intravenous injection of mecamylamine (0 or 1 mg/kg/0.1 ml inf) just prior to two 0.1 ml intravenous injections, spaced one minute apart, of nicotine (0 or 0.03 mg/kg/0.1 ml inf) for four days. After four days of pretreatment, the rats were placed inside a self-administration chamber. The cocaine self-administration session (0.5mg/kg/inf) lasted for two hours. The data show that adolescent rats that were pretreated with mecamylamine just prior to the nicotine pretreatment self-administered less cocaine, but still demonstrated enhanced acquisition. This study shows that nAChR antagonism can decrease the nicotine-pretreatment enhancement of cocaine self-administration.

Trimerization of JSRV Envelope Protein Is not Necessary for Transformation

Alex Hamil

Mentor: Hung Fan

Jaagsiekte sheep retrovirus (JSRV) induces ovine pulmonary adenocarcinoma (OPA), a contagious lung cancer in sheep that is localized in lung epithelium Clara cells and type II pneumocytes, and which causes a characteristic overproduction of surfactant in the lungs. Previous studies have shown that the envelope protein (Env) of JSRV uniquely functions as an oncogene, as it is sufficient to induce lung tumor formation in mice and transformation of epithelial and fibroblast cells *in vitro*. Further research has demonstrated that both the Env surface protein (SU) and the cytoplasmic tail of the Env transmembrane protein (TM) are necessary but not sufficient for transformation. The ectodomain of TM is less studied, particularly the effect of Env trimerization on transformation. In this study, we mutated five lysines in the putative trimerization motif in the ectodomain into alanines through site directed mutagenesis. These mutations were found to eliminate cleavage of the Env protein into SU and TM, which is correlated with an abolishment of transformation. This loss of transformation was confirmed by a transformation assay of the trimerization mutant in rat fibroblast 208F cells. However, a co-transfection of the trimerization mutant and ΔGP Y590F, a cytoplasmic tail mutation known to abolish transformation, successfully transformed 208F cells. These results suggest that the transformation-essential intracellular signal involved with Env tyrosine 590 can be relayed without trimerization of Env.

Monitoring Breast Tumor's Responses to Avastin Using a Diffuse Optical Spectroscopy

Ann Hana

Mentor: Albert Cerussi

Avastin is an anti-angiogenesis drug that has been approved by the FDA as the first-line therapy for metastatic colorectal cancer to be used in combination of the chemotherapy for cancer treatment. We used a non-invasive, optical spectroscopy method (LBS) to monitor the tumor pathological changes in response to the Avastin treatment. LBS quantitatively measures the near infra-red (NIR) absorption and scattering spectra of the main NIR chromophores/absorbers (water, lipids and hemoglobin) in breast tissues, which can be used to calculate their concentrations. Variations in these chromophores' concentrations are correlated to the tumor physiological changes. Responders to the Avastin treatment showed a decrease in their tumor's hemoglobin and water concentration, and an increase in their lipids concentration. We also tested the sensitivity of LBS to the tumor pathological changes by comparing the overall patients' responses to all the presurgical treatments with the pathology findings and MRI. Based on our TOI calculation, which has been a useful index for the detection of malignant breast lesions, our classification was more similar to the pathology findings than the MRI.

Improving Carbon Nanotube Transistors Through Needle-Like Contacts

Phillip Haralson

Mentor: Philip Collins

Carbon nanotubes are known to exhibit both semiconducting and metallic properties, depending on the structure of the nanotube. This project focuses on improving the transistor properties of semi-conducting single-walled carbon nanotubes (SWCNTs). Our work is motivated by a recent theoretical physics publication in which an unusual device architecture is able to provide a ten-fold improvement in semi-conducting SWCNT transistor properties. This unusual device architecture involves creating needle-like contacts between the carbon nanotube and the metallic electrodes to increase the effect of the applied gate voltage. These contacts are unique, because they are approximately the same size as the SWCNT itself. Through a unique fabrication technique that we developed, we have been able to build such devices to test this prediction. Using this unusual device architecture, the preliminary results that we have obtained thus far have been confirming the theoretical predictions made by the paper. We hope that the use of this fabrication technique will conclusively confirm the theoretical predictions.

A Design and Method to Remove Excess Glucose in the Small Intestine for Prevention and Treatment of Type 2 Diabetes and Obesity

Joseph Hazani

Mentor: Abraham Lee

A design and method to remove excess glucose in the small intestine for prevention and treatment of Type 2 Diabetes and obesity has been developed. The design is a swallow-able (at meal time), capsule-sized micro device that blocks the absorption of glucose that would elicit an unhealthy rise in insulin level in the bloodstream. By maintaining physiologically healthy insulin levels in the blood-

stream, one will not gain a tolerance to the hormone, thus preventing (or reversing) the occurrence of Type 2 Diabetes. Because insulin levels are also related to obesity, this device also treats obesity.

Removal of Excess Fatty Deposits via a Targeting Microbubble Delivery System

Joseph Hazani

Mentor: Abraham Lee

Since lipomas, which are harmless fat cell tumors, and other excess fat deposits are undesired in today's society, more and more of the population is turning toward cosmetic surgery for their removal. But liposuction, the current standard for removing fat deposits, is expensive and has an unfavorable mortality rate. The proposed improvement over removing excess fat deposits is using albumin microbubbles loaded with a fat dissolving chemical to specifically target excess fat via injection. Once targeted, ultrasound may be used to burst the microbubbles, thereby unleashing the encapsulated chemicals. The chemical to be used, sodium deoxycholate, has been shown in the scientific literature to dissolve fat safely *in vivo*. There has, however, been concern that since these chemicals act in a nonspecific manner, they also have the potential to destroy non-fatty tissue, such as muscle. But fat cell targeting microbubbles directly deliver these chemicals to the fat cells, minimizing any interaction with non-fat cells. This is accomplished by binding the microbubbles to fat cells using the binding properties of fatty acids. Since albumin is a natural carrier of fatty acids to fat tissue, the binding, and thus the targeting, of the microbubbles to the fat is uncomplicated. Future work will include developing targeting and removing of low-density-lipoproteins (LDL) accumulated in cardiovascular tissue.

Age Differences in Preschoolers' Ability to Discern Fantasy and Reality

Brittany Hendricks

Mentor: Jodi Quas

Previous research has found that young children demonstrate difficulties discerning fantasy and reality when the events depict emotional as opposed to neutral content. For example, when viewing images, children show a bias to report that positive fantastic events are real (e.g., happy animals talking), but negative fantastic events are not (e.g., frightening monsters). However, the extent to which this response bias generalizes to other contexts, such as stories in which positive and negative events can occur, is unknown. The purpose of this study was to examine whether children's response bias would persist when presented with positive and negative events simultaneously in a story. More specifically, the study focused on developmental differences between younger and older children's fantasy-reality distinctions. Three- to five-year-olds were told stories that included both positive and negative fantastic and real events and asked whether the events could occur. Older children were expected to correctly report that fantastic events could not occur regardless of the emotional content, whereas the younger children were expected to report that emotional fantasy could occur. These findings have implications for how children's perceptions of information presented to them in storybooks can be used in educational settings.

The Depressive-Like Effect of Nicotine in Tranylcypromine Pretreated Adolescent Male Rats

Jon Heston

Mentor: James Belluzzi

Depressed individuals, especially teenagers, have rates of smoking far higher than the general public, leading some researchers to speculate that these individuals may be using cigarettes as a form of self-medication. Our lab has previously shown that a treatment of nicotine and tranylcypromine (3 mg/kg, i.p.) , a monoamine oxidase inhibitor had antidepressant effects in adolescent but not adult rats that underwent a forced swim test (FST). This effect was not seen with nicotine or TCP alone in either age group. To determine whether the antidepressant effect depended on the level of MAO inhibition we repeated the previous experiment, except with three doses of TCP (0.3, 1.0 or 3.0 mg/kg, i.p.). Levels of MAO activity were assayed subsequent to the FST as a way to correlate behavior to levels of enzyme inhibition. It was found that tranylcypromine dose dependently inhibits MAO-A and B. Additionally, we found that nicotine pretreatment shifted the behavior from swimming to climbing and immobility. Moreover, nicotine did not interact with the MAOI. Thus, our results, contrary to our previous study, show nicotine by itself or in combination with an MAOI to be depressant. The contradictions between this study and our previous study may be due to differences in scoring criteria.

An Exploration of High School Physics Teachers' Pre-Profffessional Preparations

Jarod Hicks

Mentor: Roger McWilliams

This paper examines the preparations that high school physics teachers make before working independently in a classroom. The exploration is based on interviews with six physics teachers in Orange County school districts. The purpose of each interview is to investigate what was and was not beneficial in their experiences during their training to become a high school physics teacher. The experiences include physics and all other classes, community service, employment, and research. The study shows that most of the experiences are beneficial. It also shows many experiences that are useful are not included in academic planning

used in training a high school physics teacher, and that some experiences are not beneficial in this training.

Breaking The Aliiance Structure
Zaki Hmaydani
Mentor: Lina Kreidie

Hezbollah has reached a crossroad with two distinct paths; militant and political. Hezbollah's leadership is well aware of the significance of maintaining its political power; however, before the organization relinquishes its militant wing, it plans to make the most of its arms to provide itself and its allies with a formidable counterweight to achieve domestic and regional interests. In this study, I argue that the United States must put an end to its preference for war and pursue a strictly diplomatic route to secure its interests in the region—particularly when dealing with the Iranian-Syrian-Hezbollah axis. To explore the favorable geopolitical trends, I research related literature, journals, current events and speeches of leaders. Based on this extensive analysis, I present a feasible policy for the United Stated to break up this alliance. My emphasis is that the regional balance of power between the United States and Iran is heavily reliant on leverage that emanates from the use of proxy forces. It is in America's best interest to facilitate the dialogue between its proxy—Israel—and Syria to undercut Iran's link to the military empowerment of Hezbollah. I propose an agreement that would offer the Golan Heights back to Syria, and Shabaa farms back to Lebanon. The agreement must also include a transparent exchange of prisoners between Israel and Hezbollah. In return, Syria's role as a conduit for Iran to reach its most valuable regional asset—Hezbollah—must cease. This agreement would be a significant step toward permanent peace between Syria, Lebanon, and Israel; thus alleviating much of Iran's regional sphere of influence.

Recidivism of Offenders With and Without Mental Illness
Anh Ho
Mentor: Jennifer Skeem

The number of people in the criminal justice system has reached an all time high, and a large proportion of these individuals are placed under community supervision on probation or parole. Two major studies examining the relationship between mental disorder and recidivism have shown that persons with mental illness (PMIs) are more likely to fail under community supervision (e.g., commit a new offense, have probation revoked, or violate the terms of probation. While many reasons have been proposed to explain such trends, two studies alone do not provide sufficient empirical grounds to unequivocally confirm the relationship between mental disorder and recidivism. This study seeks to examine whether previous findings are replicable. To this end, we used an existing database of over 62,000 parolees in California and compared the recidivism for disordered versus non-disordered offenders. Approximately 13% of the sample had a diagnosed mental disorder. Consistent with previous research, we found that those with mental disorders were more likely to fail parole and more likely to have technical violations than their non-disordered counterparts.

The 2.6Å Crystal Structure of hp53R2: A Novel p53-Inducible Ribonucleotide Reductase
Danny Ho
Mentor: Sheryl Tsai

Ribonucleotide reductases (RRs) are a class of enzymes responsible for the *de novo* synthesis of dNTPs for DNA repair and replication. Human RR consists of two homodimers, M1 and M2. A human homolog (~81% sequence identity) to M2, hp53R2, was discovered in 2000. Unlike M2, hp53R2 is induced by UV light and γ-irradiation in a p53-dependent manner. Certain cancers have been shown to overexpress RRs to create a supply of dNTPs for continual cell division. Thus, RR is an important target for cancer research. Currently, hydroxyurea is the chief small molecule inhibitor for M2 in the clinic. Because of its high homology to M2, hp53R2 has also become a target for cancer research. The two enzymes exhibit different susceptibilities to radical scavenging and iron sequestering small molecule inhibitors, such as DFO, *in vitro*. Towards the goal of understanding how such differences can be owed to structural differences, we have solved the hp53R2 x-ray crystal structure to 2.6Å resolution. The structure shows marked differences between hp53R2, M2, and mouse M2, and offers insights into the different inhibition susceptibilities to small molecules exhibited by hp53R2 and M2. In elucidating these differences, we hope to provide information towards the design of hp53R2-specific drug inhibitors.

Mutation in the *Drosophila* Calcium Channel Gene cac/Dmca1A Reduces Sustained Calcium Currents in Cholinergic Projection Neurons
Andy Hoang
Mentor: Diane O'Dowd

Neurons in wildtype neuronal cultures prepared from the brains of late stage *Drosophila* pupae exhibit both sustained and transient calcium currents. These currents are insensitive to classic vertebrate calcium channel blockers, including verapamil, nifedipine, and omega-conotoxin. However, the sustained calcium currents are reduced, but not completely blocked, by the spider toxin PLTX. The PLTX-resistant currents are predominantly transient. In addition, hypomorphic mutations (NT27 and cacs) in the *Drosophila* calcium channel gene, cacophony, also known as Dmca1A, result in a reduction in the density of the sustained PLTX-sensitive current in cultured neurons. This demonstrates

that the cacophony gene encodes PLTX-sensitive calcium channels in the general population of brain neurons in culture. I confirmed that the current remaining in the presence of PLTX and in hypomorphic mutants is mediated by voltage-gated calcium channels, since they are blocked by cobalt, a general blocker of voltage-gated calcium channels. In addition, I recorded Projection Neurons (PNs), identified by GFP-labeling, both in wildtype and in an NT27 mutant background. I found that GFP+ NT27 mutant PNs exhibit ~ 40% reduction in the sustained calcium currents. This demonstrates that PNs, which are cholinergic neurons in the antennal lobe, express PLTX-sensitive calcium channels that are encoded by the cac/Dmca1A gene.

