct and shape what ultimately became the platform for my final piece, titled 1:2:1 set to 5 Minute Break by Norman Beede.

The Effects of Global Ischemic Insult on Calpain-Mediated Spectrin Breakdown
Ahad Shiraz
Mentors: Christine Gall & Ching-Yi Lin
Ischemia is generally defined as the inadequate flow of blood to a specific part of the body or a specific organ. Although a complete understanding of the processes that take place is still lacking the ischemic cascade is comprised of several complicated mechanisms that could lead to severe brain damage. Brain injury by transient complete global brain ischemia (cardiac arrest) or regional incomplete brain ischemia (ischemic stroke) cause large increases in cytosolic Ca\(^{2+}\) associated with activation of calpains. Calpains are a large family of calcium-sensitive cytosolic cysteine proteases found in all vertebrate tissues studied. Once these calpains have been activated they partake in the proteolysis of alpha II-spectrin subunit. Spectrin is the main protein component of the cell membrane skeleton and participates in signal transduction and propagation and regulation of many cellular processes. The goals of the proposed research are to test the hypothesis that forebrain/hippocampal neurons, activation of \(\mu\)-calpain contributes to different degrees of spectrin breakdown, which result from mild or protracted ischemic insult. More specifically, Studies using cultured hippocampal slices will vary the periods of hypoxic/hypoglycemic insult and survival to determine parameters for induction of spectrin breakdown and neuronal cell death as assessed by Western blot analysis and Fluoro-Jade staining and LDH activity, respectively.

Expression of the Wildtype Mouse Form of Mutant \(\gamma\)D-Crystallin
Christopher Shymansky
Mentor: Rachel Martin
It is estimated that 50% of the world population’s eyesight is diminished due to cataracts by age 65. The major constituent of these solid formations is the mutated form of an eye lens protein known as \(\gamma\)D-crystallin. A single change in the gene coding for this protein, due to UV damage or a rare in-born mutation, disrupts its configuration, turning an otherwise incredibly soluble protein into an insoluble mass, obstructing vision. Structural determination of the mutant form of \(\gamma\)D-crystallin could help determine why these proteins are aggregating together and therefore result in the development of corresponding treatments. The focus of this endeavor has switched from expression of the human- to expression of the mouse-form of this crystallin compound. Currently, the gene is nearly ready to be placed into a plasmid vector, a circular piece of DNA, which will subsequently be inserted into \textit{E. coli} for production of the protein.

H-Atom Abstraction Measurements and Anti-Oxidant Properties of a Catechol Derivative
Allyson Sia
Mentor: Alan Heyduk
Anti-oxidant molecules often contain a catechol type moiety that is responsible for free radical scavenging. Catechols are phenolic compounds whose O-H bond homolysis is critical for anti-oxidant function. Recent studies suggest that anti-oxidant abilities can be quantified by O-H bond enthalpies. The presented research investigates the thermodynamics of H atom abstraction from an aminophenol molecule derived from a catechol. A radical species was generated by the conproportionation reaction of an aminophenol with an iminoquinone. Reactant stoichiometry was determined to be 1:1 by Job’s method. Titration experiments were performed and monitored by UV/Vis spectrophotometry to measure the equilibrium constant \((K_{eq})\) for the formation of the radical. \(K_{eq}\) values were relatively larger in non-H-bonding solvents. Crystallographic data was obtained for the radical species. The results of the thermodynamic studies may suggest that the radical species possesses qualities that are similar to those of anti-oxidants.

What a Tangled Web We Weave: The Conundrum of Reducing Psychological Effects of Deception
Erika Siegel
Mentor: Elizabeth Loftus
Participants are integral to psychological research, but the deception used in these studies may have persisting effects. This study extends previous research by examining the effect of deception on participants’ emotions and memory. In this study, participants attempted an unsolvable puzzle and rated their emotions during the task. Some participants were told in advance about the impossible task, others were debriefed after the task, and a third group received no information about the nature of the task. Participants returned seven days later and recalled their experience and emotions during the first session. All participants reported high levels of negative emotions during the puzzle task. Participants who received a debriefing, when compared with other participants, remembered experiencing more negative emotions during the puzzle task than they actually reported. Furthermore, participants who were briefed before the task remembered less about the nature of the ex-
Effects of Lidocaine on the Efficacy of Maggot Debridement Therapy
Sukhwinder Singh
Mentor: Ronald Sherman

Maggot debridement therapy (MDT) is a method of debriding (cleaning) non-healing wounds using live blow fly larvae. Studies have demonstrated that this method is relatively safe, the major adverse event being pain or discomfort in those few patients who have sensitive wounds. The purpose of this research was to determine whether topical anesthetics such as lidocaine hold any promise as an adjunctive treatment to minimize MDT-associated wound pain. The null hypothesis was that Lidocaine applied to the wound models would have no effect on the feeding and development of medical grade Phaenicia sericata. Previous studies demonstrated that a specific maggot-rearing liver-agar (MRLA) is a good surrogate for a necrotic wound undergoing MDT. Various concentrations of 2% lidocaine were applied to triplicate sets of MRLA plates as 1 ml aliquots every 4–6 hours for 72 hours. Larval growth and development were used as markers for debridement efficacy. The results indicate that addition of 1% and 10% lidocaine solution had no effect on maggot survival or growth rate, but no maggots survived the 100% solution beyond 24 hours. Pupal weights of the 1% and 10% groups were significantly less than that of the control (0%) group (p < 0.05). Topical lidocaine may be an appropriate method for controlling MDT associated pain, since its effects on maggot development and survival are minimal. Further research is necessary to assess whether lidocaine has any adverse effects on maggot debridement and to determine the clinical relevance of these findings.

Modeling Hybrid Vehicle Fuel Mileage Ratings with a Software Simulation
Manish Sinha
Mentor: Tony Givargis

The Environmental Protection Agency (EPA) determines a vehicle’s fuel mileage rating by placing the vehicle on a dynamometer and measuring the fuel emissions, which are then directly correlated to the amount of gasoline consumed. While convenient, this test procedure simplifies critical features of a typical drive, such as physical forces, individual driving habits, use of air conditioning, and realistic highway speeds. What emerges is a discrepancy between EPA tested and consumer reported fuel mileage ratings. This discrepancy is more pronounced for hybrid vehicles, since they produce fewer emissions through the dual use of an electric motor and internal combustion engine as propulsion sources. To address this inconsistency, we built a hybrid vehicle software simulator that accounts for resistive forces, such as drag, in addition to the physical characteristics of the course, such as grade. Our approach departs from traditional methods by not only taking into account the aforementioned factors but also by putting a special emphasis on the control theory that guides the selection and intensity of the propulsion source based upon a desired speed by the driver. We found that the hybrid vehicle fuel mileage ratings calculated by our simulator are lower than those reported by the EPA. Our results not only have implications on the hybrid automobile industry that pivots its marketing on fuel mileage ratings, but also for consumers who expect reliable information before making a purchase.

Placing Boundaries on the Evolution of the Universe
Charles Smythe
Mentor: Elizabeth Barton

The universe has not been in stasis. Quite the contrary, it shows significant signs of evolution throughout its lifetime. This project examines a narrow-band image of a very narrow range of wavelengths of light coming from distant galaxies in the Hubble Deep Field North. Analysis of the incident light recorded by this image helps determine the redshift of galaxies, which in turn reveals how far away they are from Earth. Since light takes time to travel a given distance, the farther away an object is, the further back in time these observations go. These unique properties of the image are used to search for higher redshift galaxies than have previously been confirmed, allowing a look further back in time than ever before, in addition to the ability to examine star formation in closer galaxies. Calculation of discrepancies between the resulting observations and theoretical predictions from a model of the universe that excludes evolution leads to plausible evidence that suggests evolution has indeed occurred.

The Afterlives of the Greeks, or: What is the Canon of World Literature?
Jenny Sohn & Martin Vega
Mentor: Jane Newman

In the winter and spring quarters of 2004, four undergraduate students of Comparative Literature embarked on an investigative study that aimed to tackle various questions regarding the purpose and execution of the academic discipline. The literary curriculum of the 19th and 20th centuries proved that there was indeed an existence of the dominant and highly-standardized Eurocentric canon. The focus of this project was to develop a systematized methodology in which current and future students of Comparative Literature could read texts (not just limited to the aforementioned canon), to inspire and encourage the posing of questions for the understanding of the cultural in-
tercourse within these works. During the course of this study, ancient Greek poems written by Homer, Sophocles, and Euripides were juxtaposed with reworkings of those texts, written by the poets’ modern successors Derek Walcott, Seamus Heaney, and Wole Soyinka, and were used to determine the relevance and benefits of bringing vastly different cultures into dialogue with one another. Other issues addressed in this project include the ways in which a reader’s Ansatzpunkt could be awakened and outside disciplines (i.e. philology, history, literary theory) integrated to ensure a thoroughly appreciative reading of any work.

Three-Dimensional Optical Coherence Tomography and Optical Doppler Tomography for the Non-Invasive In Vivo Diagnosis of Oral Malignancy

Kulginder Sran

Mentor: Petra Wilder-Smith

The purpose of this study is to assess non-invasive Fourier-domain Optical Coherence Tomography (OCT) and Optical Doppler Tomography (ODT) for early detection and evaluation of oral cancer. OCT provides imaging of static structure while ODT shows dynamic blood flow. Cheek pouches of Golden Syrian Hamsters were imaged using OCT/ODT during carcinogenesis. The right cheek pouch of each hamster was treated 3X/week with carcinogen 0.5% 9,10 dimethyl-1,2-benzanthracene (DMBA), and the left cheek pouch served as the control. Hamsters were imaged during various cancer stages. This allowed imaging and quantifying changes that corresponded with specific clinical and histopathological stages in the cancer progression. Once visible tumors developed, the animals were sacrificed, the tissue excised and the areas imaged for histology. The scans provided information on structural in conjunction with physiologic changes that occurred during the transformation of normal tissue into malignant tissue. The 3-D scans were able to cover larger areas than those covered by a 2-D system. Body temperature and anesthesia were found to have a profound effect on blood flow detection. The 3-D OCT/ODT images provide better lesion definition than 2-D imaging does and agree well with histology findings. Body temperature and anesthesia must be optimized to attain high resolution, reproducible 3D OCT/ODT imaging of tissue structure and blood flow in small vessels.