Glial Cell Changes Following the Onset of Spontaneous Seizures in Wild-Type vs. Aquaporin-4-Deficient Mice

Christina Hoang

Mentor: Devin Binder

Aquaporin-4 (AQP4) is member of a family of integral transmembrane proteins that act as water channels in cell membranes, thus increasing membrane permeability to water. Located throughout the central nervous system, AQP4 is expressed in astrocytes predominantly at sites of fluid transport in contact with the cerebrospinal fluid. Astrocyte cell migration is facilitated by AQP4, which in turn significantly affects glial scar formation, a phenomenon that prevents regenerative therapies in the central nervous system. Preceding the migration phase in astrocytes is the activation phase, characterized by ramification of the astrocytic processes and upregulation of the glial protein GFAP. It is unknown whether AQP4 plays a role in the activation of astrocytes in addition to migration. A discovery in this area could have profound implications in diseases such as epilepsy, in which activation of astrocytes is commonly observed in experimental animal models. Therefore, we propose to study the role of AQP4 in the activation of astrocytes with two different seizure models in animals. Systemic intraperitoneal pilocarpine injections and intrahippocampal kainic acid injections have been used to create spontaneously epileptic animals to study the role of AQP4 in the activation of astrocytes. Comparisons of GFAP expression in AQP4 wildtype and knockout animals have been evaluated to study the role of AQP4 in astrocytic activation. GFAP immunization appears to be decreased in the acute phase following seizures. GFAP immunal reactivity is then increased in the days following initial seizures; the period of GFAP upregulation of immune activity coincides with the appearance of sponataneous seizures of the mouse models.

Introduction of Cholesterol to Increase Microbubble Lipid Shell Stability

Kinman Hong

Mentor: Abraham Lee

Microbubbles are important in the field of ultrasound monitoring in patients and have the potential to develop into the next on-site drug delivery system. The challenge remains in developing a stable lipid shell to house these microbubbles over extended periods of at least seven days. Previous techniques use 1,2-distearoyl-sn-glycero-3-phosphocoline (DSPC) and 1,2-distearoyl-sn-glycero-3-phosphoethanolamine-N-[poly(ethylene glycol)2000 (DSPE-PEG2k) with a nitrogen gas core to generate 10 μm microbubbles on poly(dimethylsiloxane) (PDMS) devices. Few studies have explored the possibilities of lipid shell stability, while even fewer use DSPC and DSPE-PEG2k as the main components. The goal is to introduce cholesterol with DSPC and DSPE-PEG2k lipid formation to significantly extend the life of microbubbles. The resulting new microbubbles will be collected and observed under a time lapse environment to record their size over time. It is necessary to determine the correct molar percentage of these three elements, as each configuration will yield a wide range of microbubble stability.

Identifying Genes Affecting TGF-β Mediated Cell-Cell Adhesion

Stephanie Hua

Mentor: Ken Cho

During development, embryonic cells rely on adhesion properties to undergo morphogenesis. The strength of cell-cell adhesion in the cadherin system depends on the amount and types of cadherin expressed on each cell surface. The activin member of the TGF-β superfamily signaling was shown to induce the expression of both FLRT3 (Fibronectin Leucine Rich Transmembrane protein) and Rnd1 (a small GTPase), and regulates the amount of cadherin expression on the cell surface by regulating cadherin endocytosis. Since the mechanism of action remains still largely unknown, in this study, the connection between TGF-β and cadherin systems was further investigated. *Xenopus laevis* embryos were injected with a pool of mRNA synthesized from a collection of 9,000 full-length cDNA clones and injected into *Xenopus* embryos at the 2-cell stage and allowed to develop until mid-blastula stage (stage 8.5). Animal caps were then dissected and cells were allowed to dissociate before being transferred into either fibronectin or E-cadherin-coated chambers. Adhesion of the dissociated cells onto cadherin and fibronectin-coated substrate was determined. We found that cells expressing one of the cDNA fractions displayed reduced adhesion to cadherin-coated substrate. This suggests that the cDNA pool contains a gene presumably encoding for a protein that participates in cadherin-mediated endocytosis. Importantly,

the fraction does not contain either FLRT3 or Rnd1 cDNA; thus, the unidentified clone is likely to represent a novel gene.

Making Various Shapes of Macrocycles Using Fmoc-Abc^{2k}(Boc)-OH as Monomers

Chun-Ching Huang

Mentor: James Nowick

The unnatural amino acid, 4'-amino-[1,1'-biphenyl]-4-carboxylic acid (Abc), had been developed and used as a building block for making macrocycles of various shapes by Nowick's group. It is the ability of Abc to substitute the amine group onto para, ortho, or meta position on the second phenyl ring that made it an ideal monomer for structure design with versatility. The addition of two propyloxyammonim groups (designated as k), by Christ Gothard et al., onto Abc allowed it to be more water-soluble and provided a potential to be used in biological systems. My project is to employ Abc^{2k} as my building block to design macromolecules with defined shapes by using techniques such as Suzuki cross-coupling reaction and peptide synthesis. Currently, I have synthesized triphenylmethanol triacid, which is a molecule with three benzoic acids joined to a central carbon, which could be used as a vertex for building a three-dimensional cage. Using triphenylmethane triamine, a yet to be synthesized molecule, as counterpart and Abc^{2k} as side arms, I was hoping to build a simple three-dimensional spherical cage. Steric hindrance and cavity capacity of the cage will be further studied.

Formula Hybrid Race Car

Karen Hung

Mentor: Michael McCarthy

Hybrid technology is becoming increasingly popular as environmental awareness becomes more important. Automotive companies are gearing towards designing cars that do not depend entirely on gasoline. In this project, a design for a hybrid race car was made and implemented using an existing chassis from a previous student project. The car was student built and uses a 250cc internal combustion engine, two permanent magnet motors, and a 165F ultracapacitor. It was a learning experience in engineering design and manufacturing.

The Abundance of Phages Infecting *Synechococcus spp*. along the Newport Coast

Yazeed Ibrahim

Mentor: Jennifer Martiny

Although cyanophages are highly abundant in marine environments and are known to be major players in the abundance and mortality rates of marine cyanobacteria, little is known about the interactions between marine cyanophages and their bacterial hosts. In addition, little is known about the factors and trends that play into the abundance and diversity of marine cyanophages. In this study, we used the Most Probable Number method to estimate the concentration of marine *Synechococcus* spp. cyanophages in Newport Coast seawater on a monthly basis between October 2007 and March 2008. We found that the abundance of cyanophages infecting *Synechococcus* spp. was dynamic and changed throughout the six-month period. The concentration of the cyanophages infecting the four studied *Synechococcus* spp. hosts ranged from less than 1 phage ml^{-1} infecting host WH 8101 in December to more than 480 phages ml^{-1} infecting host WH 7803 in February. Observing cyanophage concentration changes over time will help to better define the interactions between *Synechococcus* spp. and cyanophages in Southern California's coastal environment.

Is Contextual Fear Memory Supported by Different Brain Networks at Recent and Remote Time Points?

Megan Ikeda

Mentor: John Guzowski

This study examines whether contextual fear memory is supported by different brain networks at recent and remote retention time points by detecting the immediate early gene, Homer 1a, as a marker of neuronal activity. Rats were trained on contextual fear conditioning and tested at 2- and 30-day time points. Activation of Homer 1a in the CA1 of the hippocampus and anterior cingulate region of the prefrontal cortex was detected using fluorescence *in situ* hybridization (FISH). Homer 1a activation in both the hippocampus and prefrontal cortex was significantly higher during task acquisition than retention tests, and there was no difference between retention tests. The latter results suggest alternative views to the standard systems consolidation theory of memory.

Macro- and Micro-Rheology at a Lipid-Actin Interface

Daniel Imbach

Mentor: Michael Dennin

Lipid monolayers are interesting and effective models of cellular membranes and, as such, knowing the physical properties of these membranes is important in the realms of both physics and biology. Langmuir monolayers are simply single molecule thick layers of lipid molecules that have a hydrophobic tail and hydrophilic head, much like the ones that comprise biological cell membranes. This project focuses on discovering the visco-elastic properties of these membranes, both on a bulk level and on a microscopic level. To achieve the measurements for this project a highly specialized instrument was constructed, which allowed for simultaneous measurement on two relevant length scales. On the macroscopic scale our device allowed for the bulk measurement on monolayers via a traditional

Langmuir trough device. For measurements on the microscopic scale an optical trap tool was assembled and integrated into the device. The technique of optical trap rheology consists of focusing a laser at probe particles placed in the monolayer and then measuring their movements due to their thermal energy. As the particle vibrates, the laser creates a force on the particle, which will draw the particle back into the laser focus; by modeling this force as a spring we are able to derive the microscopic scale viscoelastic properties of the monolayer. The construction and use of this tool has allowed us to collect data that previous devices were unable to gather, and the analysis of our results will allow for unique insight into the microscopic details of these monolayers.

Preparation of Nanoporous Ion Current Oscillator

Laura Innes

Mentor: Zuzanna Siwy

Nanopores are of great interest in the scientific community today, due to the fact that biological nanopores embedded in a cell membrane are the basis of many physiological processes in living organisms. Nanopores are also the basis for single-molecule biosensors. The purpose of this study was to observe how the nano scale influenced the movement of ions through a nanopore. Special emphasis was put on the electric interactions of transported ions with the pore walls. Existence of these interactions induces enhances concentrations of ions in a nanopore, which in turn leads to nanoprecipitation of weakly soluble salts. We studied two systems in which nanoprecipitation of cobalt hydrogen phosphate and calcium hydrogen phosphate occurred. We looked at the formation of the individual crystals and of their mixtures. We observed that the formation of the nanoprecipitates induced voltage-dependent ion current oscillations in time, whose characteristics and frequencies depended on the nanoprecipitate chemistry. The ion current oscillations frequency could be tuned between a fraction of Hz to ~10 Hz. We also observed that ion current fluctuations in our synthetic nanopores with a diameter of 2 nm resemble ion current behavior of biological voltage-gated channels.

Development of New *Drosophila* Models of Polyglutamine Disorders to Characterize Common Pathomechanisms

Aditi Iyengar

Mentor: J. Lawrence Marsh

Polyglutamine (polyQ) diseases are inherited neurological disorders that exhibit significant overlapping as well as distinct features. The polyQ length and the severity of the disease are directly proportional in that the greater the polyQ length the more severe the disease. Though previous studies have shown that the molecular basis of these polyQ diseases is a CAG repeat expansion that encodes for a polyQ domain, the common pathogenic mechanism for these polyQ diseases is still unknown. To study the pathology of these diseases, *Drosophila* transgenic stocks of four different polyQ diseases were created using the binary UAS/GAL4 system for transgene expression. The four diseases include denatorubral-pallidoluysian atrophy (DRPLA), Spinocerebellar ataxias SCA2Q117, SCA6Q117 and SCA17Q117 respectively. Characteristics tested included viability, onset of disease, and neurodegeneration. The results showed that the SCA2Q117 and SCA6Q117 models both showed late onset of the disease and decreased viability with increased expression of the transgene. In addition, the results of this study establish a platform with which to compare the effectiveness of disease treatments in two different polyQ disorders that affect proteins in different sub regions of the cell.

Bioinformatics Identifies Cis-Regulatory Elements in Retinoic Acid-Responsive Genes of the Xenopus Embryo

Amanda Janesick

Mentor: Bruce Blumberg

Retinoid receptors are nuclear proteins that respond to signals from lipid-soluble ligands to regulate gene transcription and expression. The precise regulation of retinoic acid (RA) levels is critically important to the temporal and spatial expression of genes involved in vertebrate development. Retinoid-responsive genes can be regulated directly (the immediate early genes) or indirectly (the late response genes) by RA. Deciphering the regulatory networks that connect one gene to another in the retinoic acid receptor (RAR) signaling cascade remains a significant challenge. We address this by examining three distinct groups of retinoid-responsive genes using bioinformatics: genes expressed in pre-placodal ectoderm (a region that possesses the correct signals to become sensory organs), genes belonging to the same synexpression group, and immediate early genes downstream of RARs. We assume that noncoding sequence of these genes hold enough information to provide insight to whether the genes are regulated directly or indirectly by retinoic acid, and what transcription factors interact with them. Unlike previous studies that examine a few kilobases of noncoding sequence, our approach has been to examine the entire gene, comprising 20 kb upstream of the translation initiation site, the coding sequence, and 20 kb downstream of the stop codon. To our knowledge, comparable studies have not been performed in any organism. Identifying regulatory elements in a eukaryotic organism *in silico* is a powerful approach to focus and inform subsequent wet lab techniques (e.g., ChIP-CHIP) that seek to accomplish the same goal. The results of this study will facilitate the elucidation of the gene regulatory networks under the control of RA signaling. Moreover, the combination of bioinformatic and

experimental approaches will allow us to concentrate on conserved promoter elements in the target genes and lead to rapid progress in the defining regulatory hierarchies down stream of RAR.

Neural Adaptation Reveals Viewpoint Independence in the Human STS

Nicole Jardine

Mentor: Emily Grossman

The human superior temporal sulcus (STS) has been implicated in an impressive range of social cognitive processes, from the simple observance of human biological motion to inferring the intent of an actor. The STS is perhaps the human homolog of macaque STPa; this region contains neurons tuned to specific body actions, some of which are capable of recognizing multiple viewpoints of the same action. Our experiments use a rapid event-related functional magnetic resonance adaptation paradigm to probe the viewpoint specificity of biological motion-selective subregions within the STS. Observers viewed pairs of point-light animations depicting the same action viewed twice, the same action mirror-reversed, or two different actions. Across subjects, voxels within the STS exhibited a suppressed (adapted) BOLD response to pairs of the same action repeated twice and pairs of the same action mirror-reversed. This suggests a hierarchical role of viewpoint-invariant clusters of neurons within the STS that likely build the foundations for instances of higher social cognition.

Role of Bone Morphogenetic Proteins (BMPs) in the Dorsal Midline

Aamer Javed

Mentor: Edwin Monuki

Proteins such as Bmps are essential for development of embryonic tissues such as limbs, and skull and neural cells. However, the role of morphogen Bmp is relatively unknown in the development of the forebrain, where it is strongly expressed. It is generally believed that Bmps are secreted from the dorsal midline to direct development of surrounding tissues, such as the cortex. Yet, preliminary studies using a novel Bmp signaling reporter line show that Bmp activity is restricted to the hem. This study attempts to discover why this reported Bmp activity is restricted to the cortical hem. Double antibody staining with cortex marker Lhx2 shows that the Bmp signaling and cortical overlap are refined over time to a clear border, much like what occurs with the hem and cortical overlap. *In situ* hybridization studies will attempt to determine whether restrictions of components of the Bmp signaling pathway are responsible for the Bmp signaling reporter restriction. The results suggest that Bmp activity is restricted to the cortical hem; however, there is no clear evidence which factors cause the suppression.

Investigation of the Biological Roles of Adrm1 Phosphorylation

Nelson Jen

Mentor: Lan Huang

The 26S proteasome consists of a self-compartmentalized 20S protease core that is capped at one or both ends by the 19S regulatory particle, or cap (also known as PA700 in animal cells). The 20S core particle is responsible for various proteolytic activities, whereas the 19S complex is thought to carry out a number of different biochemical functions, including recognition of polyubiquitinated substrates, cleavage of the polyubiquitin chains to recycle ubiquitin, unfolding of substrates, and assisting in opening the gate of the 20S chamber to allow the unfolded substrates entry into the catalytic chamber. However the function of each subunit is not fully understood and the subunits responsible for acquiring the polyubiquitinated substrates still need to be identified. A newly identified subunit of the 19S proteasome complex, ADRM1, has been shown to be responsible in recruiting a principle deubiquitinating enzyme, UCH37, to the proteasome in mammalian cells. It has been reported that the N-terminal portion of ADRM1 is responsible for its interaction with the proteasome while the C-terminus associates with UCH37. The knockdown of ADRM1 by sRNAi did not significantly affect the proteolytic function of the proteasome; however, it causes a loss of UCH37 protein interaction with the proteasome. In addition, a knockdown of UCH37 reduces the ubiquitinating activity of the 26S proteasome. Recently, characterization of human 26S proteasome complex by mass spectrometry revealed multiple phosphorylation sites at various regions of ADRM1. We hypothesize that these modifications may play a role in regulating its function regarding its interaction with proteasome and UCH37. In this study we show that phosphorylation of ADRM1 affects the amount of UCH37s bound to the proteasome.

Action of Low Dose Resveratrol and Cetuximab on Wnt and MAPK Pathways in RKO Colon Cancer Cells

Karanjodh Johal

Mentor: Randall Holcombe

The primary purpose of this study is to determine if cross talk exists between the mitogen activated protein kinase (MAPK) signaling pathway and the Wnt signaling pathway. Both receptor activated signaling pathways are involved in important cancer properties. The MAPK pathway in cancer is a primary target for novel drugs, such as Cetuximab (anti-EGFR). Resveratrol (RSV), a bioflavonoid with many unique properties, has been studied for its anti-cancer or chemopreventative effects, especially in regards to the Wnt signaling pathway within the colon. Anti-EGFR and RSV were used in combination in RKO cells, a hereditary non-polyposis colorectal cell line with no known Wnt pathway

mutation, to confirm cross talk between both pathways. This study used the following methods: image quantification by confocal microscopy, MTT assay to measure cell growth, Western blot and nitrocellulose blot analysis for phosphorylated Erk (p-Erk), and Wnt throughput assay by transfecting RKO cells with firefly luciferase reporter plasmid and measuring by luminometry for Wnt signaling activity. Significance in treatments was found in Wnt throughput assay and MTT assay with increasing RSV concentrations, and trends were seen in p-Erk to Erk activation and Wnt throughput assay with increasing RSV concentrations. Therefore, RKO cells are affected by RSV and anti-EGFR in Wnt and MAPK signaling pathways, confirming cross talk between the two signaling pathways. Further studies will confirm trends found in anti-EGFR in combination with RSV, and determine mechanisms of action for development of lucrative drugs or treatment plans for colorectal tumors.

Comparison of Temperature and Density in an Argon Plasma Created by RF Coil and Tungsten Filament Sources

Cheryl Johnson

Mentor: Roger McWilliams

This topic of research is important in areas of plasma processing, specifically in determining the thickness of a coating applied to a surface placed in the plasma. There are multiple ways to create plasma within a laboratory setting. However, even with identical equipment and experimental layout, a plasma created by two different sources will have different characteristics. Two important characteristics, density and temperature, can be measured by a Langmuir probe. In my research, I used the results of the Langmuir Current-Voltage trace in an argon plasma to compare the density and temperature in plasmas created by an RF Coil source and a tungsten filament source. From density and temperature readings, the velocities of ions and electrons within the plasma can be calculated, and thus the rate at which they may hit a target within the plasma.

The Role of SXR in Breast Cancer Stem Cells

Kameran Johnson

Mentor: Bruce Blumberg

The Steroid and Xenobiotic Receptor, SXR, is a major regulator of drug metabolism found in many tissues in the body. Recently, SXR has been found in the breast, though its role has yet to be determined. Japanese studies have found SXR exclusively in neoplastic breast tissue, seeming to suggest that SXR is a cancer marker or aids in differentiation. However, American studies find SXR in both normal and healthy breast tissue and have determined that activation of the receptor results in apoptosis. Our research seeks to clarify the role of SXR in breast cancer by determining if the discrepancies in existing data can be resolved through breast cancer stem cells. We hypothesize that SXR is present in breast cancer stem cells and that the activation of this receptor will cause the cells to become apoptotic. We strove to isolate a population of cancer stem cells from tumor samples from the UCI Medical Center through the formation of non-adherant mammospheres. RNA was extracted from cells and tested for the presence of SXR through QRT-PCR. If present, cells would be treated with SXR activators and their growth and behavior would be monitored. We have been able to grow up a cell population, believed to be stem cells and isolated RNA, from which we will test for SXR. Eventually, therapeutics may be developed that can target the stem cells of breast tumors for a more effective treatment.

Hydrogen Sensing with a Single Palladium Nanowire

Jeffrey Kagan

Mentor: Reginald Penner

Hydrogen is a difficult gas to handle safely because it diffuses and effuses rapidly, burns with a colorless flame, embrittles metal containers, and has a lower explosion limit in air of just 4%. Existing H2 sensors are too expensive, too insensitive, and too slow. We describe a sensor based on a single palladium nanowire with lateral dimensions below 200 nm and as small as 10 nm. These nanowires detect H2 down to 200 ppm, with a response time of 20 s, while drawing just nW from a circuit. We describe the fabrication and properties of these devices in this presentation.

Mutational Analysis of Actinorhodin Polyketide Ketoreductase

Oliver Kamari-Bidkorpeh

Mentor: Sheryl Tsai

Aromatic polyketides are an important class of natural products with powerful pharmaceutical activities. Understanding and manipulating the mechanisms of polyketide synthesis will aid in the design of novel polyketide products. Type II polyketides are synthesized by a complex consisting of several standalone domains. The ketoreductase domain provides regio- and stereospecificity. Crystal structures of ketoreductase have allowed for the generation of mutants that affect the specificity of the reduction. A three residue motif, ^{94}PGG ^{96}, is responsible for the stereospecificity. Sequence comparison indicates that the motif is conserved in different type II polyketide ketoreductases other than actinorhodin polyketide ketoreductase, and may also be responsible for stereospecificity in modular type I polyketide synthases. Kinetic studies show that a single point mutation of the PGG motif, specifically a P94 mutant, is enough to control the stereospecificity of the reduction reaction. Crystal structures of mutant ketoreductase bound by an inhibitor, emodin, show that the inhibitor is reoriented in the binding cleft in comparison to wild type actKR. Understanding the importance of

key residues in actKR is a step towards the rationally controlled synthesis of novel polyketide products.

Interaction Between Endocannabinoid and GABA Systems in the vlPAG During Electroacupuncture to Modulate Sympathetic Cardiovascular Response

Nathan Kamel
Mentors: John Longhurst & Stephanie Tjen-A-Looi

A long-loop neuronal pathway involving the arcuate nucleus, ventrolateral periaqueductal gray (vlPAG), and rostral ventrolateral medulla (rVLM) is essential to reduce sympathoexcitatory cardiovascular reflex responses with electroacupuncture (EA). The underlying mechanisms in the brainstem during the effects of acupuncture show that alteration of neuronal activity in the rVLM reduces sympathetic tone to decrease blood pressure reflex response or hypertension. Previous studies suggest that activation of endocannabinoid (EC) receptor (CB1) modulates the release of γ-aminobutyric acid (GABA) in the PAG. To investigate this disinhibition during a cardiovascular reflex response and EA, we evaluated the change of the reflex response after CB1 receptor activation. Accordingly, decreased release of GABA would increase activation of neurons in the vlPAG. This increase would in turn decrease the reflex responses. On the other hand, blocking the $GABA_A$ receptor would prevent disinhibition and, in turn, modulation of the reflex responses. To examine further the mechanisms of EA, the study will focus on the vlPAG. We have established a repeatable reflexive model that shows a prolonged reduction of the responses with EA treatment. We therefore hypothesized that during effects of EA, the EC-GABA system in the vlPAG modulates cardiovascular reflexes. This study examined the interaction of EC and GABA during repeated increases in blood pressure with 30 minutes of EA. We have shown that blockade of CB1 receptors reversed the EA-inhibitory effect. In contrast, microinjection of CB1 receptor blockade with prior inactivation of $GABA_A$ receptors did not reverse the EA inhibition. In conclusion, endocannabinoid presynaptically influences GABA in the vlPAG during effects of EA.

Synthetic Studies Towards Polychlorinated Sulfolipids

Jacob Kanady
Mentor: Christopher Vanderwal

Halogenated compounds of marine origin are of great interest to synthetic chemists due to their structural complexity and biological activity. Of interest to the project are the polychlorinated sulfolipids found in Adriatic Sea mussels and freshwater micro-algae, where they accounted for half of the total lipid mass. These complex lipids have linear arrays of chlorine-bearing stereocenters that not only make them challenging synthetic targets, but also induce interesting conformational biases that lead to unknown biological function. Herein, model studies for possible synthetic pathways were continued. In preliminary studies, acyl protected *Z*-allylic alcohols were shown to give good diastereoselectivity upon dichlorination, but also gave acyl migration side products. Therefore, I first tested electron poor aroyl groups in hopes that they would reduce migration; however, they gave similar ratios of side products. Next, the three-step process of alcohol functionalization, dichlorination, and defunctionalization to give the dichloride-hydroxy stereotriad was optimized from <40% overall yield up to 56%. Although better, one future goal is to further increase the efficiency. Finally, a route to a trichloride stereotriad was discovered through the first-ever synthesis of geometrically pure α-substituted *Z*-allylic chlorides utilizing the Wittig reaction. H^1 NMR coupling constants were used to characterize the relative stereochemical relationships, and a conformational analysis was performed, showing a single that the relative stereochemistry of the trichlorides dictates their conformations on the basis of preferred *gauche* orientation of the chlorides, while minimizing *syn*-pentane interactions.

Effects of Videogame Expertise on Spatial Attention Networks

Albert Kang
Mentor: Ramesh Srinivasan

This study seeks to investigate the effects of two types of prior videogame exposure on performance and neural structures specific to spatial attention. Gamers with experience in First-Person Shooters (FPS) were compared to Role-Playing Gamers (RPG) on target detection tasks that required rapid responses to situations involving different attentional demands. This was achieved by presenting a test stimulus using a range of steady-state visually evoked potentials (SSVEPs) via three frequency-tagged conditions (3 Hz, 8.5 Hz and 20 Hz) and three spatial conditions (sf1, sf2, and sf4), which correspond to increases in the number of discrete regions attended, while holding the total attended area constant. The FPS gamers performed better in every spatial condition, which supports the notion that fast-action videogame playing enhances spatial abilities. As the task became temporally difficult, the FPS gamers seemed to be affected to a lesser extent. The results provide additional evidence that fast-action videogame playing is associated with enhancements to spatial attention networks. Neurophysiological evidence, by the use of encephalography, has been examined to note some of these differences in attention networks between the two groups with unique virtual experience.

A Socio-Economic Case Study of Tourism, Fisheries, and Environmental Issues in the Turks and Caicos Islands: South Caicos & Providenciales

Samantha Kao

Mentor: Michael Burton

A little-known British territory, the Turks and Caicos Islands (TCI) has recently begun to gain popularity as a vacation spot in the Caribbean, although this developing area has yet to reach the full-blown tourist development seen in areas such as the British Virgin Islands and Jamaica. The TCI also have a reputation for their export of conch and lobster, whose fisheries contribute extensive towards the TCI economy. The juxtaposition of their potentially viable but overstressed fishery industry and the financial appeals of a tourist economy pose an interesting situation in light of the environmental damage caused by both. On two separate occasions, I conducted ethnographic interviews and recorded daily observations to mark the pace of life and developments on South Caicos. South Caicos is currently the main area for tourist expansion in the TCI, whereas Providenciales has been a larger tourist attraction for the past few years. The environmental damage caused by fishing and the implications of tourism are tightly knit in that they both involve issues of over-consumption and damage to marine ecosystems. It is vital to examine these issues before they fully establish themselves as characteristics of the TCI, because they characterize environmental degradation across the world. There are also social issues of immigration and culture dilution within the TCI, and all of these issues represent the trade-offs of influence from developed nations. The Turks and Caicos Islands provide a stimulating and little-examined aspect of a developing territory's efforts in becoming an economically competitive and environmentally conscientious entity.

Nomatic*IM

Samuel Kaufman

Mentor: Donald J. Patterson

The research community has succeeded broadly in developing technology that can reason about coordinate or relational position. But new, higher-order systems need to reason about colloquial place, not position. We intend to solve this problem—the position-to-place problem—by gathering a broad array of position-to-place mappings from the users of a desktop software system called *Nomatic*IM*. The system uses machine learning techniques and aggregate data from said mappings to support a user in negotiating context with his or her instant messenger contacts.

The Role of Non-State Actors in U.S.-Iranian Relations

Katharine Keith

Mentors: Lina Kreidie & Caesar Sereseres

Do Iranian-Americans feel that there is a need to normalize relations between the United States and the current Iranian regime? Many believe that track-one diplomacy has failed. The number of grassroots organizations that are working toward normalizing the relations between the two countries is increasing. Based on this phenomenon, I measured the effectiveness of these organizations. This study attempted to analyze the level of recognition among Iranian Americans of a problem. Do they feel responsibility for the political situation in their home country of Iran? Do they plan to return? To explore the role of Iranian expatriates in normalization, I based my analysis on current literature, case studies, biographies, journal articles and in-depth interviews with Iranian expatriates. The objective of this study is to support the theory that track-two diplomacy can build a more solid foundation for the long-term success of track-one diplomacy. The findings of this study suggest that although some leaders of Iranian-American organizations believe the majority of the community is not interested in participation in such initiatives, they are in a strategic and obligatory position to participate in a bottom-up, grassroots movement that could establish a publicly legitimate democracy in Iran and normalize relations between their home country and the United States. This would be beneficial to both countries.