Characterization of Condensin II and Identification of a Novel Interaction with MAD1

Heather Stalker

Mentor: Kyoko Yokomori

Human condensins I and II are two related heteropentameric protein complexes essential for normal mitotic chromosome condensation. Condensin II loads onto mitotic chromosomes in prophase before condensin I and appears to play a key role in early condensation. Condensin II is distributed not only on the chromosome arms, but is also enriched at the centromeric region where it may play a role in centromere–kinetochore structure. The underlying molecular mechanisms, however, are unclear. To study the function of condensin II, we created an antibody against hCAP-H2, a regulatory subunit of the complex. Here we characterize this antibody and use it to detect condensin II localization during the cell cycle by immunofluorescent analysis. Intriguingly, coimmunoprecipitation studies using this antibody revealed a novel interaction between condensin II and MAD1. Since MAD1 is a critical mitotic spindle checkpoint protein that localizes at the kinetochore, our results provide the first molecular linkage between condensin II and the kinetochore.
**Internet Social Movements: Real World Action from Virtual World Beginnings**

Mark Sueyoshi  
**Mentor:** Caesar Serereses

Although the Internet is an integral part in our lives, the social aspect of its communicative capabilities are marginalized as simply “idle recreation.” This research examines the Japanese Internet message board called “2Channel” as a case study of social interaction on the Internet. 2Channel is an Internet community that maintains complete online anonymity with approximately six million users. Despite the lack of pre-existing networks among 2Channel users, the message board users spend endless hours communicating with complete strangers, and on occasion join together for a cause. This research is an attempt to find a correlation, if any, between the factors of anonymity and mass appeal in transforming “idle Internet chat” into real world task-based movements and civic participation. In addition, the research tackles whether computer-mediated communicative anonymity can provide positive benefits to the tangible world. Through a randomized general survey of the 2Channel electronic bulletin board system with keyword analysis, a quantitative analysis of “public affair” and social movement threads using Structural Equation Modeling (SEM) (tentative), and a qualitative analysis of user motivations through blind-call surveys seeks to research 2Channel and its structural conditions. The research has revealed that while anonymity reduces personal liability and allows for outrageous uses of 2Channel, it also allows for the development of uninhibited discussion, leading to a stronger collective bond as opposed to bonds among individual participants. The collective bond combined with enough momentum of creative energy from countless users inclines 2Channel users to act for the group rather than themselves (tentative).

**The Fabrication of Nanowire-Based Thermocouples by Way of Electrochemical Step Edge Decoration**

Emilyjane Judith Sunga  
**Mentor:** Reginald Penner

Thermocouples are used in over 50% of today’s industrial temperature measurements because of their characteristic versatility, resilience, capability of measuring wide temperature ranges, and quick response to sudden temperature changes. Previous studies have shown that decreasing the size of thermocouple junctions gives relatively faster response times, which provide more accurate measurements during rapid temperature changes. In light of such findings, I have built silver-nickel nanowire-thin film (NW-TF) thermocouples, hoping that they would yield even faster response times and thus improve upon current performance standards. The silver nanowires used to fabricate the NW-TF thermocouples were made by Electrochemical Step Edge Decoration, a method involving the electrode-

position of silver onto cleaved highly oriented pyrolytic graphite (HOPG). Once continuous wires of the preferred diameter were grown on to the HOPG, the wires were then transferred onto glass, and nickel film was applied to half of the area where continuous nanowires were found. The contacts and leads were applied to render the device functional. My results suggest that NW-TF thermocouples indeed have much faster response times than those of commercially manufactured thermocouples, thus supporting previous studies. Results of this kind gives reason to believe that thermocouples with even smaller thermocouple junctions, nanowire-nanowire thermocouples, should generate faster response times than those of NW-TF thermocouples, making nanowire-nanowire thermocouples the ideal thermocouple model.

**A Spatial Analysis of Domestic Violence: Potential Contributing Factors and Multiagency Predictors**

David Swanson  
**Mentor:** James Meeker

Domestic violence has been a persistent societal problem that remains difficult to study. The ability to identify contributing factors and to predict rates of domestic violence would serve as a powerful tool for law enforcement and legal agencies. This study was designed to identify potential socio-economic factors that correlated to increased rates of domestic violence and also to formulate a predictive model using both theory-based variables and previous years’ data from several agencies. Three years of data from the Santa Ana Police Department, Orange County Courts, and Legal Aid Society were entered into a Geographic Information System (GIS) software package, which was used to track trends, hotspots, and extreme values for confirmed service calls, temporary restraining orders, and persons who received assistance in obtaining a restraining order through legal aid. That data was then statistically and spatially analyzed. While little correlation was found between SES factors, the agency data was consistent enough to provide a strong predictive model.

**Structural Studies of Hair-Extracted and Synthetic Melanin and its Implication to Drug Design**

Tadeu Szpoganicz  
**Mentor:** Patrick Farmer

Melanin is a photo-protective pigment ubiquitously present in the hair, skin, eyes, and even in the brain, where it carries many functions, such as quenching free radicals and providing protection against UV radiation. The structure of melanin is not well understood, partially because melanin is a heterogeneous material that is difficult to handle; nonetheless, knowledge about the structural organization of this pigment is important for drug design and the understanding of different diseases such as macular degeneration and melanoma, and even the common graying of hair.
Melanin is known to bind metal ions, which can cause several pro-oxidant effects reportedly implicated in Parkinson’s disease, and this pro-oxidant effect is recognized as an important attribute to use against melanoma. Metal binding by melanin is also an important tool to obtain structural information. In this study, the binding of Al(III) by melanin has been studied via \(^1^H\) NMR of melanin precursors complexed with Al(III), potentiometric titrations of aluminum-melanin complexes, and the crystallization of melanin precursors complexed with Al(III). Natural melanin has also been enzymatically extracted from hair, and melanosomal morphology has been studied via TEM imaging in which the melanosomes display a granular appearance. ICP analysis of metal content in natural melanin is also provided. Altogether, the structural and metal-binding affinities studies of this work provide an insight to the spatial organization of melanin monomers complexed to metal ions; this kind of knowledge is a valuable resource to drug design, including metal-based drugs to target melanoma.

Hippocampal and Striatal Cortical Atrophy Used to Differentiate Subtypes of Mild Cognitive Impairment
Arash Taghavi
Mentors: Steven Potkin & Jessica Turner
Mild Cognitive Impairment (MCI) is a transition phase between the process of normal aging and the onset of dementia. While MCI subtypes have previously been distinguished through neuropsychological testing, this study aims to further characterize distinct subtypes through the neuro-imaging technique of Magnetic Resonance Imaging (MRI). MCI subjects were grouped based on the criteria of memory, with one subgroup showing definite deficits in memory (MCI-amnestic) and the other with non-memory deficit (MCI-non-amnestic). MRI acquisition of both groups followed a similar protocol. Results of the volumetric MRI analysis showed distinct patterns of atrophy for the two subtypes, with MCI-amnestic exhibiting enhanced hippocampal atrophy. Also, rostral basal ganglionic structures (caudate, putamen, nucleus accumbens) were shown to be significantly deteriorated in MCI-amnestic compared to MCI-non-amnestic. The results confirm the known differential atrophy in the hippocampus, but atrophy in the striatum presents evidence for a broader extent of MCI-amnestic cortical deterioration. Further studies need to investigate whether MCI-amnestic prognosis should be restricted to progression to Alzheimer’s or whether it can indicate a starting point for progression to other forms of dementia.

The Microcredit Generation: A Comparative Study of Grameen Bank’s Impact on Bangladesh’s Youth
Sabrina Talukder
Mentor: Inderpal Grewal
Microcredit is a revolutionary new method for eradicating poverty, and is defined as “the extension of small loans to entrepreneurs (without any form of collateral) who are too poor to qualify for traditional bank loans.” Professor Mohammed Yunus is the creator of Microcredit, and was the first to formally practice it through his organization Grameen Bank (GB), which currently has 5.7 million borrowers in Bangladesh and has inspired over 137 Microcredit programs in 37 countries. GB and Professor Yunus have recently received the Nobel Peace Prize, due to the profound effect Microcredit has had on the economic and social framework of rural Bangladesh. Although a significant number of studies have been done regarding the effect of GB’s policies on the bank members themselves, there is a lack of research concerning the relationship between GB policies and the children of the bank members, currently known as “The Microcredit Generation.” The primary purpose of this study is to determine this relationship by analyzing 18–24 year olds in three main focus groups: (1) “The Microcredit Generation” in the rural districts of Tangail and Gazipur, (2) uneducated young adults who live in the same rural districts, and (3) students of the same age group who can afford an education and reside in Dhaka, the capital of Bangladesh. Data for this study was collected over a two-week period in Bangladesh in an interview style format. The results of this study have demonstrated that GB has had a significant affect on the borrowers children in terms of their professional and personal goals.

Comparison of RNA and mRNA Methodologies
Maylynn Tam
Mentor: Ricardo Miledi
This study was undertaken to determine if there is an advantage to different RNA and mRNA isolation techniques. RNA was isolated using the single-step guanidinium thiocyanate:phenol:chloroform method, TRIzol Reagent™, and mRNA was isolated with the Oligotex Direct mRNA System™. Quantity of RNA yield was evaluated by spectrophotometer, and quality of mRNA isolated was evaluated by quantitative real time polymerase chain reaction (qRT-PCR). Isolations were performed according to protocol and manufacturer’s suggestions described elsewhere. The single-step method had a higher yield of total RNA (µg/g tissue), but the mRNA yield from RNA isolated using the TRIzol Reagent was slightly higher. Results of mRNA amplified by qRT-PCR were analyzed by the \(2^{\Delta\Delta Ct}\) method to confirm that the quality of the RNA was higher using the TRIzol method, despite a lower yield. Results indicate that there are advantages to employing a more expensive com-
mmercial kit like TRIzol Reagent for nucleic acid isolation: specifically faster, easier protocol and better quality of mRNA isolated.

**Investigation of Transplanted Neural Stem Cells: The Extent of Their Ability to Survive and Migrate in Response to an Induced Lesion**

Jasmin Tanaja  
*Mentor:* Frank LaFerla

In most clinical conditions, neuronal and synaptic losses are prominent. Many experiments have used specific-site-lesioning methods to mimic such. However, it has been a challenge to recreate a focal lesion in a transgenic animal model. In our experiment, to avoid disruption of the blood brain barrier, we used a novel transgenic mouse model in which it is possible to ablate specific types of neurons by a system of induction. This approach takes advantage of the Tet-off system to inducibly drive the expression of Diphtheria toxin A-chain. This Tet-off system relies mainly on the presence or absence of a Tetracycline analog, in our case, Doxycycline, to activate or deactivate the expression of Diphtheria toxin A-chain. Post induction, neural stem cells will be transplanted in the hippocampal region. After histological and behavioral assessment, we found that large majority of our neural stem cells (NSC) differentiated into Oligodendrocytes and Astrocytes. However, a much lower count succeeded in differentiating into neurons. Behaviorally, the NSC-transplanted-mice performed significantly better (p<0.05) than the controls during the Morris Water Maze. Our results and data provide a promising gateway to improved recovery in brain lesion in humans.