Sex and Age Differences in Dopamine-Mediated Behaviors

Anna Khalaj

Mentor: Frances Leslie

Adolescence is a time of increased risk-taking and novelty-seeking behaviors that are accompanied by maturation of motivational circuitry in the brain, particularly that of the nigrostriatal and mesocorticolimbic dopamine systems. Previous studies reveal that there are sex differences in the extent of reorganization of these systems, which may underlie gender differences in dopamine-mediated disorders seen in adolescence (e.g. ADHD). Previous studies in our lab on males have shown that adolescents and adults exhibit differing behavioral sensitivity to direct dopamine receptor agonists. This study aims to examine age and sex differences in dopamine-mediated behaviors by measuring agonist-induced locomotion and stereotypy in females, and to determine whether hormonal status is correlated with behavioral outcomes. Adolescent (P32) and adult (P90) female rats were handled daily for five days prior to the experiment. On test day, each rat was placed in a locomotor box for an acclimation period of 30 minutes, and then received an i.p. injection of saline or one dose of one of three dopamine receptor agonists: SKF 83959 (D1 ago-

nist), SKF 83822 (D1 agonist), and quinpirole (D2/D3 agonist). Following injection, locomotor and stereotypic behavior was assessed for 30 minutes. After this scoring period, trunk blood was collected and plasma was isolated to determine concentrations of estradiol using radioimmunoassay. Our data shows that females exhibit age differences in dopamine-mediated behaviors and that sex differences in these behaviors exist even prior to puberty. Our study is ongoing to examine the effects of hormonal status on these behaviors.

The Role of Health Education and Hardiness in Perceived Wellness

Rozan Khalil
Mentor: Salvatore Maddi

This study investigates the effectiveness of an undergraduate health psychology course in increasing students' awareness of their healthful habits. Relying on pre and post test measures of perceived wellness, and Hardiness, the focus is on changes in wellness from the beginning to the end of the course. This article establishes a statistically significant relationship between perceived wellness and Hardiness. Next, the article analyzes the effect of health education on perceived wellness. Participants were 70 undergraduate students from the Health Psychology course (P103) offered during winter quarter of 2008 at University of California, Irvine, who completed validated measures of hardiness, perceived wellness and other demographical variables on a volunteer basis. Correlational analyses showed that there is a moderately significant correlation between perceived wellness and Hardiness. Additionally, students demonstrated a change in their level of perceived wellness after completing the course. The conceptual and practical implications of these findings are discussed.

HAPPY

Ramni Khattar
Mentors: Shaista Malik & Jagat Narula

We investigated whether any subclinical atherosclerosis was present in patients with at least intermediate risk factors for heart disease. We performed this investigation using a noninvasive technology, the multidetector computed tomographic angiogram (MDCTA). Among 25 participants with at least intermediate level of risk factors, we found that 48% had at least mild coronary plaque. The presence of plaque was higher in men than women (p=.03) and in smokers (p=.03). One participant ended up needing revascularization. We did not find any relationship with other risk factors such as hypertension and high cholesterol with presence of plaque. In conclusion, the presence of coronary plaque is present in approximately half of the individuals with at least intermediate risk factors. Whether detecting the presence of subclinical disease early makes a difference in terms of cardiovascular outcomes needs to be further investigated.

The Ephemeral Visual

Eunice Kim
Mentor: Shelby Roberts

Although Picasso was the first to use a common photography trick to draw with light and elevate it to art, I attempt to expand upon those techniques to develop images that capture motion in a way that only photography can. Combining photography and break dancers with LED lights attached to dancers' arms and legs has often unexpected, yet interesting results. The concept behind attaching the lights to the dancers and taking photographs while they dance is that, as the dancers literally create light drawings through their movements, the figures of the dancers disappear, leaving a sculptural trace of their movements. As their movements exist in three dimensions, so do their sculptural traces, which also double as light sculptures that only exist in photographs. This project has expanded to include taiko drummers, with performances including both visual and audio elements. Although this photography trick is not unique, this project aims to work with performers in the attempt to create innovative images with light.

Differential Temperature Susceptibility and Survival of *Borrelia burgdorferi* and *Borrelia hermsii*

Juliet Kim
Mentor: Alan Barbour

The intent of this study was to determine whether the relapsing fever agent *Borrelia hermsii* is more susceptible to hot and cold temperatures than the Lyme disease agent *Borrelia burgdorferi*. Differences in temperature susceptibilities of these bacterial species could help identify potential hosts and genetic differences that may help one species survive at more extreme temperatures. *B. hermsii* and *B. burgdorferi* cell cultures were incubated at various temperatures to find the temperature at which the cells are killed. Survival was determined by ten-fold serial dilutions in 96-well plates where growth was indicated by a change media color from red to yellow. The 96-well plates were also analyzed by a spectrophotometer that measured the absorbance (A) at 562- and 630-nanometer wavelengths. An absorbance ratio (A_{562nm}/A_{630nm}) of less than 3.0 correlated with a positive-growth well, while a ratio of greater than 3.0 correlated with a negative-growth well. On average, the Lyme disease bacterium had a higher survival at the higher temperatures than the relapsing fever agent, with a mean survival (95% confidence interval) of 1.62 (0.06– 43.6) $X10^{-4}$ vs. 3.16 (1.02- 9.77) $X10^{-4}$ at 50 °C and 38.3 (1.18-1250) $X10^{-6}$ vs. 1.96 (23.5- 16.3) $X10^{-6}$ at 51 °C. At the lower temperatures *B. hermsii* had a lower survival than *B. burgdorferi* with mean survivals of 5.1 (3.5- 7.5) X10-1 vs.

11.0 (6.7-18) X10-1 at 4 °C; and 3.5 (0.9 –13) $X10^{-3}$ vs. 460(200- 1100) $X10^{-3}$ at 0 °C.

Cell-Free Expression of Mouse and Bovine γS-crystallin

Yeo-Joo Kim

Mentor: Rachel Martin

It is estimated that the eyesight of 50% of the world population is diminished due to cataracts by age 65. Cataracts are formed when proteins aggregate in the lens of the eye, and studies indicate γS-crystallin to be the major component of cataracts. *Escherichia coli* is commonly used to express proteins, but it lacks versatility with regard to expressible proteins, time-consuming culture growth, the inability to individually label amino acids, and various costs associated with living systems. The goal of our project is to set up a more versatile, faster, and cheaper cell-free expression system based on the system developed by Dr. Knapp, Dr. Swartz, and Dr. Goerke of Stanford University. Cell-free protein synthesis uses microorganism extract with added vitamins, minerals, nucleoside triphosphates (NTPs), energy source, and, sometimes, polymerase. The extract will be created from KGK10 cells, using the outline from the paper by Dr. Swarts in *Fermentation Biotechnology*. So far we have been successful in expressing mouse and bovine γS-crystallin using the traditional method (using *E. coli*) as part of an ongoing project. The details of *E. coli* expression will be presented, as well as progress toward the cell-free expression of mouse and bovine γS-crystallin.

Afro-Pessimism and Black Masculinity in Film: Representations of Black Men in Cinema from 1967–2005

Danielle Kirkwood

Mentor: Frank Wilderson

This project explores the political and ideological work achieved through the various representations of black men in film during the dwindling years of civil rights and beyond. These representations of black masculinity are examined through the lens of the newly emerging "Afro-Pessimist" theory, which takes a radical stance on the position of the black in relation to the paradigm of civil society. To formulate a comprehensive analysis of how film labors politically and ideologically through narrative and cinematic strategies, it was necessary to examine and analyze various films. The films that were used in this study include, Dutchman, Guess Who's Coming to Dinner, Killer of Sheep, The Story of a Three-Day Pass, and Training Day. As a result of this study, the relationship between Afro-Pessimist theory and black cinema has becoming increasingly clear. Through the use of narrative and cinematic strategies, these films (whether they intend to or not) serve to avow those theories of afro-pessimism that analyze the position of the black man as a non-human entity that is created through structural violence and, further, acknowledge the necessity of black exclusion to maintain the paradigm of civil society.

Detector Characterization and Detective Quantum Efficiency (DQE) Measurement of a Cadmium Zinc Telluride (CZT) X-Ray Detector for Medical X-Ray Imaging Applications

Michael Klopfer

Mentor: Sabee Molloi

Current clinical state-of-the-art digital radiography detectors rely on an indirect detection scheme where a scintillation screen made of Cesium Iodide (CsI) is bombarded by X-rays during exposure, producing visible light that is then measured and recorded by a thin film transistor (TFT) array. The output of an individual pixel from this type of detector represents the total energy incident on that pixel during the sampling time—all information about the individual energy of the photons striking the detector is lost. In contrast, solid state CZT crystal detectors are able to count individual X-ray photons striking the crystal surface as well as discriminate the per photon energy. The benefits of this type of detector are seen in reduced patient dose and the ability to perform dual energy X-ray imaging for preventative screening of coronary and breast calcium without multiple exposures. To date the use of this type of detector has been limited to defense applications. We have evaluated detection efficiency and the quality of image produced for dual energy medical applications. In our experiment we used two types of detectors, a Novarad, Inc. XENA and an eV Products demo CZT array. The QDE was measured as comparable to current CsI detectors. The dual-energy image produced from a single exposure clearly demonstrated that dual energy imaging is possible with CZT detectors. The worth of this type of detector for medical applications is clearly shown; further development in detector fabrication is necessary to reduce the cost of CZT detectors.

Comparison of Understanding of Reversed Speech in Different Listening Conditions

Michael Klopfer

Mentor: Fan-Gang Zeng

Speech is an extremely important medium of information transfer. The human brain devotes large cortical areas to speech understanding. Saberi and Perrott have shown in "Cognitive restoration of reversed speech," that the human brain has the ability to make sense of English sentences with sections that have been reversed. A strong negative correlation is made between length of sentence reversal period and sentence content understanding. This experiment seeks to further quantify the effect of noise in the brain's effort to decode degraded speech. Reversed sentences are played with or without the addition of speech

shaped noise (SSN) in various signal to noise ratios. The user is prompted to type back what is heard. Sentences are scored for correctness based on the number of correctly copied words as compared to total sentence words. The combination of noise and signal degradation from the reversal process severely impacts the overall understanding of the speech. The same effect is seen when background noise makes communication difficult in a noisy crowd. In silent conditions, a negative sigmoidal curve describes the percentage of correctly copied words versus increased reversal window. In mixed noise conditions, the same sigmoidal curve is generated, except with a steeper slope as compared to silent conditions. A strong link between difficulty in understanding and added noise to an already degraded signal is clearly demonstrated.

The Vagina Monologues
Jacob Knobel
Mentor: Don Hill

In its sixth year at UC Irvine and in its tenth anniversary worldwide, "The Vagina Monologues" has grown to have a strong, powerful impact on its audiences and its beneficiaries. The goals of V-Day UCI are to raise awareness and raise money, and this year we accomplished both goals. Statistics do not tell the whole story when it comes to violence against women in this country, particularly on college campuses. Through our performances, more than 1,000 UCI community members were exposed to these issues. Through responses to audience reaction surveys, we know that a large percentage of our audience was residents and we greatly exceeded our goals this year to involve on-campus housing communities. This is important in getting our message out to students in their first year so they are aware of issues facing women and can continue to help prevent them. Through the work that V-Day does at UC Irvine and at colleges throughout the country, millions of dollars have been distributed to local organizations working to end violence against women. Our show this year is proud to have donated over $7,500 to C.A.R.E on campus, doing our part to help end violence against women on the UCI Campus.

Declaration of Dependence: An Interdisciplinary Investigation into the American Banking Crises of the Great Depression
Alejandro Komai
Mentors: Joanne Christopherson, Caryl Margulies & Gary Richardson

It is common, in the literature on banking failures, for researchers to assume independence between banks in order to make use of powerful econometric tools of analysis. This paper investigates two ways this assumption is flawed: the banking correspondent network and spatial correlation. Drawing from graph theory to help understand the impact of the correspondent network, this paper bridges the literature of mathematics with banking history. Exploring the potential of new Geographic Information Systems (GIS) software, such as ArcGIS, provides the capacity to investigate the first law of geography: things are more similar the closer they are to each other geographically. Graph theory suggests that the correspondent network could have improved its robustness by increasing the minimum number of correspondents each bank was required to have. The fruit of these investigations affirms the potential of further investigation into the question of bank dependence, justifies further research into the applications of graph theory and GIS software, and calls into question results from econometric analyses that assume independence.

Social Support and Cognitive Appraisals
Nory Kotrasa
Mentor: Sally Dickerson

Previous research suggests social support can influence psychological appraisals and physiological reactivity. Many laboratory studies have found that high social support is related to lower cardiovascular reactivity. However, the link between different types of social support and stress appraisals has not been examined in great detail. This analysis explores the relationship between emotional, informational, and instrumental support and appraisals of a socially-evaluative speech task. Participants answered the Positive and Negative Social Exchanges (PANSE) questionnaire and participated in a speech task in front of an evaluative audience. Psychological stress appraisals were taken before and after the speech task. We hypothesized that emotional support is related to pre- and post-task appraisals, whereas informational and instrumental support would not be related to these task appraisals. Bivariate correlations were calculated between the different types of support and pre- and post-task appraisals and, contrary to our hypotheses, both informational and instrumental support were significantly associated with negative post-task appraisals, whereas emotional support was not related to pre- or post-task appraisals. These findings have implications for the nature of specific types of social support.

Interaction of the Mixed Lineage Leukemia 4 Protein with the JNK MAP Kinase
Pascal Krotee
Mentors: Lee Bardwell & Jeffrey Rogers

Mitogen activated protein kinase (MAPK) pathways are highly conserved in eukaryotes and regulate the facilitation of many biological functions. These qualities have made the pathways a promising potential target in drug therapies for many diseases. The JNK pathway, a member of the MAPK family, likely controls its interactions with its substrates via docking sites. These docking sites (D-sites) follow a highly conserved motif. A pattern matching

algorithm called Dfinder was created to scan the human proteome for proteins that possessed potential D-site motifs that interacted with JNK. Mixed Lineage Leukemia 4 (MLL4) was found to be highly ranked by this program. MLL4 was first discovered through its role in leukemias, and current research suggests that fetal mice with an MLL knockout have impaired hematopoietic activity. If MLL4 binds JNK via its predicted D-site, then MLL4 may be a JNK substrate. These interactions were tested with *in vitro* binding assays of a wild type and D-site mutant form of 35[S]-Methionine-labeled MLL4 protein with fusion proteins of GST, GST-JNK1, and GST-JNK2. The D-site mutant form of MLL4 possessed Alanine point mutations on the critical residues of the D-site. Wild type MLL4 was found to have significantly greater affinity for JNK1 and JNK2 than the D-site mutant form of MLL4 with the same proteins. These findings suggest that the critical residues within the D-site of MLL4 mediate its binding to JNK. This further explains the mechanisms through which MLL4 functions, which may also lead to a new drug target for certain leukemias.

Patterning Gold Nanowires on Flexible Substrate
Travis Kruse
Mentor: Reginald Penner

Lithographically Patterned Nanowire Electrodeposition is the fabrication of nanowires through the electrodeposition of metals into a trench fabricated using photolithography and chemical etching. The height and width of these wires can be independently controlled using LPNE, with which we are able synthesize nanowires on a flexible substrate of Kapton™ (primarily used in manufacturing flexible circuits). We characterized the electrical properties of the nanowires while being flexed. When the Kapton™ substrate is flexed, it causes the nanowires on the substrate to flex as well, reversibly altering the electrical resistance of the wires. As the substrate returns to its relaxed form, the wires also assume their initial electrical resistance. If the contortion of the substrate is too great, the wires lose electrical continuity, but as the substrate is returned to its unperturbed form, the wires are once again electrically continuous. Mechanical sensors could be constructed for use as stress meters on a microscopic scale by taking advantage of this effect. These nanowires have been thoroughly characterized by SEM, TEM, AFM, and XRD.

The Effects of Ephrin-B2 on Synaptic Connections and Myelin Development in the Auditory Brainstem
Shan Kuang
Mentor: Karina Cramer

In the development of the central nervous system, many signaling molecules play a critical role in establishing proper pathways. The Eph protein family of signaling molecules has been found to guide the proper development of networks. Previous studies have shown that molecules such as the EphA4 receptor play a role in axon targeting in the auditory brainstem, and that a mutation in the gene for the ligand ephrin-B2 alters auditory brain response by increasing the response threshold and decreasing the response latency. We examined the role of ephrin-B2 in establishing synaptic connections and myelin formation in the auditory brainstem because these two features affect neuronal transmission, which can alter brain response. The experiment examined synapsin I and MBP in *ephrin-B2* wild-type and mutant mice. Results show that the *ephrin-B2* mutant mice exhibited synapsin I expression in the medial nucleus of the trapezoid body and cochlear nucleus similar to those of *ephrin-B2* wild-type mice, but that they had altered MBP expression in the cochlear nucleus. This suggests that ephrin-B2 plays a role in the development of myelin but not of synapses in the auditory system. As such, the observed decrease in response latency with ephrin-B2 mutant mice may be explained by the role of ephrin-B2 in regulating the interaction of myelin with axons.

Choreography and Beyond: 7th Nexus
Sharon Kung
Mentor: Molly Lynch

At the 2007 American Dance Festival, held at Duke University, choreography and performance were explored by dance students from around the world. For six weeks, different choreographic approaches were analyzed and investigated in a creative process. The video presented here is a documentary of my Physical Graffiti piece, "7th Nexus," which I chose to document because of the creative complexity it offers. The goal was to counter-balance classical music against contemporary movement without destroying the classicism, grace and originality that each aspect provides. The music is "Palladio," by Karl Jenkins, inspired by sixteenth-century Italian architect Andrea Palladio, who influenced the development of Western Architecture. Andrea's motifs of arches, proportions, spatial relationships and inter-columnations are some of the themes incorporated into the choreography. In choreographic terms, this translates into the use of negative space, precision, bound-free movements and formations. The choreography also plays with timing, through which syncopation and anticipation are also incorporated. Aside from the choreographic perspective of completing a piece, lighting design is also a key element in making this project a success. An industrial look is constructed by having no side lights and only lights hanging from the top. Themes of geometric shapes and crisscrossed lines are also projected onto the stage through gobo-templates.

In-Depth Study of Neural Stem Cell Apoptosis and Chemotaxis in a Microfluidic BMP4 Gradient

Eric Kuo
Mentors: Noo Li Jeon & Edwin Monuki

Morphogen gradients are fundamental to animal development, and morphogen defects are the primary causes of human brain malformations. Nonetheless, tremendous controversy remains about the mechanisms by which morphogen gradients act on the developing brain. To date, studies on this issue have relied on traditional cell culture tools, which are inefficient and biologically limited, as models of natural gradients. In this study, a microfluidic culture device has been engineered and optimized to address these limitations. The device is used to simulate an *in vivo* environment by generating several diverse, stable, and continuous gradient profiles onto cultured cells in which their behaviors can be captured by time-lapse microscopy. The specific morphogen protein used in this study is BMP4. Our finding indicates exposure to high BMP4 concentration induces cell death and suppresses cell proliferation. Similar results are observed when there is a sharp increase in the slope of the gradient across the microfluidic chamber. However, this effect might be caused by the chemo-attractive property of BMP4, which has never been reported in literature. We have generated a real-time optical assay on cell death and on proliferation in a morphogen gradient that has revealed novel insights on the slope of the gradient and new roles of BMP4 in the developing cerebral cortex.

Presence of Native Perennial Grass Decreases Invasive Success of an Annual Exotic Grass

Marlyse Labordo
Mentor: Katharine Suding

Theory predicts that invasive success of an exotic species is affected by the genetic diversity of the exotic population and the species composition of the community it invades. We tested how exotic population genetic diversity, community species diversity, and functional similarity of resident communities affect invasion success of annual exotic grass *Avena barbata*. We tested whether: increased exotic genetic diversity caused increased invasion success, diverse communities better resisted exotic invasion, and resident communities functionally similar to the exotic resisted invasion. In a fully-factorial greenhouse experiment we established resident communities that varied in species diversity (1, 2, or 3 species) and functional group (exotic annual grass *Lolium multiflorum,* perennial native grass *Nasella pulchra,* and native forb *Amsinckia menziesii)*, and invaded them with *Avena* that varied in genetic diversity (1, 5, or 10 genotypes). We measured invasion success using dry weight above ground biomass of *Avena*. Our results indicate that invasive success was decreased by: increasing genetic diversity (*Avena* biomass decreased relative to genetic diversity ($p=0.001$)) and the presence of a functionally different grass, *Nasella*. Surprisingly, we found no support for our hypotheses. This may be a result of measuring invasive success according to peak biomass instead of seed set, which may be a better indicator of success. Additionally, *Nasella* species were planted as small plants while all other species were planted as seed to simulate natural community patterns. The increased size of *Nasella* may have significantly decreased the establishment of *Avena* despite functional dissimilarity or genetic diversity.

Moderators in the Relationship Between the Socioeconomic Status and Health Behaviors of Individuals in Early Adulthood

Cynthia LaCoe
Mentor: JoAnn Prause

Weight and overall health are critically impacted by health behaviors (e.g., diet, exercise), and socioeconomic status (SES) has been shown to influence health behaviors. Using 800 participants (ages 22–32 years) from the NHANES 2003–2004, we examined the association between SES (income, educational attainment) and health behaviors (moderate, vigorous, and sedentary activities; consumption of fruits, vegetables, whole grains, white bread, healthy types of milk, soft drinks, and fats), and the role that ethnicity and gender play in moderating the effect of SES on health behaviors. Controlling for study variables, income was positively associated with time spent in moderate-intensity activities and negatively associated with time in sedentary activities. Relative to a high school education (HSE), less than an HSE was associated with less moderate activity and higher consumption of fruits and vegetables. More than an HSE was associated with less moderate activity, more time in sedentary activities, consumption of less white bread and more vegetables, whole wheats, and lower/non-fat milks. Males engaged in significantly more vigorous and strengthening activities, but also consumed more white bread and soft drinks relative to females. Relative to non-Hispanic Whites, Mexican Americans spent less time in moderate activities and consumed significantly more fruits and less fat. SES indicators (education and income) differentially impacted health behaviors, and both gender and ethnicity moderated the relationships. These findings suggest that it is important for health professionals to have a solid understanding of their target audience and tailor health promotion strategies accordingly.

The Sensitivity of Focused Assessment of Sonography for Trauma (FAST) in Detecting Clinically Significant Injury in Pediatric Patients with Blunt Abdominal Trauma

Andrew Laguna

Mentors: John Christian Fox & Shahram Lotfipour

Focused Assessment of Sonography for Trauma (FAST) is an imaging tool used by emergency physicians to diagnose injuries resulting from blunt abdominal trauma (BAT). We predicted that the sensitivity of FAST is equivalent to computed tomography (CT) in detecting clinically significant injury resulting from blunt abdominal trauma in pediatric patients. Clinical significance was measured by the amount of free fluid and degree of organ injury shown by CT and the surgical course of action taken by emergency physicians. In this prospective study we examined a total of 432 patients over an approximate four-year period, from which 75 patients were excluded, mainly due to no confirmatory CT or surgical course. Three hundred fifty-seven patients were analyzed. Our results showed that FAST was 54% sensitive for pediatric patients with clinically significant BAT injuries, demonstrating that for diagnostic purposes this modality should always be used in conjunction with a confirmatory procedure.

Synergistic Effects of Haptotactic and Chemotactic Attractants on Osteoprogenitor Cell Invasion

David Lai

Mentor: Andrew Putnam

Over the past two decades, tissue engineering has emerged as a viable therapeutic modality to regenerate bone that needs to be replaced as a result of trauma, injury and/or congenital defects. Bone morphogenetic proteins (BMPs) are a family of potent growth factors, or morphogens, known to induce cell migration and promote the formation of bone and cartilage. The most widely studied in this family is BMP-2, which has not only proven beneficial for bone-related clinical treatments but is also FDA-approved for human clinical uses. The use of BMP-2 is an obvious choice for enhancing bone regeneration via a tissue engineering approach. However, the influence of the three-dimensional (3-D) extracellular matrix (ECM) is largely unknown. We hypothesized that structural-mechanical cues inherent in the ECM can regulate the behavior of osteoprogenitor cells, and may be just as important as soluble chemoattractants. To test this hypothesis, we used an embedded hydrogel model to investigate the coordinated effects of BMP-2 and ECM density on the 3-D invasion of an osteoprogenitor cell line. Image analysis techniques using NIH ImageJ enabled the quantification of the extent of migration. In parallel, the use of a simple microfluidic device and time-lapse fluorescence microscopy enabled the experimental characterization of diffusive transport as a function of ECM density, permitting us to calculate the theoretical concentration of BMP-2 to which the bone cells are exposed. When these two studies are coupled together, they show that the haptotactic attraction of the ECM is the main driving force for cellular invasion, while the presence of BMP-2 strongly supplements the extracellular environment to accelerate cell-movement. This finding provides insight towards rational design of hydrogel biomaterials capable of supporting bony in-growth and bone tissue regeneration.

The Effects of Assortative Mating by Flowering Time on other Phenological and Morphological Traits Arthur Weis

Jason Lam

Mentors: Steven Franks & Arthur Weis

Global warming and environmental changes are expected to place selection on traits of plants, especially traits related to the timing of flowering. Previous studies have examined the effects of precipitation changes on the timing of flowering in *Brassica rapa.* However, how the effects of assortative mating by one trait can effect variances of other traits were not addressed. This study attempts to determine how assortative mating by one trait can affect the evolution of other phenological and morphological traits in *Brassica rapa.* Phenological traits include duration of flowering, and morphological traits include height, stem diameter, and number of stem nodes. The experiment was carried out by planting offspring of plants that have undergone one generation of either random, hyper-assortative, or natural mating in the greenhouse and collecting data on phenological and morphological traits. Experimental results supported previous findings that assortative mating by flowering time increases genetic variation for this trait. The results also indicated that assortative mating increases the genetic variation of stem diameter for the natural and random mating group but not for the hyper-assortative mating group. In contrast, assortative mating by flowering time did not increase the variance of the number of stem nodes and height in any of the three groups. The increase in the variance of the traits discussed above indicates a rapid evolutionary response. Climatic changes can select for and produce rapid evolution in plants.

Passing Gas: Is Ethanol the Solution to our Energy Crisis?

Alexander Lamb

Mentor: Roger McWilliams

The current petroleum-based energy model for the United States is not a viable long-term option for solving climate change and independence from foreign energy sources. Ethanol has emerged as a leading candidate in the field to replace petroleum and solve these problems, but beyond the romantic notion of a "green" system a definitive answer to ethanol's feasibility has not yet been determined. A

model of ethanol's forecasted production and America's energy consumption was created to find a definitive answer. Based on analysis of ethanol's energy impact and its ability to replace petroleum, this paper concludes that current practices in the ethanol industry will not viably solve the energy crisis of the United States.

Large-Network Cortical Model for Generation of Realistic Local Field Potentials and Action Potentials
Trevor Law
Mentor: Zoran Nenadic

Reliably recording the activities of individual neurons in the animal brain, using intra-cortical recording systems, is of substantial interest for basic neuroscience studies and the development of brain-computer-interfaces (BCIs). An important part of the effort to achieve this is the development of algorithms for detecting neural action potentials, attributing them to individual neurons, and "decoding" neural representations of stimuli and (especially for BCIs) subjective intent. Validating such algorithms using data obtained experimentally can be problematic, primarily because the true excitation states of neurons within the brain, referred to as the ground truth, are generally inaccessible. However, mechanistic computational models, although they certainly cannot reproduce all aspects of neural tissue, do provide access to a simulated ground truth. To facilitate the development of signal processing algorithms for intracortical electrode recordings, a computational modeling framework has been developed for the purpose of generating realistic extracellular potential signals resulting from the activity of a large network of spatially distributed model neurons. The framework is implemented using the Python programming language, GENESIS, a numerical neural model simulator, and MATLAB (for data analysis). It is demonstrated how appropriate choices for model parameters can yield biophysically plausible network behavior and extracellular potential signals.

High Resolution Three-Dimensional Reconstruction of the Optic Nerve Head Using Second Harmonic Generation (SHG) and Confocal Microscopy
Annie Lay
Mentor: Donald Brown

Glaucoma is the second leading cause of blindness worldwide. This disease is typically caused by an elevated intraocular pressure (IOP) that the retinal ganglion cells (RGCs) cannot tolerate. As a result, RGCs and their axons in the optical nerves die, which is manifested by loss of vision. Death of RGCs is mainly due to damage of the axons in the optical nerve head (ONH), which is believed to be caused by the structural distortion of the ONH and the mechanical vulnerability of the lamina cribrosa, the posterior area of the sclera made up of collagen beams, which defines channels through which axon bundles exit the eye. In this study, we used a multiphoton microscopy known as Second Harmonic Imaging Microcopy to generate second harmonic signals from collagen, allowing direct optical imaging of the lamina cribrosa. To follow the structural deformation of the ONH more closely, we stained cell structures to allow better visualization. Cell nuclei were stained with SYTO 59, cellular actin with phalloidin and tubulin filaments with paclitaxel. Our results consist of high resolution 3-D reconstructed data sets of the ONH structure from humans and animal subjects commonly used in glaucoma studies. Interestingly, in higher primates, the data shows presence of hook-like fibrils that seem to hold together the ring-like fibrils of the canal wall and the scleral matrix. These hook-like fibrils are not seen in rabbit, pig, guinea pig and canine specimens, and appear to be absent in glaucomatous patients.