**Stripped of Their Rights, Injustices Unsettled: Japanese Latin Americans Kidnapped and Interned During World War II**

Lisa Tanaka  
*Mentor:* Dorothy Fujita-Rony

During World War II, the United States government kidnapped 2,264 men, women, and children of Japanese ancestry from Latin America. The Japanese Latin Americans were placed into U.S. internment camps, for the purpose of exchanging them for American soldiers (POWs) trapped in Japan. After the war, the Japanese Latin Americans did not receive a thorough apology from the U.S. government and only were given a meager $5,000 compensation. While Japanese Americans successfully fought for redress for their experience during World War II, the Civil Liberties Public Education Fund had minimal funds and many Japanese Latin Americans are still fighting for redress. My project analyzes Japanese Latin American migration from Japan to Peru, incarceration and post-World War II life, the role of the U.S. government, civil and human rights, national identity and U.S. citizenship, and gender and generation. In particular, I focus on the life of activist Grace Shimizu, the director of the Japanese Peruvian Oral History Project and a leader in the “Campaign for Justice,” which fights for the rights and redress of the Japanese Latin Americans. Without the effort and hard work of activists such as Shimizu, the fight for redress and compensation would not be feasible. My research on Shimizu documents her Japanese Peruvian family history, her life as an activist, the significance of establishing the Japanese Peruvian Oral History project and the Campaign for Justice, and the importance of understanding that mistakes throughout history should never be repeated.

**A Study of the Influence of Outward Appearance on Perceptions of Personality**

Christina Tang  
*Mentor:* Charles Chubb

It is common knowledge that people dress in certain ways to influence other people’s perceptions and attitudes towards them. This study seeks to understand how changes in appearance that are large enough to be seen but too small to be actively noticed can influence an individual’s perception of another person’s personality traits. An understanding of this phenomenon would bring awareness of automatic subtle judgements that people make on others based on an unconscious cognitive mindset. Participants saw pictures of eight different models, four women and four men, each with a different small apparel change combination (collar up vs. collar down paired with belt vs. no belt). Each participant viewed each of the eight models once (in one of the four clothing conditions) and rated the given model on each of ten personality trait scales derived from McRae and Costa’s Five-Factor Model of Personality. Although there were large systematic effects of which of the eight models were being judged, there were no significant effects of attire manipulation. This suggests that the influence exerted by the particular clothing manipulations used here on participants’ assessments of the models’ personalities was negligible in comparison to other aspects of our models’ appearances.

**Wirelessly Interfacing with the Yamaha Disklavier Mark IV**

Matthew Teeter  
*Mentor:* Christopher Dobrian

The music technology industry is only recently beginning to realize the potential of wireless communication technology for control and communication of data in music and multimedia applications. A new breed of musical devices is starting to integrate technology that allows the wireless transmission of MIDI messages, real-time audio and video data, control data for performance synchronization, and commands for remote hardware control of these instruments. The Yamaha Disklavier Mark IV piano is the first
musical instrument with wireless capabilities built in. It communicates via WiFi, which allows the piano to transmit and receive information from nearby wireless controllers. The piano originally comes with two such controllers: the handheld Pocket Remote Controller (PRC), and the larger Tablet Remote Controller (TRC). Both of these devices are proprietary, closed systems. In this project, we wished to create platform-independent software having the same functionality as these existing controllers, which could run on a conventional laptop. We deciphered the raw wireless network traffic to determine the messaging protocol the Disklavier used to communicate with the supplied controllers. Once we understood the inner workings of the piano, we created software using a variety of technologies, including Java, PostgreSQL, XML, and Flash. The software can control the piano from a laptop, thereby opening new possibilities in music creation and performance. We hope that manufacturers will use a similar protocol to control other robotic instruments that are currently under development, to promote an open standard for musical instrument control.

Lithographically Patterned Nanowire Electrodeposition
Michael Thompson
Mentor: Reginald Penner

Nanowire fabrication methods can be classified either as top down, involving photo- or electron-beam lithography, or bottom up, involving the synthesis of nanowires from molecular precursors. Lithographically patterned nanowire electrodeposition (LPNE) combines attributes of photolithography with the versatility of bottom-up electrochemical synthesis. Photolithography defines the position of a sacrificial nickel nanoband electrode, which is recessed into a horizontal trench. This trench acts as a “nanoform” to define the thickness of an incipient nanowire during its electrodeposition. The electrodeposition duration determines the width of the nanowire. Removal of the photore sist and nickel exposes a polycrystalline nanowire—composed of gold, platinum or palladium—characterized by thickness and width that can be independently controlled down to 10 and 15 nm, respectively. The process has been characterized electrochemically as well as by atomic force microscopy, scanning electron microscopy, transmission electron microscopy, and x-ray photoelectron spectroscopy. Metal nanowires prepared by LPNE may have applications in chemical sensing and optical signal processing, and as interconnects in nanoelectronic devices.

Found Spaces Theater Company
Samuel Thornton
Mentor: Anthony Kubiak

The power of art is amazing to witness. I know that, in my experience, art has led me to find out new things about myself and the entire world around me. Indeed, through art, we can gain an understanding of the world around us, and perhaps even be moved to make a change socially or within ourselves, progressing as a human race to new forms of life. With the Found Spaces Theater Company, my fellow artists and I agreed to follow in the footsteps of such playwrights as Tennessee Williams and Oscar Wilde, and produce new pieces that bring to light particular aspects of society that are otherwise shunned or skipped over. All of these performances would be free, so that they would be open for anyone to see. There would be a suggested donation of $10, and much of the money collected would be donated to a charity that specializes in the issue that inspired the performance; we would also give the charity a booth so that they could answer questions audience members might have. Through this process, I have been witness to the power of theater more than I had been before, and seen that many mainstream concepts of theater are rather misleading. German playwright Bertolt Brecht wanted theater’s entertainment factor to lead to a certain kind of instruction to the audience, and through that instruction have the audience gain a better understanding of themselves and, more importantly, the society around them. Found Spaces has taught me that this is possible.

Two Mitochondrial DNA Mutations in ND3 and ND6 Genes Affect Complex I Activity and Assembly and May Have Synergistic Effects in Causing Leigh’s Syndrome
Kevin Tien
Mentor: Vincent Procaccio

Complex I of the mitochondrial respiratory chain is an “L” shaped structure in the mitochondrial inner membrane with a portion protruding into the mitochondrial matrix. The complex is composed of 45 subunits, seven of which are encoded by the mitochondrial genome (mtDNA); the other 38 subunits are encoded by the nuclear genome. It is known that mitochondrial diseases can be caused by mutations in this complex. We recently found two pathogenic mtDNA mutations in a patient with a Complex I enzyme deficiency and Leigh syndrome. These mutations in the mtDNA are T14487C and C10159A, located in the ND6 and ND3 genes respectively. Patients harboring a T14487C mutation alone phenotypically have bilateral striatal lesion syndrome marked by progressive dystonia and cognitive impairment. The mutation C10159A has not been described previously, but the mutation at position T10158C targeting the same amino acid has been considered as a common pathogenic mtDNA mutation. The possibility of the contributing effects the second mutation, C10159A, on this patient’s phenotype will be analyzed. Heteroplasmy determined via different techniques indicates high levels of both mutations within the patient’s cells. Westerns and Blue native gels have shown a general decrease in the as-
Synthesis of 2,3-Dioleoylglycerol Toward Chirality Studies of Cellular Signaling Molecule Interactions—and—Synthesis of a Thioether Library Toward Expansion of Reductive Lithiation Methodology

Heath Timmons
Mentor: Scott Rychnovsky

My presentation will involve findings and results for two disparate projects. The first section of the presentation documents the synthesis of 2,3-dioleoylglycerol, which was completed for collaborative bioorganic studies. This molecule is the unnatural enantiomer of 1,2-dioleoylglycerol, and the collaboration focused on using the sample as a probe to study stereospecificity in the interaction between this molecule and the enzyme 1,2-diacylglycerol kinase. This synthesis involved the use of different asymmetric catalysis methods, complicated lipid purification, and extensive stereochemical analysis. The second portion of the presentation discusses an exploratory methodology project inspired by Rychnovsky group studies of reductive lithiation pathways. Using the model of phenylthioether reduction with LiDBB, a library of substituted phenylthioethers and biarylthioethers was synthesized and screened for reactivity with lithium. Promising leads in this experiment are inspired by Rychnovsky group studies of reductive lithiation. The presentation discusses an exploratory methodology project inspired by Rychnovsky group studies of reductive lithiation pathways. Using the model of phenylthioether reduction with LiDBB, a library of substituted phenylthioethers and biarylthioethers was synthesized and screened for reactivity with lithium. Promising leads in this experiment are inspired by Rychnovsky group studies of reductive lithiation, and the collaboration focused on using the sample as a probe to study stereospecificity in the interaction between this molecule and the enzyme 1,2-diacylglycerol kinase. This synthesis involved the use of different asymmetric catalysis methods, complicated lipid purification, and extensive stereochemical analysis. The second portion of the presentation discusses an exploratory methodology project inspired by Rychnovsky group studies of reductive lithiation pathways. Using the model of phenylthioether reduction with LiDBB, a library of substituted phenylthioethers and biarylthioethers was synthesized and screened for reactivity with lithium. Promising leads in this experiment are indicated for use in more complex systems, allowing enumbering elements of the original methodology to be circumvented.

Racial Disparity in Cardiovascular Disease Risk Factors and Mortality Among Women as a Result of Social Issues

Carla Toko
Mentor: Michael Montoya

In 2003, cardiovascular diseases (CVDs) accounted for 53.1% of all female deaths in the United States, according to the American Heart Association. However, there is popular belief in scientific literatures that African-American women have the highest prevalence and mortality rates when compared to other racial/ethnic groups. The purpose of this study is to explore the claims that African-American or black women have the highest risk of heart disease among women of all races. This was accomplished by surveying peer-reviewed articles to find the risk factors of CVDs, and explaining, through the risk factors Felicia LeClere’s theory, that neighborhood segregation and low socioeconomic status (SES) are the reasons for such disparity. According to the results, the major risk factors for CVDs are physical inactivity, obesity, diabetes, hypertension and smoking. The findings confirmed that there is a health disparity in terms of prevalence but not significantly in terms of mortality. Furthermore, the results proved that neighborhood segregation and low SES play a significant role in the health disparity through the risk factors and treatments received.