Efficient Representation of Photometric Properties in a Projector-Camera Pair
Maxim Lazarov
Mentor: Aditi Majumder

Projector-camera systems have a wide variety of applications, ranging from flexible large-area display walls to novel interaction methods. The accurate calibration of projector-camera systems is critical to their use in most applications, but has previously been a complicated and involved process that required either a previously calibrated projector or camera. We presented a method that accurately estimates all photometric properties of both the projector and camera in an uncalibrated projector-camera system. Further we developed a compact and flexible representation of spatial intensity variation (known as vignetting effect) of a camera or projector's optical system. The observation that light intensity smoothly falls off from the center to the fringes of the images led us to choose Bezier surfaces. Such Bezier surfaces also allow us to represent a camera or projector's spatial intensity variation using far fewer values than with other representations, and also allow us to include device settings such as aperture and focal length, in addition to the expected spatial coordinates. An aspect crucial to this representation is the correct parameterization of device parameters at each data point. By correctly parameterizing our data points, our representation becomes significantly more flexible as it allows us to accurately predict the vignetting effect at unsampled points. This representation further simplifies calibration by permitting the sparse sampling of a few well chosen data points rather than all possible device parameters.

Endonuclease G Plays a Role in Immunoglobulin Class Switch DNA Recombination and Somatic Hypermutation

Darrick Lee
Mentor: Paolo Casali

Double-strand DNA breaks (DSBs) are critical for immunoglobulin class switch DNA recombination (CSR), and are associated with somatic hypermutation (SHM). DSBs in Immunoglobulin (Ig) V(D)J region can be generated independently from activation-induced cytidine deaminase (AID). DSBs in the switch (S) region during CSR are generated through deamination of deoxycytosine (dC) by AID, subsequent deoxyuracil (dU) deglycosylation by uracil DNA glycosylase (Ung) and abasic site nicking by apurinic/apyrimidic endonuclease (APE). Although AID-dependent DSBs have been detected in S region DNA of human and mouse B cells, unignorable amounts of background DSBs have also been detected in S region DNA in the absence of AID or uracil DNA deglycosylation activity. One major question that remains to be answered is how AID-independent DSBs are generated and what role they play in CSR and SHM. Endonuclease G (Endo G) is one of the most abundant nucleases in eukaryotic cells. It cleaves single- and double-stranded DNA, primarily at dG and dC, the preferential sites of DSBs in V(D)J and S region DNA. In addition, Endo G shows high efficiency in cutting the DNA strands in an R-loop, which is involved in CSR. We used Endo G -deficient mice to address the role of Endo G in CSR and SHM. Our experiments showed that Endo G deficiency results in not only an impaired CSR to IgG1, IgG2a, IgG3 and IgA, but also greatly reduces mutational frequency in IgH intronic J_H-iEμ DNA. The alteration of CSR and SHM in Endo G-deficient B cells did not result from altered cell proliferation or apoptosis, as indicated by the findings that B cells apoptosis, germinal center formation, cell cycle and proliferation are virtually normal in *endo G*$^{-/-}$ mice. Our findings not only determine an important role of Endo G in CSR and SHM, they also imply that AID-independent DSBs are directly involved in these processes.

Progress Towards the Synthesis of Sieboldine A

Brian Leon
Mentor: Larry Overman

In 2003, Kobayashi and coworkers isolated a new *Lycopodium* alkaloid, sieboldine A. Upon its isolation, it was shown that sieboldine A was a potent inhibitor of acetylcholinesterase, and was cytotoxic towards murine lymphoma cells. The complex structure of sieboldine A is unprecedented in the literature, containing a tetracyclic core in which one of the rings is a unique *N*-hydroxyazonine ring. Progress towards the synthesis of sieboldine A is detailed, as well as recent attempts to further understand the key Prins–pinacol cascade reaction used to set the quaternary carbon stereocenter.

Internet Reputation Systems

Cameron Lewis
Mentors: Tatsuya Suda & Ariffin Yahaya

An Internet reputation system is a mechanism that aggregates data about past interactions between individuals, serving as a mediator between two potential partners to help each decide whom to trust, encourage trustworthy behavior, and deter dishonest participation, thereby minimizing the inherent uncertainty of Internet interactions. These systems encounter a variety of problems, including overcoming anonymity and potentially infinite number of aliases of individuals, subjecting deserving users to sanctions, and ensuring that gathered data is accurate *and* readily available to interested individuals. A variety of commercial and academic implementations have attempted to conquer these problems with simple and complicated algorithms, methods that interpret reputation globally (one set of reputation scores for all members) or locally (each member has its own reputation scores for all other members), and models that use first-hand (personal) information only or that use first- and second-hand information. Despite all of the current implementations, many questions still remain, including: how does a system allow new users to quickly gain a good enough reputation to become an active member of the community and how can a system allow for members of its community to recover from poor reputation. The result of my research was the writing of a survey paper that I can use to compare to my new idea—an attack on both problems through a new approach to reputation aggregation and interpretation: a balance between short-term and long-term reputation with an emphasis on current reputation through the addition of a new concept: *streaks*.

The Effect of *Rhodiola rosea* on *Drosophila melanogaster* Fecundity and Number of Progeny

Veronica Lewis
Mentor: Mahtab Jafari

Aging is thought to result from the accumulation of damage due to oxygen free radicals, which are byproducts of normal metabolism. In addition, there is a strong inverse relationship between aging and reproductive fitness, and treatments that extend life span frequently impair reproductive potential. The extract of the herb *Rhodiola rosea* was recently identified as a potent and effective anti-aging agent that increases longevity without comprising the fecundity, nervous system or metabolism of the species tested. We have evaluated a new extract of *Rhodiola rosea* (SHI) that contains a greater concentration of the active component (80% versus 60%) than did our previous mixture, and is a pure extract without added compounds, with

regard to its impact on the number of eggs and progeny produced. Supplementation of SHI *Rhodiola rosea* decreased both the number of eggs laid and the number of offspring produced compared to control diet fed flies. These results suggest SHI *Rhodiola rosea* may potentially extend life span by negatively impacting reproductive fitness.

Absence and Presence in the "Poethics" of Performance Art (in "Theory" and "Practice")

Denise Li
Mentor: Stephen Barker

In *Body Art: Performing the Subject*, Amelia Jones challenges the element of "disinterestedness" present in conventional art history and criticism by emphasizing instead an approach toward artistic production and reception (more specifically, body/performance art) that embraces *intersubjectivity* and the "particularization" of the body/self. I explore Jones' approach in the context of the "poethics" of post-structuralist feminist writer Hélène Cixous, whose experimental practice of *écriture féminine* ("feminine writing") suggests that "poetry" and theory are inseparable. I compare this poetico-philosophical merging with Julia Kristeva's psychoanalytic-aesthetic "identification-interpretation" approach toward "borderline" situations of subjectivity (for instance, psychosis and melancholia), which involves a "back-and-forth movement" between fiction and knowledge. Both methods operate according to an alternative "logic" that transgresses rational, "fixed" conceptual and linguistic frameworks, informing a phenomenological orientation that is compatible with Jones' project. Collectively, they participate in a discourse about absence and presence that can be useful to artistic and theoretical practices. Body/performance art is useful in particular because of its corporeally-based, process-oriented nature; much of Cixousian "poethics" revolves around ideas about the body/self in relation to writing. Notions about narcissism, loss, incoherence, uncertainty, time and space will also be investigated in this multi-faceted journey into the creative critical consciousness, and what it means to exist in the *entre-deux* (space "in-between") not only in performance and philosophy, but also in life.

The Effectiveness of Vietnamese Strategic Hamlets

Kevin Li
Mentor: Charles Wheeler

In this paper, I will discuss the function of the Strategic Hamlet Program in the American War in Vietnam. Specifically, this discussion will revolve around the reasons why this militarization of the populace by the beleaguered South Vietnamese government failed. As both an experiment in modernist social engineering and, more importantly, an anti-guerilla military strategy imported from the British Malaya (with echoes stretching back to nineteenth-century Chinese history), the Program fell short of expectations. I contend that, aside from the political failings and ineptitude of the Diem government, there were deeply rooted structural problems. An examination of the clash between the National Liberation Front cadre and the South Vietnamese military at the spatial junctures the hamlets created will elucidate the significance of the "disciplinary mechanisms" these hamlets produced, and their implications for the failure of U.S.-South Vietnamese counterinsurgency and nation-building strategies.

Up-Regulation of Renal and Vascular Scavenger Receptor SRA1 and Down-Regulation of HDL Receptor ABCA-1 in Kidney and Vascular Issues

Xuan Li
Mentors: Zhenmin Ni & Nosratola Vaziri

Chronic Kidney disease (CKD) is associated with accerlerated atherosclerosis, which is in part due to diminished plasma level and impaired maturation of HDL. In the artery wall, oxidized lipoproteins are engulfed by macrophages via scavenger receptor SRA-1, a process that can lead to foam cell formation and atherogenesis. HDL prevents atherosclerosis by retrieving surplus cholesterol via binding to the ABCA1 receptor. Free cholesterol reaching the surface of HDL is promptly esterified by LCAT and sequestered in the core of HDL. The loaded HDL then detaches and travels to the liver where it forms a reversible binding with SRB-1, allowing it to unload its cholesterol content and return to the circulation for recycling. In addition to SRB1, liver contains an HDL holo-receptor (B chain ATP synthase), which internalizes and degrades HDL. Earlier studies showed down-regulations of hepatic Apo A1 (the main apoprotein constituent of HDL) and LCAT gene expression in CKD. However, the effect of CKD on SRA1, ABCA1 and of B chain ATP synthase has not been previously investigated and was explored here using CKD and normal control rats. The CKD group showed marked increases in SRA-1 abundance and a significant reduction of ABCA-1 abundance in the kidney and aorta. However, liver SRB1 and ATP synthase B were not affected by CKD. Thus, CKD results in up-regulation of SRA1 and down-regulation of ABCA1 in the aorta and kidney, events that support development of atherosclerosis and glomerulosclerosis.

The Emergence of Civil Society in Mexico: The Importance of Grassroots Organizations in the Spread of Civic Culture and Citizen Participation

Kimberly Liang
Mentor: Ricardo Chavira

During the aftermath of the 1985 Mexico City earthquake, many observed the awakening of popular citizen participation. In an era when Mexico's citizens were accustomed to the patronal styling of their hegemonic, one-party government, the lack of sufficient government response to the

widespread panic, and its slow mobilization of relief efforts forced many Mexicans to organize and execute citizen led rescue groups. The inadequacy of the government to positively respond to citizen needs, along with its inability to consolidate the citizen relief organizations into itself, led to a form of political organization that was independent from the government and from any particular party; thus, a prime example of civil society becomes apparent. However, other instances of civic participation independent of the state have predated the events of the 1985 earthquake and help define the type of civil society organizations that exist up to the present. Through the examination of Mexican grassroots movements, especially those that have called attention to the poor indigenous masses of Mexico, it can be argued that the emergence of civil society has strengthened and advanced democracy in Mexico because of increased citizen participation in the form of civil society organizations.

Brazil's Ethanol in the Global Perspective
Adriana Lira
Mentor: Caesar Sereseres

The rapid growth and industrialization in many areas of the globe are exhausting current energy resources, leading to the race of uncovering energy alternatives. The detrimental effects on the environment together with a growing conscientiousness of depleting resources among the public and high officials have placed various nations on a fine line that impels them to take some form of action and consider different energy alternatives, such as biofuels. This study explores energy concerns that develop regarding international policies for energy allocation, the effects on economic development and energy security. In addition, the research focuses on Brazil's production of ethanol as a potential alternative and viable fuel resource that responds to the global energy challenges of resource depletion and environmental effects. The literature review sheds light on critical issues of global energy, Brazil's ethanol approach and international policies and agreements that pertain to the allocation of energy supplies and mitigation of environmental effects. The findings reveal that the initiative to employ ethanol as an alternative energy resource falls short in various aspects, as its secondary effects out-weigh its benefits. The study allows for a deeper understanding of the critical current energy concerns and the need of strategically employing other methods and resources to meet our global energy needs.

A McDonal Kreitman Test of Selection Using the Blue Opsin Gene of Liminitis Butterflies
Saif Liswi
Mentor: Adriana Briscoe

Color vision in *Limenitis* butterflies is based on the presence of long wavelength sensitive, blue wavelength sensitive, and UV wavelength sensitive visual pigments. Previous work by the Briscoe Lab has revealed that spectral diversification of the long wavelength sensitive visual pigment between closely related *Limenitis* species was due to the action of positive selection. Because color vision requires two spectrally-distinct classes of photoreceptor cells, it is possible that diversifying selection on the long wavelength visual pigments has also resulted in diversification of the blue sensitive visual pigments. Using the same statistical test (McDonald Kreitman test), the goal of this project is to determine whether or not positive selection has diversified the blue opsin in the same closely related *Limenitis* species. To determine this, reverse transcriptase polymerase chain reactions (RT-PCRs) were performed on twenty-five samples and sequenced in ninety-six well plates. Our preliminary results indicate that the blue visual pigments have indeed undergone genetic diversification. These results suggest that the blue sensitive visual pigments are also physiologically distinct, which awaits further study.

Study of the Plasma Structure in the Plume of Hollow Cathodes
Justin Little
Mentor: Manuel Gamero-Castano

This detailed experimental and theoretical study of the turbulence within a hollow cathode plasma will improve our understanding of the anomalous transport phenomena observed within the device. Hollow cathodes represent a lifetime limiting component of many electric propulsion systems. Electrode erosion mechanisms remain poorly understood, thus motivating research into the physics occurring within the hollow cathode plasma. A hollow cathode is currently on loan from JPL and is to be used in this study. The necessary mounting hardware has been integrated within a vacuum chamber to support extensive experimental testing. The first plasma was created and the operating parameters were obtained. Initial diagnostics include a spectral survey of the plasma using a digital spectrometer and simple single-tip Langmuir probe measurements of the plasma temperature and density. A fast-response (>100MHz) electrical probe is in development that will allow the characterization of turbulent transport mechanisms within the cathode plasma.

Simulation of Transport Phenomena in the Plume of Stationary Plasma Hall Thrusters
Justin Little
Mentor: Manuel Gamero-Castano

The objective of this study is to use computer simulations to improve our understanding of the physics of Hall thruster operation, with the ultimate goal of optimizing experimental research. The computer code HPHall has been used extensively in academia to model accurately the

plasma structure within a device, but it contains inherent physical inconsistencies in the plume region. This study investigates the unphysical amount of Bohm diffusion required to accurately model the electron mobility and the relatively large temperature gradients (~10eV/mm) in the plume region that result from this model. To resolve these inconsistencies, improved models for electron transport and Xe^{++} ionization have been implemented within the structure and algorithms of the code. It was determined that the introduction of coulomb collisions between electrons and ions in the plume region has a negligible effect on electron mass and heat transport. However, an increased rate of $Xe^{+} \rightarrow Xe^{++}$ ionization results in a 40% larger discharge current, thus increasing the amount of current carried by doubly-charged ions and relieving the simulation's dependence on anomalous diffusion mechanisms.

Distributed and Fractal Pixel Sensors
Leslie Liu
Mentor: Joerg Meyer

In regular CMOS cameras, we can usually see aliasing—noise that can be seen in small structures. Aliasing, for example, can be represented through noise in fabric patterns such as a striped shirt. Not only is aliasing common in everyday artifacts, we can also see aliasing in scientific imaging. The chip layout has been modified from a regular chip layout by using "distributed" and "fractal" pixel sensors. Distributed sensors are at least two non-continuous parts that are electrically connected. Fractal sensors are essentially a distributed sensors, but with fractal-like shapes. By changing the chip layout so that it is using distributed and fractal pixel sensors, it should allows us to perform functions such as anti-aliasing. Using MATLAB, test images were created in hopes of strengthening the concept. By using a different simulation algorithm, we are able to create images that will show how distributed and fractal pixel sensors can perform anti-aliasing.

Electronic Waste at the University of California, Irvine
Victoria Liu
Mentor: Joseph Dimento

Electronic waste is a growing problem as increasing levels of technology become obsolete in today's technologically driven world. Piles of computers, monitors, cell phones, and the like find their way to landfills around the world, and improper disposal of these products results in toxins spreading into the air and groundwater. This study examines the issue of e-waste at the university level, examining how UCI students dispose of their electronics and their reasons behind their chosen modes of disposal. Using a questionnaire, the responses of 164 students were recorded and analyzed. The data reveals that convenience is a main factor in determining disposal practices, but that recycling has not reached its full potential because students do not know about the consequences of e-waste buildup beyond its definition in the most general sense, and because recycling centers are not advertised to a wide enough extent. From these results, it has been concluded that the recycling option needs to be better publicized, not only in physical terms, but also in terms of why this option should be pursued. Furthermore, recycling facilities should be made convenient for students to access, and incentives should be offered as much as possible.

Electro Acupuncture Activates Glutamatergic Neurons in Arcuate Nucleus (ARC), which Project into Ventral Lateral Periaqueductal Gray (vlPAG)
Yu Liu
Mentor: John Longhurst

Our previous studies have shown that electroacupuncture (EA) stimulation at the Neiguan-Jianshi acupoints activates arcuate nucleus (ARC) to ventral lateral periaqueductal gray (vlPAG) projection, which is essential for the inhibition of the cardiovascular reflex. However, the neuronal projection between ARC and vlPAG that can participate in the inhibition of the reflex during EA stimulation has not been identified. The ARC is located in the mediobasal hypothalamus, adjacent to the third ventricle. It is involved in the regulation of the autonomic nervous system and is responsible for the regulation of blood pressure and heart rate. VlPAG is located around the cerebral aqueduct within the midbrain. To show the anatomical relationship between ARC and vlPAG, retrograde dye was injected into rats' vlPAG. The retrograde dye was absorbed by the axons in vlPAG, and then traveled to the cell body of the neuron. Detecting cell labeling in the ARC shows the neuron projection between ARC and vlPAG. The rats were then separated into two groups, an EA treated group and a sham-operated control group. Immunohistochemical study was performed on ARC sessions of rats' brains. The brain tissues were stained with c-fos antibody, an early gene expressed by the activation of the cell. The expression of c-fos shows the activation of neurons by electro acupuncture (EA) stimulus. As a result, tracers were found in ARC, which also co-localize with c-fos. The expression of c-fos co-localized with tracer showed dramatically greater increase in the EA treated rats than the control rats. This study shows that electro acupuncture can activate neurons in ARC, which project their axons into vlPAG.

Analysis of Two Post-Translational Modifications, Polyglutamylation and Polyglycylation During Mouse Spermatogenesis
Itamar Livnat
Mentor: Grant MacGregor

We investigated the role of polyglutamylation and polyglycylation, two novel post-translational modifications

(PTMs) in mouse spermatogenesis. Polyglutamylation adds glutamates to proteins, thereby acidifying them, while polyglycylation adds glycines. To investigate the function of polyglutamylation in spermatogenesis, we used ROSA22 mutant mice, which lack an α-tubulin polyglutamylase that causes a loss of α-tubulin polyglutamylation in the brain. ROSA22 mutant male mice are sterile, due to defective spermatid flagellar assembly, which suggests that polyglutamylation of α-tubulin is required for sperm development. To analyze changes in PTM of tubulin during spermatogenesis, we analyzed total protein from testes of wild-type mice of different ages during the first wave of spermatogenesis. We also compared PTM of total protein from adult wild-type and ROSA22 mutant mice. In each case, proteins were analyzed using 2-dimensional polyacrylamide gel electrophoresis and Western blotting, using antibodies specific for polyglutamylated tubulin and polyglycylated protein. No difference was observed in polyglutamylation of testicular tubulin at postnatal day 25 or postnatal day 38, indicating that tubulin first undergoes this modification before postnatal day 25. As found in the brain, wild-type and ROSA22 mutant mice varied significantly in the pattern of polyglutamylated α-tubulin in testis, which supports a defect in PTM of tubulin as the underlying cause of male sterility in ROSA22 mice. During the first wave of spermatogenesis, protein polyglycylation was first observed at postnatal day 30.

Endogenous GluR1 Surface Expression in Acute Slices

Richard Liwanag

Mentors: Christine Gall & Ching-Yi Lin

According to recent studies, learning stimulates long-lasting changes in the synaptic strength of glutamatergic synapses, which is essential for memory. The regulation of synapses that occur in the brain is associated with membrane trafficking and phosporylation of protein receptors. The presence of one particular protein receptor, AMPA (α-amino-3-hydroxy-5methyl-4-isoxazole propionic acid)-glutamate type receptors (AMPARs), has an impact on the level of rapid excitatory transmission in the mammalian CNS and regulation in the strength of glutamatergic excitatory synapses by being a target for multiple signaling pathways. AMPARs are oriented in tetramers consisting of four subunits, GluR1-GluR4. The subunit composition of AMPARs located in the hippocampal CA3-CA1 synapse are mainly composed of GluR2 paired with GluR1 or GluR3 subunits. In this experiment, we focus on the dynamic surface expression of endogenous GluR1in acute slices prepared from rat forebrain. In the recording chamber perfusing oxidized prewarmed aCSF (31 ± 1 °C), acute slices without any treatment were harvested at specific time points (0, 5, 10, 30, 60 min). The newly insertion, internalization and steady-state surface expression of GluR1 were assessed using surface protein biotinylation with minor modifications and Western blot analysis with antibody direct against GluR1. There was a clear and progressive decrease in both the insertion and steady-state level of GluR1 at the tested time points; however, an increase in internalization was found. These results provide direct evidence to help understand how GluR1 trafficking into and from the membrane correlates with the progression and plasticity of synaptic current.

The Effect of Carbon Doping on PDMS and its Role in the Heart Strain Gauge

Edward Lo

Mentor: William Tang

There is a need to measure the strain of tissues that require a much higher elongation, since some of the tissues are able to have strains up to 100%. This means that there is a need for new polymers that are able to be used in these strain gauges. There have been studies on which polymers are biocompatible and useable for the strain in tissue. One such polymer is PDMS (polydimethylsiloxane) substrate, which can be doped with different things that have conductive applications. One popularly used method of having a conductive PDMS strain gauge is to dope it with carbon. Carbon is a conductive substance that is usually not very elastic, but when mixed with PDMS can become elastic as well as conductive. There have been many studies on carbon doped polymers, and their applications in human tissue and in the computer industry have sparked great interest. In this research we set out to find the optimal carbon to PDMS ratio for the strain gauges, and whether there is an optimal size, shape, and conductivity in tensile testing. With the ability to know the optimal PDMS/Carbon ratio, size, shape, and conductivity I was able to construct a device that would be best suited for measuring the strain of heart tissue. This ability would allow a myriad of functions to become available. Doctors would be able to characterize heart tissue problems, allowing people to better understand the workings of heart tissue.

Academic Families Among Latina/o Undergraduates

Veronica Lopez

Mentors: Jeanett Castellanos & Caesar Sereseres

Over recent decades, the Latina/o population has rapidly grown, yet Latina/os students are not journeying through their educational experiences with positive encounters and educational progress. Research suggests that Latina/o students report having a difficult time adjusting, persisting, and graduating college, and feeling isolated and lonely. An evolving construct associated with helping Latina/o students cope with these educational barriers is academic family, which is a type of social support system that allows students to engage in family-like systems in the university.

The purpose of this study is to understand the role of academic family in Latina/o students' college experiences. Using a psychosociocultural framework, this study examines how Latina/o students engage with other students by implementing family-like systems. The role of their own family, faculty and staff was also examined in the context of developing academic family. Data collection and analysis is in progress; however, preliminary findings suggest that Latina/o undergraduates seek organizations, peers, and faculty to assist them in their educational journeys. Academic family serves as a support system in which every individual serves a different purpose in providing psychological, social and cultural support. The conclusions are ground-breaking, given that no study has examined the role and processes of academic family in Latina/os' college experiences. Our findings provide insight for effective guidance when working with Latina/o students, direction on how to facilitate the creation of a successful academic family, and recommendations on the role of culture when interacting with Latina/o students.

African Americans in Higher Education at Major Non-African American Universities, Issues of Attendance and Coping Mechanisms

Tameyka Love

Mentor: Belinda Robnett

African Americans have historically faced challenges with regard to acquiring formal education. After slavery there were segregation laws preventing African Americans from attending White colleges and universities. After African Americans gained the legal right to attend college alongside Whites, they still did not gain social acceptance. As a result, "Black students worked to create social and academic support systems whose goals were to help ensure their survival and success at predominantly White colleges and universities." The literature shows that African American students at non-Black universities usually have to adjust more than White students, so they create their own social and cultural networks in order to cope with isolation. The purpose of this project is to examine the support systems and other methods that African American students use to cope with being a minority on campus and to understand their effect on academic outcomes. The findings suggest that individuals who have larger social networks tend to have greater academic success. It is my hope that this project will provide the academic community with a better understanding of the Black experience at the University of California and other major universities.

FRT 42D and *ovo^{D}*: Using a New Genetic Tool for a Large Scale Maternal Effect Screen in *Drosophila melanogaster*

Ernesto Lujan

Mentor: Rahul Warrior

One method of analyzing gene function is to examine phenotypes of tissues that are homozygous mutant for the gene of interest. A problem with this approach is that the wild-type gene product is often essential for the organism to develop to a stage where the tissue can be examined. A solution is to generate clones of homozygous mutant cells in animals that are otherwise heterozygous. Clones are generated by first recombining a mutation onto a chromosome that contains a Flippase Recombination Target (FRT) sequence. Expression of the Flippase (FLP) enzyme in animals heterozygous for the chromosome and a wild-type FRT chromosome results in recombination and daughter cells that are either homozygous for the mutation or for the wild-type chromosome. This is particularly useful when analyzing the maternal effect of homozygous lethal mutations in *Drosophila melanogaster*, as female germline cells can be made homozygous for the mutation while somatic cells are heterozygous for the mutation, and thus the organism is viable. For easy selection of germline clones, the dominant female sterile mutation, *ovo^{D}*, is used, as only recombined cells that are homozygous for the mutation develop successfully. Currently, a chromosome with FRT 42D and *ovo^{D}* is not available. We have created this chromosome and are using it to analyze the maternal effect phenotype of 237 P-transposable element induced lethal mutations from the Drosophila Stock Center at Bloomington, Indiana that were each recombined onto chromosomes with FRT 42D.

Mutations that Cause Abnormal Connections in the Development in the Auditory Brainstem

Samantha Luk

Mentor: Karina Cramer

Eph and ephrin proteins play an important role in the brain, due to their many functions in establishing the precision needed for development. One important brain area in which these proteins have a large impact is the auditory system, which requires many complex and exact connections. One such pathway within the auditory system is found between the ventral cochlear nucleus (VCN) and the medial nucleus of the trapezoid body (MNTB). Based on previous studies on ephrin-B2 and its functions, this ephrin protein may play an important part in creating the specific axon connections seen between VCN and MNTB. We investigated the potential role of ephrin-B2 in influencing the connectivity of the VCN to MNTB pathway by studying the anatomy of this pathway. Fluorescent dye was used to trace the axonal connections from VCN to MNTB in normal, wild type mice and mice with a mutation in the

ephrin-B2 gene. Normally, the axons coming from VCN project primarily to the contralateral, or opposite, MNTB. However, it was found that the mutant ephrin-B2 mice did not develop normal axonal connections from VCN to the contralateral MNTB like the wild type mice. This abnormality in the auditory pathway suggests ephrin-B2's role in axonal guidance during the development of the auditory system.

Assessment of Axon Guidance by Neurotrophic Growth Factors in 3-D Gradients

Gregory Lull

Mentor: Lisa Flanagan

During spinal cord injury, a glial scar bordering the lesion site prevents axonal crossing and reestablishment of neuronal synaptic connections. Previous research indicates that axonal blockage by the glial scar is due to the lack of growth-stimulating factors and the presence of growth-inhibitory factors. This project aims to mimic a spinal cord lesion site by using a 3-D biomaterial cell scaffold in a microfluidic culture device to assess whether different gradients of growth factors (GFs) can direct axonal extensions. To establish the model, we determined an optimized neuronal growth medium by culturing embryonic day 13.5 (E13.5) mouse spinal cord neurons (mSCNs) with varying concentrations of neurotrophic GFs (BDNF, NT-3, and NGF) in different media combinations and immunostained with a neuronal antibody (TuJ1) to evaluate neuronal extensions. After determining an appropriate basal media, we seeded E13.5 mSCNs into our microfluidic devices at different densities and checked cell survival. Our results show that BDNF and NGF promote axon extensions and that a seeding density double that of the coverslips is required for growth in our microfluidic devices. However, axon extensions were not uniform in all regions of the device. A calcein-AM stain revealed intact cell membranes in regions lacking robust axonal extension, leading us to conclude that cells were alive but shear stress from contact with media in those regions prevented growth cones from extending. Modifications to the microfluidic devices are underway to minimize shear stress and enable assessment of the effects of GF gradients on axon extensions.