From a Socialist Economy to a Market Economy: China’s Economic Reforms Increase Unemployment Among College Students and Laid-Off Workers

Jing Tong
Mentor: Dorothy Solinger

China’s emergence as a major economic player in today’s global marketplace is attributed to Deng Xiaoping’s market reforms of the late 1970s. The economic reforms also, known as “socialism with Chinese characteristics,” have rapidly increased China’s GDP, but have also worsened the unemployment situation. With the decline of state-owned enterprises, and with China’s structural adjustment away from the socialist economy, there is no longer guaranteed work. Laid off workers and college students have suffered from the decline in the number of government jobs, and from capitalism. I have found that government policies to support the unemployed have been inefficient and have done little to help the people make the transition into a market economy. From my interviews with college graduates, I have discovered that many are dissatisfied with their current jobs and the current job market. A college education no longer automatically leads to a well paying and satisfying career. The topic is an important issue for developing countries that are also trying to introduce market reforms. The interviews and surveys will add to the knowledge about college students and their employment opportunities after graduation. Unemployment is a growing social and economic problem in China, and there is a growing body of research on this topic; however, by introducing college students into my research, I hope to bring a different perspective that will help to bridge the gap in knowledge of unemployment among college students and to contribute to future research on this topic.

Regulation of CNS Autoimmunity Through β1,6GlcNAc Branched N-Glycan Alterations by 1α,25-Dihydroxy Vitamin 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 EAE (Experimental Autoimmune Encephalomyelitis—the mouse model for Multiple Sclerosis (MS)) by an unknown mechanism. Deficiency of 1α,25-(OH)₂Vitamin D₃ has been proposed to be a environmental factor regulating T cell mediated autoimmunity in humans and rodents. Here we explore whether 1α,25-(OH)₂Vitamin D₃ negatively regulates T cell function by enhancing production of β1,6GlcNAc branched N-glycans. 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.

Blogging Towards Freedom: Effects of Weblogs on Iranian Youth
Elnaz Toussi
Mentor: Lina Kreidie

The Internet has introduced a new means of communication for the Iranian youth, both in Iran and in other countries, to express and further their wants and desires for a more democratic Iran. Blogging has become an increased norm among Iranian youth as a source of political dissidence. This is an arena not widely explored, but is growing vastly as each day passes. I explore the phenomenon of blogging and whether it is a successful method of resistance for the Iranians to defy the control and supervision of speech by their government. Others who have explored the “blogistan” world have done general surveys and broadly touched upon this topic. With a look at the 1979 Revolution, we see that technology played a major but silent role in the rapid change of the state. We can see a parallel to the role of technology then and the role that technology plays now in Iran. Many, including the Islamic Republic, underestimate the blogging world. Since the cyber world is consistently changing on a daily basis, many cannot see the imprints it has made on a semi-cyber revolution by the Iranian youth. The results show the consistent and growing dissidence against censorship and the possible repercussions that will take place.

Coronary Blood Flow Simulation Study of Fractional Flow Reserve (FFR) as a Means of Quantifying Coronary Stenosis Severity
Huy Tran
Mentor: Sabbe Molloi

Fractional Flow Reserve (FFR) is used by physicians to estimate the severity of coronary stenosis. FFR gives an index for the severity based on the change in flow between normal and diseased arteries. Arterial flow, however, is affected by anatomical changes due to arterial narrowing and by physiological changes such as arterial resistance and flow distribution due to contrast injection during imaging process. This study aimed to address the effects of contrast injection on arterial resistance and flow. Simulations of contrast injection were carried out on a reconstructed arterial tree using a computer program and a simplified two-compartment model of the arterial tree. In vivo studies on swine animal models were done to address changes due to contrast injection. We measured the changes in flow and FFR that resulted from contrast injection at multiple stenosis severity. Results indicated that there were small depressions of flow upon injection of contrast, and that pressure drop changed as a result of arterial resistance and arterial diameter changes. Flow depression and pressure drop became more significant with higher severity of stenosis. Data predicted by our simulation program showed a high degree of similarity with the experimental results. The small variation is due in part to the complexity of anatomical structure and physiological changes of the coronary artery (such as abnormal anatomical structures) that are yet to be fully projected by the simulation. Further development of the program and implementation will better account for these factors.

Response of Hamster Blood Vessels to Pulsed Laser Irradiation and an Anti-Angiogenic Drug
Nadia Tran
Mentors: Wangcun Jia & John Nelson

The purpose of this study is to find laser parameters that result in photocoagulation of blood vessels and a method to prevent the revascularization of these treated vessels. The goal is to develop a more effective treatment of cutaneous vascular lesions, such as port-wine stain (PWS). We investigated different laser parameters on blood vessels of rodent window chamber models (RWCM) to observe the effect of both multiple laser pulse (MLP) and single laser pulse (SLP) irradiation, along with the use of an angiogenic drug, rapamycin, with the aim of causing permanent blood vessel removal. It was observed that MLP irradiation had a higher percentage of acute coagulation in irradiated vessels and at a lower fluence per pulse than with SLP. Furthermore, the use of rapamycin as a drug therapy for MLP irradiated vessels showed a deceleration in the rate of revascularization over time, compared to vessels treated only with MLP irradiation. While only a small number of vessels have suffered irreversible vessel damage, the implications of this study should be explored further, possibly with other laser or drug treatments.
Biomedical Applications of Optical Coherence Tomography in Dental Hard Tissue and Imaging Variables
Flora Trang
*Mentor:* Petra Wilder-Smith

Optical Coherence Tomography (OCT) is an innovative non-invasive imaging technology that can provide 2-D and 3-D surface and subsurface information on hard dental tissues. The goal of these studies was to investigate the effects of several variables on OCT data from teeth, as a basis for developing standardized, reproducible protocols for dental imaging procedures. A standardized protocol was then implemented to evaluate demineralization and remineralization effects in extracted teeth. Caries-free extracted human molar teeth were used to evaluate the effects of: (1) probe and incident light angulations, (2) change of focal plane, and (3) tooth hydration on OCT data. A spectral OCT system connected to an adjustable protractor and stage were used to measure incident light angle and focal plane. Hydration effects were measured using tooth samples previously desiccated or submerged underwater for varying amounts of time. After evaluating those factors and developing a standardized protocol, OCT was used to investigate the effects of demineralization and remineralization using citric acid and fluoride. Light incidence and focal plane standardization were necessary to achieve reproducible data. Using a standardized approach, the effects of dental demineralization and remineralization were detected and quantified using OCT. Results support the need for standardized OCT imaging protocols.

The Investments and Influences of Compulsory Motherhood
Lan-Anh Jenny Trinh
*Mentor:* Jennifer Terry

The importance of motherhood is widely recognized, its impact appreciated but less understood, its commitment popularly accepted but unexpectedly littered with difficulty and sometimes regret. Motherhood in reality is not the dream it is painted to be. The contract of reproduction and motherhood is often undertaken without a critical interrogation of embedded external influences: reward incentives, romanticization, and the naturalization of a biological destiny have simultaneously created and excused a strain of pathological motherhood. This paper explores how the reproduction factors affect our interactions with the child, parent and each other; provide answers to the critical inquiry of why motherhood has become the telos of female existence, and offer an alternative narrative to those who choose to resign from the prescription of motherhood.

Identity Formation 101: A Creative Identity Intervention Program for Kenyan Orphans
Megan Trotter
*Mentors:* Shawn Rosenberg & Johanna Shapiro

The developmental psychologist Eric Erikson claimed that self-definition was the main obstacle in the progression from adolescence to adulthood. He argued that without a strong and healthy sense of identity, individuals are more likely to have poor decision-making abilities and thus are at greater risk for drug abuse, delinquency, and other negative consequences. The purpose of this research was to explore possible disruptions in identity formation and test an intervention program in African children adjusting to the loss of their parents due to AIDS, domestic violence, or other traumatic events. Eight subjects, ages 9–12, six males and two females, all residing in a rural orphanage in Kenya, were interviewed before and after the intervention program. These results were compared against eight other orphans in the same age group from an orphanage in an adjacent town. The subjects and the control group were interviewed on five aspects of identity: gender, tribe, orphan status, race, and self-image identification. Over a period of two months, the subject group participated in activities to help them to express their individual identity. Based on descriptive and qualitative data analysis, we expect to find a significant difference between pre- and post-interviews both within and between groups. Also we expect to develop greater insight into the identity formation process of orphans within this tribal society. Finally, this research could shed light on the issue of identity formation in general and possibly offer ideas for improvement of current identity intervention programs.

The Role of Soil Glomalin in Toxic Metal Dynamics in an Urban Watershed
Diana Tsai
*Mentor:* Oladele Ogunseitan

Glomalin, an ubiquitous soil protein produced by arbuscular mycorrhizal fungi (AMF), is capable of sequestering potentially toxic elements (PTEs) such as copper (Cu), cadmium (Cd), lead (Pb), and manganese (Mn). Sediment samples were collected from seven sites along San Diego Creek, a major watershed in Orange County that drains about 320 km² of water into the Upper Newport Bay estuary and empties directly into the Pacific Ocean. Therefore, PTE contamination along the creek could degrade both inland and coastal water quality. Glomalin extracted from the soil samples was analyzed for Cd, Mn, and Pb concentrations by using the Simultaneous Multielemental Atomic Absorption Spectrophotometer. Concentration of Cd ranged from 0-0.338 mg g⁻¹, Pb ranged from 0.11-188.95 mg g⁻¹, and Mn ranged from 2.23-784.42 mg g⁻¹. These data show that glomalin is a major reservoir for toxic metals in embankment soils, and further studies on the role of
eroded glomalin’s contribution to watershed pollution are warranted.

Development of Binding Patterns in Liver and Spleen: Binding of Liposomes Incorporating a *Plasmodium* Amino Acid Sequence
Monica Tsai
*Mentor:* Richard Robertson

In adult mice, liposomes containing a peptide from *Plasmodium* have been shown to bind to liver and, to a lesser extent, spleen tissue. The purpose of this study was to determine the age at which this capacity for liposome binding in liver and spleen of mice develops. Vascular perfusions were used to fix liver and spleen tissue with paraformaldehyde. Immunocytochemistry was used to observe the patterns of immunoreactivity to antibodies including albumin, F4/80, GFAP, heparan sulfate, and chondroitin sulfate. Liver and spleen slices adjacent to those processed with antibodies were treated with liposomes. The adjacent slices were then viewed and photographed under a fluorescent microscope. Liver and spleen tissue from adult animals and animals of the postnatal (P) ages P7, P10, P13, P14, P17, P20, and P26 have been processed. Heparan sulfate immunocytochemistry resulted in staining along the walls of sinusoidal capillaries and central venules in the liver, and in the borders between the white pulp nodules and red pulp in the spleen. A liposome binding pattern similar to that of heparan sulfate antibodies has been observed in the liver tissue of animals at all of the previously mentioned ages; however, a similar pattern has not been observed in the liposome treated spleen tissue. Liposomes incorporating a peptide from *Plasmodium* bind to liver tissue in a pattern similar to that of heparan sulfate immunocytochemistry, but do not bind to spleen tissue in a notable pattern. The capacity for liposome binding develops at an early age in the liver.

Motor Delays in Autism Spectrum Disorder: Prevalence and Relationship to the Autism Phenotype
Susan Tse
*Mentors:* Pamela Flodman, Kathryn Osann & M. Anne Spence

Motor milestones were studied in children with autism and compared to motor development in typically developing children in a university based multidisciplinary research program. One hundred and fifty-two children were studied in terms of motor milestones, autistic behavior, intellectual ability, and adaptive behavior, using standardized instruments. Studies showed that autistic children walked and developed other motor skills later than typically developing children. There were, however, autistic children who achieved motor milestones at ages similar to those of typically developing children. Autistic children with normal motor development did not differ from autistic children with delayed motor development with respect to autistic behaviors, intellectual ability, or adaptive behavior. It was found that those children who learned to walk before 16 months also developed other motor skills at a normal age. Those children who learned to walk later achieved other motor skills at later ages. Future studies of children with autism should search for additional differences between those with and without motor delay. Studies of maternal health, birth complications, chromosome abnormalities, and twins may lead to an explanation for the observed motor delay in a subset of children with autism.

A New Method for High Precision Solubility Measurements for Use in Oceanographic Tracer Research
Linda Tseng
*Mentor:* Eric Saltzman

The use of transient tracers in oceanography requires high quality measurements of the solubility of gases in seawater. Hydrochlorofluorocarbons are potentially useful tracers whose solubility is not well known. In this study, a new method of measuring gas solubility in pure water and seawater was developed. The method procedure involved equilibrating a gas stream in a porous tubular membrane inside a temperature-controlled cell volume in which the gas stream would strip the compound in interest dissolved in the water. The solubility measurements of HCFC-141b, CCl4, CFC-11, and HCFC-22 were made in both pure water and seawater over temperature range of 1–30 °C. Coefficients for the gas solubility equation were calculated for each experiment. The results were compared to published values, and the solubility measured for HCFC-141b, CCl4, and CFC-11 significantly deviate from the published values; however, the solubility for HCFC-22 has values deviating less than 5% from the published values.

Quantification of Macrophage Response in Contusion and Laceration Spinal Cord Injuries
Michelle Tu
*Mentor:* Hans Keirstead

A common consequence of spinal cord injury (SCI) is demyelination of axons, which leads to impaired physiological function. We have previously demonstrated that contusion SCI results in widespread demyelination, whereas laceration results in localized demyelination. Additionally, contusion injury sites transplanted with human embryonic stem cell (hESC)-derived oligodendrocyte progenitor cells (OPCs) showed enhanced remyelination and motor recovery. In contrast, adult rats with laceration injuries treated with hESC-derived OPCs did not show enhanced remyelination or improved motor function. This data reveals that targeting demyelination may not be a feasible approach to repairing laceration SCI. An examination of the inflammatory response after SCI may elucidate dif-
different responses to contusion and laceration injuries, which may explain these observed differences. Specifically, we are examining macrophages that play a role in both demyelination and remyelination. We will quantify the temporal and spatial response of macrophages after contusion and laceration SCI. We hypothesize that there will be a different response of macrophages in contusion and laceration injuries that coincides with the varying degree of demyelination and remyelination in these distinct injury types.

The Psychosociocultural Factors that Influence Chinese American College Students’ Alcohol Consumption
Rosa Tu  
*Mentor*: Jeanett Castellanos

The model minority stereotype may conceal the alcohol consumption behaviors of Chinese-American college students. At the same time, Chinese-American college students may experience distress from the model minority stereotype, which places pressure on Asian Americans to achieve high academic and occupational success. The peer pressure to drink that exists on college campuses may place them at risk for problematic drinking behaviors that serve as a means of coping with their distress. It is important that university counseling centers and other campus organizations identify positive coping strategies and provide culturally competent services to Chinese-American students regarding their alcohol use. The purpose of this survey study is to examine the psychosociocultural factors that influence Chinese-American college students’ alcohol consumption. Specifically, the influence of collective self-esteem, internalization of the model minority stereotype, depression, peer pressure to drink, perceptions of alcohol as a stress reliever, and cultural congruity on alcohol consumption patterns will be examined by gender and generational level. Data collection and analysis is ongoing. Findings will provide university counselors insight on how to better address Chinese undergraduate alcohol consumption patterns. Specific directions will be provided for prevention through outreach, group counseling, and other program initiatives. Implications for future research will also be addressed.

Dance in Malawi: An Exploration of Teaching, Choreography, and Performance in Kogoya Village
Taylor Ullery  
*Mentor*: Donald McKayle

Malawi, called the warm heart of Africa, is one of the poorest countries in the world, with over 80 percent of its population living in rural villages. This past summer, I traveled to one of these Malawi villages, called Kogoya, and spent two weeks with a group of 25 young girls, ranging in age from 7 to 17, teaching them a dance that they would perform for their entire village. With the help of translators, we spent a few hours each day learning and practicing the steps and getting to know each other. They started out the first day with shy introductions and ended with shouts of joy and pride at the successful execution of their newly learned dance steps. At the end of the two weeks, the performance took place at the dedication ceremony for a newly constructed village community center. The audience included over 300 of their family and friends, and the village chief. With extremely limited educational opportunities and the pressure of motherhood roles at very early ages, young girls in the village rarely have time for creativity or fun. Through the process of learning and performing this dance, the girls were able to gain confidence, experience a sense of creative accomplishment, and find joy and inspiration through their involvement in artistic creation.

A Division of Age
Michelle Urenda  
*Mentor*: Mara Lonner

Edward Degas’ *Waiting* portrays two figures, a woman and a child, who radiate a sense of loneliness and separation despite being seated next to each other. Degas has created a curious disconnection in this piece that I feel is partially caused by the clear division between the roles of child and adult that existed in his time. Modern children and teenagers try to grow up too fast to reap the benefits of adulthood before they are ready for the responsibilities that come with it, while adults seek to regain the reckless freedom of youth. As a result of this, the divisions and distinctions that separate people based on currently-held conceptions of responsibility, ability, maturity, and innocence have become severely blurred. To gain a greater understanding of modern age distinctions, I have researched currently and previously held conceptions of childhood, as well as the demands and social expectations presented by modern society. I have augmented this research with studies of work and subjects of Edward Degas, as well as the themes and methods of Catherine Opie and Annette Messager, which I have found relevant to the development of my project. This research was applied to the development of a range of conceptual sketches. The most successful of these was then adapted into a sculptural oil painting that seeks to explore the blurring of age distinctions in women and girls in modern society.
The Evolution of Women's Suffrage in Iranian Society: Portrayals of Identity, Struggle, and Resistance Through Iranian Literature, Poetry, and Film
Elica Vafaie
*Mentor:* Roxanne Varzi

The goal of this research is to examine the role of the Iranian women throughout the modern history of Iran and how literature, poetry, and film have portrayed the evolution of their suffrage and struggle to obtain rights and recognition in society. Growing influence of and competition with the West offered a new socio-economic perspective to Iran and challenged the traditional role of women in society. The Constitutional Revolution of 1906–1911 marked the introduction of democracy and civil society and the start of modern Iranian feminism. The literary works of various Iranian women reveal how they saw their changing identity and struggle to overcome the cultural, social, and political obstacles to gain their respective rights in society. The tension between modernity and tradition, particularly the Islamic view of the role of women, however, continued throughout the twentieth century and were reflected in many literary works. This tension peaked during the 1979 Islamic revolution and led to significant setback for the modern sector. New restrictions imposed by the Islamic Republic, however, have resurrected the feminist movement, as women have lost all the gains they had made since the Constitution Revolution. This analysis examines how over the last century, Iranian literature, poetry and film have been a channel for women’s suffrage, giving Iranian women an opportunity to establish a medium to explore their identity and place in contemporary Iranian society. The literary works indicate that Iranian women have been very active and have made significant strides to regain and extend their rights.

“Brought to You by Viewers like You”: Gender Difference in Political Advertisements
Enny Van
*Mentor:* Mark Petracca

The gender gap and its consequences on equal numerical representation has long been the focus of American politics, and analysis of this effect can be fruitful under the scope of political media. The media has been one sphere political scientists have looked to as a possible reason for this occurrence, as well as a means through which to address the gender gap and gender stereotyping. Most explanations though too often focus on the differences in political platforms seen between men and women, while rarely addressing how campaign strategies and political advertisements may play an important and vital role in gender and politics. I argue that political commercials can be a mode of campaign strategy, in which one can locate and determine gender difference in American politics and its possible implication on the democratic process. Femininity guards against the dishonesty, manipulation, self-interest and corruption that seem to demarcate politics. And, as this construction keeps its hold on American public life, politics seems to profess itself as a sphere best reserved for men. The implications of this are of great importance in determining how one must assess the interplay of politics, gender and the media. Common opinion has always speculated and assumed that the campaigns and political life for candidates fundamentally differ based upon gender. While there has been a vast number of studies pertaining to the differences between issues deemed female or male, or how the use of certain campaign tactics is more prevalent for one gender over another, the unanswered and untouched question is whether there is a true gender difference in politics or the perceived differences are based on long-standing assumptions.

Familial Influences on the Emotional Experience and Self-Esteem of Asian American Undergraduates
Leyna Vo
*Mentor:* Jeanett Castellanos

Asian cultural values influence Asian Americans to place sensitivity to others’ emotional needs before their own, limit expression of strong feelings, and repress negative feelings to maintain harmonious relationships. Some Asian parents socialize their children to only express emotions that reflect traditional Asian values. In fact, emotions not parallel to Asian cultural values are discouraged, rejected, and regulated. In response, Asian American children may restrict their emotions and feel shame or guilt for experiencing emotions that were deemed inappropriate by their parents. This study surveys 200 Asian American undergraduates to examine how parents’ and students’ adherence to Asian values influences undergraduates emotional expression. Most importantly, the influence of engendering both Asian appropriate and inappropriate emotions on students’ self-esteem will be examined. The study predicts that Asian Americans with more traditional parents will have a larger range of inappropriate behaviors, encounter more negative expressions, and report lower self-esteem.

Magnetic Field Effects in Arabidopsis thaliana
Anita Vora
*Mentor:* Thorsten Ritz

The geomagnetic field plays a role in guiding magnetosensitive organisms such as birds. The magnetic response has been well studied in migratory birds, whose responses in orientation tests are affected by the wavelength of ambient light. However, the mechanisms by which these magnetic responses occur are virtually unknown, and migratory birds are not an ideal system to study magnetic field effect mechanisms. To establish magnetic field effects, I looked at a plant model system, Arabidopsis Thaliana. Since crypto-
The Role of Lhx2 Transcription Factor on Cell Proliferation in the Cerebral Cortex
Roger Vu

Mentor: Edwin Monuki

Lhx2 is a transcription factor that is known to have a role in cerebral cortex development, as Lhx2 loss of function results in a small forebrain phenotype in mutant mice. This phenotype suggested the presence of a proliferating defect, which is indicated by decreased labeling using the S-phase marker, BrdU. However, these studies did not account for the presence of excessive dorsal midline structures that truncate the cortical domain, which were discovered in subsequent studies. Therefore, it is still unclear whether Lhx2 plays a role in mediating proliferation in the cerebral cortex. My research uses an Lhx2 conditional knockout mouse (CKO), to investigate whether the previously reported small forebrain phenotype is due to a proliferation defect in the cortex. By performing immunohistochemistry, using anti-phosphohistone H3 (PH3) as a marker of cells undergoing mitosis, I counted PH3-positive cells within the cortex and found no significant difference between control and mutant mice at embryonic stages E12.5 and E14.5 in the number of PH3-positive cells per unit length. This suggests that either loss of Lhx2 does not affect gross proliferation levels of precursor cells in the cortex, or that the defect is very subtle in nature and may require additional animals to be analyzed. However, these data do not eliminate Lhx2 as a mediator of cell cycle in the cerebral cortex due to the complex nature of neural development.

Asian and Latino Couples: A Qualitative Study of Influential Factors in the Formations of Minority-Minority Romantic Relationships
Rebecca Wang

Mentors: Samuel Gilmore & John Liu

In the 50 years since the passage of the 1965 Immigration and Naturalization Act, the racial composition of the United States has undergone major changes. The two largest groups of immigrants into the United States are Asians and Latinos, settling mostly in California. With such a large wave of immigration, the importance of race and ethnicity has become a hot topic of discussion. The goal of this project was to look at the meaning of race and ethnicity in the lives of Asians and Latinos involved in a romantic relationship. Though there are many studies that look at interracial relationships, few look at those between two minorities, and even fewer examine the dynamics of Asian and Latino interracial relationships. This project was intended to gain a better overall understanding of interracial relationships by examining those between Asians and Latinos using qualitative methods. Six couples were interviewed, resulting in twelve individual in-depth interviews. Couples from a more bicultural background had the least amount of conflict in the relationship, while couples whom came from strong cultural Asian or Latino backgrounds produced more conflicted relationships.

Assessing Perceptions of Incarcerated Juvenile Offenders
Megan Watt

Mentor: Elizabeth Cauffman

Previous research suggests that attitudes and perceptions may influence behavior, particularly in situations concerning the law and authority figures. This study examines juvenile offenders’ perceptions of the justice system as well as their attitudes toward the institution and how these perceptions are related to institutional offending and victimization. Data were collected from 197 serious male juvenile offenders between 14 and 17 years of age, who were incarcerated in a secure juvenile justice facility in southern California. Analyses revealed a significant change in youths’ opinions over the first month of incarceration. Specifically, opinions of program helpfulness and organization became more positive over time, while perceptions of staff and ward apathy grew more negative as time passed. Interestingly, those who view the police in a less positive way begin to view the staff as being more apathetic. Surprisingly, correlations between justice system attitudes and perceptions of the facility revealed no significant relation to either victimization or offending behaviors within the institution.
Measurement of Capacitance and Coefficient of Kinetic Friction in Polysilicon MEMS Devices

James Wenner
*Mentor:* James Rutledge

MEMS, or microelectromechanical systems, are mechanical machines with scale lengths on the order of several micrometers. Although currently a $5 billion per year technology, friction and wear issues have prevented development of MEMS applications involving sliding contact between components. I studied MEMS devices, made at Sandia National Laboratories, that are designed to study friction and wear. I developed a new optical-electrical technique to measure the capacitances and elastic forces that drive the devices. My measurements have indicated that the capacitances are 60% larger than those predicted by simplistic theoretical estimates, and that the spring constants are constant to within a factor of a few percent. Preliminary measurements of the kinetic coefficient of friction, derived from measurements of current, and their underlying theoretical bases will be presented.

Understanding the International World of High School Students: A Case Study of the Past, Present, and Future of Model United Nations

John Wie
*Mentor:* Caesar Sereseres

California’s Social Sciences State Standards places its emphasis primarily on historical knowledge and data while the study of international issues is a secondary consideration. Model United Nations (MUN), a nation-wide high school and collegiate program that lets students take on roles as delegates of various nations through research and debate, is one well-defined option that helps alleviate this gap in the current statewide standards. However, the program is still not widely available in some high schools because of curriculum demands, while many are also searching for financial support. I have conducted a number of interviews with MUN-related faculty in Southern California, consulted MUN-affiliated documents, and passed questionnaires to MUN students. This was to better understand the past and present goals and processes of the MUN and to gather ideas in building a new MUN outreach program to support the future of MUN at UCI. The study has revealed the effectiveness of MUN programs in preparing students for different areas of university level research and debate, and also as an engaging program. However, many schools experienced common obstacles, including financial burdens and a lack of faculty support. Most importantly, however, MUN is another path for students to acquire knowledge of the international community and develop core abilities such as analytical thinking, research methods, and writing skills.

Kinetic Friction in Polysilicon MEMS Devices

James Wenner
*Mentor:* James Rutledge

Beyoncé in Limbo: The Contortions and Back Bending of Black Femininity

Justina Williams
*Mentor:* Sohail Daulatzai

This presentation presents a critical analysis of pop music superstar Beyoncé Knowles as a mass-mediated figure of black femininity in the post-civil rights era United States. The analysis focuses on intersecting performances of race and gender as they inform the dynamics of the contemporary R&B music industry. To that end, the study presents a reading of Knowles’ recently released music video, “Ring the Alarm,” demonstrating how the troubled historical legacy of black female performance remains significant for the conditions of creative production, the marketing and the reception of contemporary artists.

The Influence of Skin Tone on the Perception of Life Opportunities for African Americans

Shatina Williams
*Mentor:* Jared Sexton

The color complex has moved to the background of Black disunity theories in recent years. Much research examines colorism along the lines of nominal categorization of stereotypes; especially as it relates to sexual attraction. Examining the disparities within the color complex has allowed researchers to understand the social, economic, and political complexities of color disparities within the Black race. In recent years, research has moved to account for the psychological and social attitudes based on skin tone. It has attributed the negative aspects of career and social success to darker skinned African Americans while casting fairer skinned African Americans in a challenge of Black racial belongingness. The current literature suggests that the idea of stereotype susceptibility has bound African Americans to accept stereotypes assigned them and opened doors for psychological re-invention based on skin tone. This study measures self-esteem and collective self-esteem among African American students at the University of California, Irvine. It is presumed that fairer skinned African Americans have higher levels of individual self-esteem while simultaneously displaying lower levels of collective self-esteem in comparison to darker skinned African Americans. The current research suggests that psychological factors further contribute to career and social success.

Nitrogen Fertilization and Species Loss Affect Soil Processes and Microbial Enzyme Activity of the Alpine Tundra

Ryan Winkleman
*Mentor:* Katharine Suding

High-elevation ecosystems are predicted to be very vulnerable to atmospheric nitrogen (N) deposition. Although it is clear that rising N levels from pollution can cause species
loss and alter soil processes, it is less clear whether these effects will cause unpredictable non-additive changes to alpine function. To determine what effect increasing N deposition has on plant-soil interactions in the alpine tundra, we manipulated plots at Niwot Ridge, Colorado by removing a dominant species sensitive to increasing N and adding N fertilizer for five years. We assessed how these changes affected soil characteristics and the activity of nine microbial extracellular enzymes. N addition raised soil inorganic N content, lowered pH, and suppressed the activity of certain carbon (C)-degrading enzymes. The loss of a dominant species was associated with an increase in the activity of a phosphorus (P)-degrading enzyme. The responses of tannin-degrading enzymes depended on both N addition and species removal. These results suggest that N deposition will have both direct and indirect effects on soil properties and microbial function. Understanding these interactions is important in determining possible steps that may be taken to save this valuable ecosystem.

The Superfluous Man in 19th Century Russian Literature and 20th Century Existentialistic Embodiment
Pamela Won
Mentor: Lora Mjolsness

Nineteenth century Russian literature often portrays the male protagonist as the superfluous man of the novel. The superfluous man is defined as the Russian archetype who is usually educated, intelligent, handsome, and idealistic, but unable to engage in effective action. He is a bystander, a drifting individual who cannot bring himself to set a foundation for life, but instead pursues innocuous moments of pleasure until boredom becomes a dominating factor. Often called the Byronic, or epic hero, this archetype struggles with both society and inner turmoil. Superfluous men range from being sympathetic characters like Prince Andrei Bolkonsky (War and Peace 1865), lone idealists like Ivan Karamazov (The Brothers Karamazov 1880), or aloof nobles similar to Pechorin (A Hero of Our Time 1839). Supporting the Russian archetype is the philosophy of existentialism studied by Jean Paul Sartre, whose twentieth century theories relate to nineteenth century character and social developments of Russia. My focus is to show commonalities between the two time periods in a way that existentialism unknowingly and subconsciously plays a pivotal role in Russian literature. Sartre’s definition of atheistic existentialism identifies famous Russian literary protagonists based on how the Byronic hero wants to assume Godlike power, in Sartre’s definition, to fulfill impulsive desires. Main characters in three Russian novels will be analyzed as components that have evolved into contemporary existentialism. Dissertations, publications, and novels were used to get to this research’s theories. A hybrid of classic archetypes and modern philosophy also provides a large scope on social changes.

Factoring and Discrete Logarithm Algorithms
Angela Wong
Mentor: Alice Silverberg

There exist public key cryptosystems in which the underlying assumption is based on the hypothesis that factoring in the integers and discrete logarithms in finite cyclic groups are difficult to compute. Examples of such cryptosystems include RSA and El Gamal. This project will take a look at the algorithms that tackle these systems and explore the practicality and complexity of these algorithms. The efficiency of these algorithms determines the difficulty of breaking these cryptosystems. So far, no algorithm that runs in polynomial time exists for either of these problems. This study considers the security of such cryptosystems from a mathematical point of view, specifically focusing on the number theory behind these algorithms. These cryptosystems will remain relatively secure until we can find fast, practical algorithms to break them.

Biosynthesis of Lovastatin: Crystallization and X-Ray Diffraction of a Lovastatin Polyketide Enoyl Reductase
Emily Wong
Mentor: Sheryl Tsai

Statins are widely prescribed as cholesterol-lowering drugs for the treatment and prevention of cardiovascular diseases. Lovastatin is an important member of the statin family and is the first cholesterol-lowering drug approved by the FDA. The structural complexity and chemical lability of lovastatin has prevented its facile synthesis and derivatization using synthetic chemistry alone. In comparison, lovastatin biosynthesis by polyketide synthase (LovPKS) provides a technically simpler and more efficient method of producing the drug. In this study, we examine a crucial element of LovPKS, the proposed medium-chain dehydrogenase and enoyl reductase known as LovC, and report its crystal structure and an assay to test its enzymatic activity. We report the expression, purification and X-ray crystallography of LovC. Our results show that LovC shares highly similar structural characteristics with other medium-chain dehydrogenases, specifically quinone oxidoreductase (QOR), and is the only known enoyl reductase to exist as a monomer. We also developed, for the first time, an in vitro assay by using the compound NCI-636688 as a suitable in vitro substrate, in conjunction with NADPH as a cofactor. In the future, the native structure of LovC may be used as a guide for site-directed mutagenesis and bioengineering of novel, useful lovastatin derivatives.
Cellular Proliferation in Cells Expressing Constitutively-Activated Rab7 Q67L
Susan Wong

Mentor: Aimee Edinger

Growth factors are signaling proteins required for cellular proliferation, growth and survival. When growth factors become limiting, nutrient transporters are endocytosed and sent to the lysosome for degradation, causing cells to starve to death in the presence of abundant nutrients. Studies from the Edinger lab have shown that nutrient transporter degradation requires Rab7, a small GTPase that promotes fusion between late endosomes and the lysosome. Previous research has shown that the inactivation of Rab7 inhibits cell death in the absence of growth factors, suggesting that Rab7 may function as a tumor suppressor protein. I am investigating whether activating Rab7 could be a potential approach to cancer therapy by causing nutrient transporter down-regulation and slowing tumor cell growth. To determine how Rab7 activation affects cells, I measured cell accumulation using the hemocytometer, and cell death by flow cytometry in murine hematopoietic cells expressing constitutively-activated Rab7. Results show that when Rab7 is activated, cell accumulation is greatly reduced. Consistent with this, flow cytometry shows that cells die following Rab7 activation. Furthermore, flow cytometry data show that Transferrin receptor expression declines upon Rab7 activation, supporting the idea that Rab7 activation causes cell death by producing nutrient transporter down-regulation. Whether Rab7 activation sensitizes cells to nutrient restriction is currently being tested. These results suggest that activating Rab7 in tumor cells could be a novel approach to cancer therapy.

Investigation into the Role of the dFollistatin Inhibitor in the Activin and BMP Signaling Pathways
Alison Wu

Mentor: Kavita Arora

The TGF-β, Transforming Growth Factor-B, superfamily of secreted growth factors has been found to be critical for early embryonic and adult development in many species. In Drosophila, these ligands have been implicated in regulation of the cell cycle, immune response, axial patterning, cell fate specification, apoptosis, and morphogenesis. Precise regulation of these pathways occurs through both positive and negative regulation of signaling at the level of ligand and the receptor, as well as through modulation of intracellular pathway components. Understanding the numerous mechanisms by which signaling output is regulated is critical in clarifying the multiple effects of the Activin and BMP signaling pathways in Drosophila. One of the best-characterized negative regulators of Activin signaling is Follistatin, which has been found to interact with BMP ligands as well. We used over-expression assays to determine the functional role and specificity of dFollistatin (dFol). We found that dFol has strict specificity towards Activin ligands, but does not affect BMP signaling in Drosophila.

The Cardinality Principle: A Pivotal Number Concept in Young Children
Gowa Wu

Mentor: Barbara Sarnecka

This study examines the cardinality principle in 25 English monolingual children under the age of 48 months and explores the underlying concepts that give way to their understanding of this principle. Four games were played with each child. The first game tested their counting skills and the last game determined if they were cardinal principle knowers or not. The second and third games tested their knowledge of the successor function of how numbers are related to each other. Performance differences between cardinal principle knowers and non-cardinal principle knowers are of interest to this study. Preliminary findings suggest that, on average, cardinal principle knowers perform better in tasks testing knowledge of number relations than non-cardinal principle knowers.

Grim is Required for the Apoptosis of the Glial Cell in the Microchaete Lineage
Julie Wu

Mentor: Carrie Brachmann

Programmed cell death (PCD) is of critical importance in the shaping and sculpting of developing tissues and healthy maintenance of cells. rpr, hid and grim are three related proteins that are all proapoptotic when ectopically expressed in cells. bid is essential for embryonic development and regulates many instances of PCD in the larval and pupal stage. rpr on the other hand is required for pruning of the developing nervous system. No function for grim has yet been described due to the lack of grim mutants. We generated small deficiencies that delete grim and two neighboring genes of unknown function, termed grim\textsuperscript{sec} and grim\textsuperscript{35A}. Both grim deletions are viable and fertile, indicating that grim is not required for normal development, unlike rpr and bid. However, we have determined that apoptosis of the glial cell in the microchaete lineage is grim-dependent. Suppressor of Hairless (Su(H)) binding sites have been identified upstream of grim, suggesting that grim may be a direct target of Notch signaling. We will present our investigation into this hypothesis.
Love Me, Love Me Not: Academic and Social Consequences of Parental Behavioral Expressions of Love on Chinese and European American Students’ Adjustment to College
Yao Xu
Mentor: Chuansheng Chen

Measures of parenting styles have been developed with European American participants. Consequently, several aspects of Asian-American parenting have not been captured by these assessment tools. Although previous studies have identified unique aspects of Asian or Asian-American parenting such as “training,” empirical evidence is lacking in linking such parenting practices to adolescent outcomes. This study focused on one specific dimension of parenting—parental loving care—to investigate how cross-cultural differences in these specific parental behaviors affect youth outcomes (grades, depressed mood, and problem behaviors). To better capture parents’ expression of their care, we developed a 14-item scale. Exploratory factor analysis with orthogonal rotation revealed three underlying factors. The first factor, Parental Sacrifice, consisted of nine items; the second factor, Concern about Health, of two items; and third factor, Concern about Education, of three items. The results did not show any ethnic differences in the mean level of the three parenting factors. Two of the factors (Parental Sacrifice and Concern for Health) were positively associated with perceived parental warmth for both groups. However, Concern about Education had a significant positive correlation with perceived parental warmth for European Americans, but a significant negative correlation for Asian Americans. In addition, the correlation between Parental Sacrifice and students’ depressive symptoms was significantly negative for Asian Americans, but not significant for European Americans. Contrary to our prediction, parenting care had little association with problem behaviors and school grades.

EDD and DNA Damage Response
Pei-Hsuan Yang
Mentor: Phang-Lang Chen

EDD (E3 isolated by differential display or hHyd) is a HECT-domain E3 ubiquitin ligase that, in previous studies, appears to be amplified and over expressed in several cancers, and mutations of this gene have been linked to breast cancer. Based on the unpublished research from my lab, it is observed that EDD is a component of the BRCA2 (breast cancer susceptibility genes) -RAD51 (eukaryotic orthologue of bacterial RecA) complex. Since both of these proteins are vital for homologous recombination, DNA repair, and the maintenance of genomic stability in several ways, I proposed that EDD might play a crucial part in modulating this complex during DNA damage repair. My hypothesis was tested through using cell clones that contained two distinct constructs: expression EDD shRNA and TetR. By doing this, EDD expression within the cells could be regulated. Several U2-OS cell clones with such inducible knockdown properties were obtained. One of these clones, USE23, has been selected for further characterization. I performed a time course experiment to determine the kinetics of the depletion of the endogenous EDD protein, and found the endogenous EDD protein was nearly completely depleted at Day 4 by Western blot analysis. With this information, the effects of EDD depletion on the DNA damage repair pathway can be tested. I found that EDD depletion leads to deregulation of several proteins, including Rad51 and E2F1, in response to DNA damages. My preliminary results are consistent with the potential involvement of EDD in DNA damage repair pathway.

The Role of the PI3K in B-Cell Somatic Hypermutation and Class-Switch DNA Recombination
Brenden Yee
Mentor: Paolo Casali

PI3K (Phosphoinositide 3-kinase) is a major cell signaling protein capable of phosphorylating the inositol carbon ring of phosphatidylinositol (PtdIns). Diminished PI3K signaling results in immunodeficiency and a lack of proliferation and differentiation of B-cells, but unregulated PI3K signaling results in various malignancies. We investigated the role of PI3K in two major pathways that contribute to antibody diversity of the adaptive humoral immune response: somatic hypermutation (SHM) and class-switch DNA recombination (CSR). Impaired B-cell proliferation and differentiation will have an adverse effect on SHM and CSR. PI3K inhibition was done via deletion of the p85α regulatory subunit in mice. To observe the effects, we examined B-cell and lymphoid tissue samples from wildtype and knockout mice. Techniques included immunofluorescence, ELISA, in vitro class-switch assay, and intronic V(D)J DNA sequencing. PI3K knockout mice show impaired germinal center formation, a weakened immune response to antigens, and reduced CSR, but normal SHM. These findings further our understanding of the role of this central signaling molecule in immunity and disease.

Phylogenetic Utility of a Nuclear Gene (UVRh1) from Nymphalid Butterflies
Emily Yee
Mentor: Adriana Briscoe

A nuclear gene encoding the ultraviolet-sensitive rhodopsin was isolated from several nymphalid butterfly species to assess the utility of this nuclear gene for resolving phylogenetic relationships. To examine this question, the nuclear gene from DNA samples of the nymphalid species were: (1) isolated, (2) sequenced, and (3) analyzed using neighbor joining methods. The resulting phylogenetic trees
were then compared to phylogenetic trees developed from mitochondrial genes. Preliminary results present a comparison of utility between nuclear and mitochondrial genes for establishing phylogenetic relationships.

Chronic Nicotine Exposure Increases Levels of Rack1 Protein in the CA1 Region of the Rat Hippocampus
Ulysses Yee

Mentor: Katumi Sumikawa

Past research has shown that an area of the brain called the hippocampus is strongly connected to learning and memory. Therefore, understanding the cellular mechanisms that occur within the hippocampus is crucial to identifying new drug targets for treating diseases, such as Alzheimer’s, that are associated with memory loss. Within this aspect of cellular mechanisms, it is well known that nicotine can induce activation of nicotinic acetylcholine receptors, but past studies have also shown that activation of these receptors can somehow potentiate NMDA receptor response by indirect stimulation of src signaling. While the exact mechanism of the protein interactions involved are not fully understood, I have studied the presence of an inhibitory scaffolding protein called Rack1, which may be involved in this form of src signaling. I have examined the levels of Rack1 protein in the CA1 region of the hippocampus by performing Western blots on chronic nicotine treated hippocampi. My results show that there is an increase in the levels of Rack1 protein in chronic nicotine treated rats. In addition, I also tested for the levels of Rack1 protein from rats that were withdrawn from chronic nicotine exposure. The results of the withdrawn rats show no significant difference when compared with the control group. Therefore it may be possible that chronic nicotine exposure can increase the levels of the Rack1 protein in the hippocampus, and that the effects are reversible via nicotine withdrawal. Such information might prove useful in identifying the proteins involved in src signaling.

Dangers in the Line of Duty
Albert Yi

Mentor: Richard McCleary

There are many factors involved in police homicides, as they have occurred in situations ranging from dealing with murders to solving neighborhood complaints. Racial tensions have aggravated an increase in police deaths as well. Research in the years before the millennium has shown a slight decrease in police homicides, however, the death toll is high depending on the month of the year and the crime rate. The choice of weapons used by criminals had been mostly firearms because of its quickness and durability in close combats. Criminals who attack police officers had been drug addicts and there had been no difference as to a criminal who may know the officer or may not know the officer. Research has shown that enforcing gun control laws does not increase or decrease police homicides. Canadian crime rates differ from those in the United States, even with equal numbers of guns available to public.

Clinical Neuropsychological Examinations Can Estimate Specific Brain-Structure Volumes to Discriminate MCI from AD: Establishing a Volumetric Algorithm
Danny Younes

Mentors: Steven Potkin & Jessica Turner

In an effort to aid the Alzheimer’s diagnostic arena—arguably limited by the medical insurance (MI) industry—this study aims to help differentiate Mild Cognitive Impairment (MCI) from Alzheimer’s disease (AD) for the establishment of a clinical algorithm. Neuropsychological examinations, the only way to clinically detect dementia, are widely administered to assess cognitive states for MCI and AD with ease and medical insurance authorization. Additionally, despite practical limitations set by MI policies, neuro-imaging has proved to be promising in early detection, as some volumetric studies have focused on the atrophy of the hippocampus and entorhinal cortex (predominantly the first structures of the medial temporal lobe (MTL) affected in the neurodegenerative pathology). We hypothesized that the neuropsychological batteries can estimate the volumes of AD biological markers to create a diagnostic/volumetric algorithm. Magnetic Resonance Imaging (MRI) was used in scanning nine AD subjects and 11 MCI subjects, whose weighted T1 images were subcortically segmented in FreeSurfer to yield volumes of the MTL structures generating a statistically significant differential ratio (p<0.009). Two-stage least squares regression was used to generate a significant algorithm predicting the differential ratio using the MMSE (p<0.05). Significant diagnostic discrimination (for MCI and AD) was found possible using the MI approved neuropsychological examinations to yield the specific brain-structural volumes previously attained only by neuro-imaging (which is bearing difficulty for MI authorization). These preliminary findings promote the efforts to establish an AD diagnostic algorithm for clinical use that can also incorporate the sex-differences in the symptomatic manifestations of AD or other variants.

Role of Nicotinic Receptors in Tranylcypromine-Mediated Enhancement of Nicotine Self-Administration
Yali Yu

Mentor: Frances Leslie

Although tobacco is highly addictive, nicotine—the main psychoactive constituent in tobacco smoke—is a weak reinforcer. This has led our lab and others to hypothesize that other known constituents in tobacco smoke, such as an irreversible, non-selective monoamine oxidase (MAO),
may interact with nicotine to enhance reinforcement. Previous studies in our lab have shown that treating animals with tranlycypromine (TCP), an irreversible, non-selective MAO inhibitor, 1 hr prior to nicotine self-administration can enhance the reinforcing effects of nicotine. However, the mechanism for this phenomenon has yet to be determined; TCP has nonspecific effects other than the inhibition of MAO. To evaluate whether the enhancement of nicotine self-administration after TCP pretreatment is mediated through nicotinic receptor mediated mechanisms, animals were injected with either (+)-TCP (1.5 mg/kg/inj, i.p.) or (±)-TCP (3 mg/kg/inj, i.p.) 1 hr prior to self-administration testing. After achieving a stable baseline of responding (±20% for two consecutive days), animals were injected with a nicotinic receptor antagonist, mecamylamine (1, 3, or 5 mg/kg, s.c.), or saline vehicle, 15 min prior to nicotine self-administration. Different treatments were separated in individual rats by at least 72 hours, within which time stable baseline responding was restored. Mecamylamine significantly inhibited the enhancement of nicotine self-administration after (+) but not (±)-TCP pretreatment. These results suggest that (±)-TCP maintains self-administration responding through a non-nicotinic acetylcholine receptor mediated mechanism. Future studies will be needed to clarify the mechanism underlying this observation, which could help develop a better animal model for the study of tobacco addiction.

Rapid Identification of Mitochondrial DNA Mutations in Patients with Neuromuscular Presentations Suggesting Mitochondrial Respiratory Chain Dysfunction by Using Surveyor Nuclease Strategy
Jacquelyn Yuan
*Mentor: Vincent Procaccio*

Mutations of mitochondrial genome (mtDNA) are responsible for mitochondrial respiratory chain defects in numerous patients. Each cell contains thousands of copies of mtDNA and normal and mutated mtDNAs may coexist within cells, a condition known as heteroplasmy. Recently, we have developed a new strategy for the rapid identification of heteroplastic mtDNA mutations. This method, which is based on the use of a mismatch-specific DNA endonuclease, named Surveyor Nuclease, enables the systematic screening of the entire mitochondrial genome in 48 hours. The technique can detect DNA heteroduplexes formed by the hybridization of PCR products derived from wild-type and mutant mtDNA, mtDNA mutants present at as low as 3% heteroplasmy. We have used this new strategy for screening the entire mtDNA of several patients with neuromuscular features suggesting a mitochondrial respiratory chain dysfunction. In one family, a heteroplastic A to G transition at nucleotide 5793 of the tRNA\[^{\text{Glu}}\] gene was detected in a patient affected with a severe neurological syndrome. By Surveyor Nuclease, this substitution was subsequently found in different cells or tissues from various family members after PCR amplification demonstrating the usefulness of this method. This is a novel mutation never reported before, and requires further investigations and functional studies. In another family, we identified the common 8344A>G mutation in association with a second 4295A>G variant in the tRNA\[^{\text{Leu}}\] gene. This result suggests that a combination of two mutations can be responsible for variable phenotypes and may partly explain the broad clinical spectrum presented by mitochondrial disorders.

**Modeling the Non-Uniform Distribution of Elastic Modulus and Thermal Injury in Laser-Irradiated Porcine Nasal Septal Cartilage**
Allison Zemek
*Mentor: Brian Wong*

It has been theorized that cartilage can be heated with a laser to produce shape-change without cell damage. Contrarily, previous data suggests that the critical temperature resulting in cell death is significantly below the threshold temperature of thermally induced deformation. Therefore, other options were considered for cartilage reshaping such as spatially selective laser irradiation. To evaluate what spatial arrangement of laser spots will produce minimum cell death and maximum shape-change, the mechanical properties of cartilage before heating and after rehydration must be thoroughly and specifically catalogued. Since laser irradiation results in non-uniform thermal injury, the elastic modulus determined for a laser-irradiated sample will only be an average value; individual samples must be tested to specifically evaluate the mechanical properties of non-uniformly damaged cartilage. First, a laser-spot profile was created (temperature vs. radius). Then, individual 15 mm x 15 mm cartilage samples were heated uniformly to similar temperatures with an RF generator. Then, the elastic modulus for each uniformly heated sample was determined, and the data was compiled into an elastic modulus vs. radius graph, simulating the elastic modulus profile of non-uniform heating caused by laser irradiation. The profile information (elastic modulus vs. maximum temperature) compiled in this study can be used to develop a mathematical model to predict the effects of non-uniform thermal damage caused by laser irradiation.

**Asymmetric bis-Boron Compounds as Enantioselective Catalysts**
Carrie Zhao
*Mentor: Kenneth Shea*

Therapeutic compounds for the treatment of disease are becoming increasingly complex as targeted processes (e.g., neural, metabolic) and structures (e.g., receptors) become more selective. Many carbon-based therapeutic com-
pounds, such as Indinivar and Taxol, present especially challenging synthesis requirements because of their multiple chiral centers. We have provided a more efficient method for synthesizing non-racemic compounds through the use of chiral Lewis acids. Previous research has indicated that mono-Lewis acids are effective in the synthesis of enantiopure compounds through the binding to two electron donors. More recently, achiral bis-Lewis acids have shown enhanced activity with carbonyl substrates due to simultaneous binding to both lone pairs. We went further by synthesizing a chiral bis-boron Lewis acid capable of bidentate binding to a carbonyl substrate. We also determined the asymmetric synthetic utility of this class of catalyst in Diels-Alder reactions. We showed that the bis-Lewis acid catalyst produced superior yield over the corresponding mono-acid as well as improved enantioselectivity. Our success in this project provides a new powerful tool for asymmetric organic synthesis with the ability to outperform current mono-Lewis acids.

**WormView, a Visualization Interface for *C. elegans* Gene Expression Data in WormBase**  
Vicky Zhou  
*Mentor: Lincoln Stein*

*Caenorhabditis elegans* is a soil nematode that is one of the most studied model organisms in biology. It is the first multi-cellular organism with a completely sequenced genome. This large bulk of information is available in WormBase (www.wormbase.org), the model organism database for *C. elegans*. WormBase currently contains the expression patterns for about 5,000 genes. These expression patterns were previously displayed as text, which is valuable but difficult to digest. I enhanced the expression pattern display by creating a “coloring book” interface, WormView, to visualize this data. I first drew a transparent base image of the worm and 50% transparent organ overlays. I integrated these overlays with the database by using the anatomy ontology terms for *C. elegans*. I then wrote a Perl script to access the anatomy ontology terms for genes and highlight the corresponding organs in WormView. For genes with multiple expression patterns, I added a disambiguation page that allows the user to compare patterns quickly. The WormView image can also serve as an entry point for a new search by tissue, instead of by gene. WormView enables users to visualize and digest data quickly, compare expression patterns within one gene and across different genes, and search iteratively between genes and tissues. WormView was deployed on the Gene Summary and Expression Pattern pages on the public WormBase site in January 2007.

**Reducing Risk of Bank Failures During the Great Depression**  
Xing Lian Zhu  
*Mentor: Gary Richardson*

This study explores the reasons that banks failed during the Great Depression and provides solutions to minimize such risk in the future. Possible causes of bank failure included the decline in the quality of banking assets, decrease of agricultural incomes, and loss of public confidence in the banking system. Although previous studies have been done on similar topics, the data are not as comprehensive in terms of selection and coverage. To analyze the risk characteristics of commercial banks, I examined the original cross sectional data of all banks in the U.S. from the Rand McNally Banker’s Directories published in 1929. I divided the banks into three categories: (1) banks that did not fail throughout the Depression, (2) banks that were suspended but came back to business during the Depression, and (3) banks that did fail and closed. My analysis employs statistical and economic analysis, including random sampling, regressions, various hypothesis testing and the fit of econometrics/probability models. Research confirms the hypothesis that banks failed due to their poor assets and performance issues such as high debt ratio, low solvency and bad loans. To control for banking risk, such characteristics needed to improve. Another key factor of bank suspension was the contagion of bank panic across agriculturally concentrated states. However, banks that failed during the panic period had a higher probability of reopening, as compared to banks failed in non-panic period.