Urban Policy and Multiculturalism in the Netherlands: Integration or Conflict?

Lynly Lumibao

Mentor: Scott Bollens

The Netherlands, like many European countries, has become increasingly multicultural. However, some of the consequences of cultural diversity have also led to segregation and tension between ethnic minorities and native inhabitants. Today, social inequalities exist between native Dutch and ethnic minorities. Ethnically mixed neighborhoods that contain a significant number of Moroccan and Turkish inhabitants are perceived as qualitatively inferior. Policymakers and local municipalities fear that social polarization will hinder social cohesion. In response, urban policies in the Netherlands have been launched to counter problems of social exclusion within major cities. However, in recent history, many policies that have focused on urban regeneration have not solved the problems of ethnic marginalization within neighborhoods. First, the concept of social exclusion will be analyzed. Second, an overview of urban policies in the Netherlands is discussed. Additionally, three case studies are provided in order to link policy methods with the incorporation of ethnic minorities. The purpose of the study is to examine how recent urban policies have impacted neighborhoods and assess whether these policies have improved social cohesion. Despite far-reaching initiatives, the results remain questionable. However, policymakers are making strides towards fostering cultural ties while revitalizing urban neighborhoods.

Strategic Humor in Vietnamese Re-Education Camp Memoirs

Trinh Luu

Mentor: Charles Wheeler

Vietnamese re-education camp memoirs (h□i ký tù c□i t□o) enjoy prestige in the Vietnamese diasporic community as testimonies to the brutal nature of the Vietnamese Communists and to the suffering they inflicted upon former foes after 1975. Beneath their stated agenda to preserve the memory of their imprisonment, however, these memoirs employ literary mechanisms that run counter to our expectations, in ways that suggest more sophisticated ends. Instead of moral exhortations or political polemics, these texts rely on odd drolleries, childlike levities and absurd vulgarities to consecrate their memory of collective loss. From linguistic perversions and scatological expletives to mocking caricatures and bizarre war-ghosts stories, humor is everywhere. More than rhetorical performances, these acts of humor function as political maneuvers that seek to turn corporeal and emotional urgencies into laughing matters.

A Study in Dance Improvisation

Annie MacDougall

Mentor: Lisa Naugle

Dance improvisation is a unique art form—one that demands resources of the mind and body to make instantaneous choices regarding movement, space and time, while being highly mindful of the shaping of the present moment. My research began by discussing and evaluating the effectiveness of these choices through closely studied performance improvisations captured on film. A dancer's movement qualities, intentions and relationships (with live music, peer performers, and an audience) weave together

spontaneous images and stories that are constantly being realized and then changed. My research was enhanced through firsthand experience in performance improvisation in *Dance Visions*, the dance department's faculty concert. As I faced infinite choices onstage, the same work, titled "Raw, Without Blinders," developed into an inimitable dance for each performance. This study has led me to appreciate the value of dance improvisation as a vital tool for dancers; it allows one to freely create new movement; explore movement qualities and energies; become more responsive to intuitive movement; and build proprioceptive knowledge, focus and versatility.

Paul Taylor Summer Intensive

Ana Macias
Mentor: Loretta Livingston

For my project, I sought to find out whether or not there was a difference between east coast and west coast training in modern dance, and to see if there is a "family tree" of modern dance. On the first day of classes, it was expressed that the Paul Taylor Summer Intensive did not teach a "Taylor Technique." It is not codified technique; it is not a practiced technique that is widely known to dancers. It is a style that is practiced in the school and by dancers in the Paul Taylor Dance Company and Taylor II. In those four weeks, I realized that modern dance does not have a formula for a technique and style that relies on a geographical constant. Modern dance thrives nationally and internationally, and modern dance training relies more upon the dancers that practice the techniques than the techniques themselves.

Facilitating *In Situ* "Isotagging" of Sugars in the NMR Tube Using Selective TBDPS Protection of Primary Hydroxyl Groups

Katherine Mackenzie
Mentor: A.J. Shaka

^{1}H-NMR spectra of carbohydrates are difficult to analyze because they exhibit spectral crowding. The compound trichloroacetyl isocyanate (TAI) replaces all the hydroxyl groups of a carbohydrate with carbamate groups. The proximal ring proton signals of the TAI-reacted carbohydrates become dispersed and shifted downfield, allowing for identification as primary or secondary. The NH signals of the carbamate groups are easily counted to confirm a complete reaction of all OH groups. The reaction produces no side products and can be performed in an NMR tube. TAI enriched with ^{13}C and ^{15}N can be used to "isotag" carbohydrates, allowing multidimensional NMR analyses. The highly reactive nature of TAI makes it incompatible with many common solvents. TAI reacts violently with H_2O and D_2O, forms a pink solid when mixed with pyridine, and does not properly derivatize sugars in DMSO. It reacts with other lone-pair containing solvents, which unfortunately are the ones used to solubilize carbohydrates. $CDCl_3$ was the solvent used in TAI reactions with small sugar alcohols, but large carbohydrates do not easily dissolve in $CDCl_3$, posing a serious problem. The group *tert*-butyldiphenylsilyl (TBDPS) was used to selectively protect the primary hydroxyls of maltitol. This protected carbohydrate easily dissolved in $CDCl_3$. The TAI derivitization reaction with the sugar was carried out in the NMR tube. TAI reacted with the remaining hydroxyl groups without displacing TBDPS, and the spectrum showed the peak dispersion characteristic of a TAI-reacted carbohydrate. The signals from TBDPS do not overlap with the peaks from the carbohydrates.

Were Smaller Banks More Likely to Fail During the Great Depression?

Joel Madero
Mentor: Gary Richardson

During the Great Depression, 30–40% of banks failed throughout the United States, contributing to the greatest economic downturn in our country's history. My project aims to address one potential reason for bank failures, whether relatively fewer assets were correlated with a greater failure rate from 1929 to 1933. Bank branching restrictions during the Depression resulted in a large amount of smaller banks in many counties throughout the U.S. I have collected data on all banks in six states—Arkansas, Connecticut, Delaware, Illinois, Missouri, and Washington DC. Total assets is an independent variable, along with several control variables, and failed/did not fail is a dependent variable. My prediction was that banks with relatively fewer assets would be more likely to fail, because they would not be capable of covering losses as easily. Initial results were consistent with this hypothesis, as smaller banks in the sample were several times more likely to fail. Upon further investigation—adding control variables and running new regressions—the hypothesis no longer held. Once controls were added, bank size in terms of assets proved to be insignificant. In conclusion, there is no evidence that bank size hurt or helped banks during the depression; instead, location, either state or Federal Reserve District, proved to be much more significant.

The Potential Anti-Aging Effects of (-) Epigallocatechin gallate (EGCG) from Green Tea on *Drosophila melanogaster*

Mona Malakouti
Mentor: Mahtab Jafari

Green Tea consumption has increased in recent years; it is the second most consumed beverage after water, although this is not uniformly representative of all countries. Claims have been made that certain constituents of green tea, especially tea catechins, offer many different health benefits. One such catechin, (-) epigallocatechin gallate (EGCG) has

been shown to have antioxidant properties by upregulating SOD and catalase enzymatic activity, which counteracts ROS. The free radical theory of aging describes how the accumulation of such free radicals can lead to cellular damage associated with aging. This study aims to investigate the potential of EGCG as an anti-aging agent, with its ability to counteract the negative effects of ROS and the progression of aging. A mortality assay using the model system *D. melanogaster* was conducted to assess whether EGCG can reduce mortality. The results show significant decrease of mortality of female *D. melanogaster* at the lowest dosage, whereas the medium dosage used is toxic to male *D. melanogaster,* and increases mortality. There are studies to indicate that, at certain doses and in certain environments, the naturally occurring antioxidant EGCG may have prooxidizing effects, which must be further evaluated.

Muscle Activity Patterns and Feeding Kinematics in Atlantic Hagfish (*Myxine glutinosa*)

Erick Maravilla

Mentor: Adam Summers

We investigated motor patterns of the three largest muscles in the hagfish feeding apparatus: the deep protractor muscle (DPM), clavatus muscle (CM), and tubulatus muscle (TM). The anatomy of the DPM and CM suggests they respectively protract and retract the dental plate. Bipolar electrodes were implanted in anesthetized *Myxine glutinosa*. After recovery, we simultaneously videotaped behaviors and muscle activity patterns from the feeding specimen. Ingestion required three gape cycles (dental plate protraction-retraction events), and intraoral transport required four gape cycles. Percutaneous implantation of electrodes did not inhibit normal feeding behaviors. Time to maximum gape was significantly longer during transport events than capture events. Gape cycle and dental plate retraction times were similar in both capture and transport. The DPM was active during protraction, while the CM and TM were active during retraction. In both capture and transport phases, the DPM had longer bursts (414 ms) than the CM (308 ms) and TM (255 ms). For each muscle, burst duration was similar in both capture and transport phases. All muscles were active during every gape cycle in the capture phase. In the transport phase, the DPM was active in all gape cycles, while the CM and TM were active during the first two gape cycles. We propose TM activity during retraction provides a fixed point for the CM to retract the dental plate. Decreased TM and CM burst frequencies during transport phases raise the possibility that elastic recoil of the CM tendon is sufficient to passively retract maximally protracted dental plates.

Reactions to the Use of Wearable Recording Technology for Aiding People with Memory Impairments

Gabriela Marcu

Mentor: Gillian Hayes

As part of a research team, I studied the reactions of secondary stakeholders to the use of SenseCam, a small wearable recording device used to help individuals with memory impairments. SenseCam takes photographs automatically—either at preset intervals or in response to sensory input—that can be reviewed to help individuals remember captured events. The study focused on the perceptions and reactions of those who may be subjected to this recording. We used surveys and interviews to gauge responses to the use of SenseCam in everyday situations. These responses to imagined uses of SenseCam *in situ* enabled us to construct models about this recording technology grounded in real-life experiences. Our results indicate that self-presentation, control of data and its dissemination, and desire to help those in need all impact reactions to recording technologies like SenseCam. By finding out how people respond and react to a recording device in use around them, then probing their reactions further through in-depth interviews, we uncovered suggestions for how this technology should be designed, presented, and used to assure its successful adoption.

Surface Tension Measurements of Alkali Halides Salts Dissolved in Ethylene Glycol

Yannika Marrs

Mentor: John Hemminger

Over the past century, scientists have believed that salts were repelled from the liquid vapor interface of water. In the last decade there has been significant new insight into the nature of the liquid vapor interface of aqueous salt solutions, showing that this past view is often incorrect. To understand the basic behavior of salts at these interfaces we need to look at solvents other than water. However, little is known about the corresponding liquid vapor interface when an organic solvent is used. Our experiments examine the liquid-vapor interface of non-aqueous solutions through measurements of surface tension. We studied a sequence of potassium halides; varying between F^-, Cl^-, Br^-, and I^-, using ethylene glycol as the solvent. The surface tension of these alkali halide solutions was measured at a constant percent saturation. In addition, measurements were taken at varied salt concentrations to examine the concentration dependence of surface tension. There has been little previous work on the effects of salt on the surfaces of ethylene glycol solutions. However, ethylene glycol is an attractive model solvent and these surface tension measurements compliment new sum frequency vibrational spectroscopy studies of the same interface.

Comparative Analysis of United States and Mexico Security Strategies

Cristian Martinez

Mentor: Caesar Sereseres

The United States-Mexico border extends 1,920 miles from San Diego, California to Brownsville, Texas. This region is affected by transnational flows of trade, tourism, organized crime, violence, environmental pollution, unauthorized migration, and the fear of terrorism since the 9/11 attacks. Policymakers and local communities (primarily, but not exclusively in the southwest region) are pressuring to secure the U.S.-Mexico border with physical barriers and/or technology-based security measures. The purpose of this research project is to present a comparative analysis on U.S. and Mexico strategies to secure the shared border; and to provide an understanding of the effects that border security policies and operations have on the broader U.S.-Mexico relationship. Interviews with scholars and public officials from the United States and Mexico provided assessments that compared the border security perspectives and strategies of each nation. Preliminary analysis suggests that Mexico is willing to improve border policy efforts as well as combat organized crime by implementing bilateral agreements with the U.S. on border security. Preliminary analysis also suggests that the United States may move away from traditional unilateral forms of border security, such as the Secure Fence Act of 2006—estimated to cost $1.8 billion for 700 miles of fencing—towards bilateral efforts such as the Merida Initiative—which promotes shared intelligence and technological-based security and is estimated to cost $1.5 billion. The tentative conclusion of this research is that the bilateral approach best serves the border security interests of both nations—leading to a more secure and efficient international border for Mexico and the United States.

Age Differences in the Expression of D1 and D2 Dopamine Receptor Synergy

Lesly Martinez

Mentor: Frances Leslie

In adults, full expression of dopamine-mediated behaviors such as locomotion and stereotypy are mediated via the combined actions of dopamine at the D1 and D2 dopamine receptors, a concept known as synergy. Previous studies in our lab using indirect dopamine agonists have suggested that adolescents may not require these synergistic actions to express maximal locomotor and stereotypic behavior. Our lab has also shown in males that the sensitivity to direct agonism at the D1 and D2 receptors changes with age. Therefore we hypothesized that there may also be an age difference in the extent of behavioral D1/D2 synergy. To test this hypothesis, we used two different combinations of low dose D1 and D2 direct agonists and measured the induction of locomotor and stereotypic behaviors. Two distinct D1 agonists were used: SKF83822, which activates D1 dopamine receptors that couple to adenylyl cyclase activation, and SKF83959, which couples to phospholipase C second messenger activation. The two agonists were administered in combination with the D2-like agonist, quinpirole. Our data supports our hypothesis that while synergy plays an important role regulating adult behavior, it does not play a major role during adolescence.

Verbal Working Memory in Spanish-English Bilinguals

Nancy Martinez

Mentor: Mary Louise Kean

Previous studies regarding verbal working memory have demonstrated that the phonological loop contributes to the retention of verbal materials. Limited data has also suggested that there is semantic processing in verbal short term memory. The objective of this study was to investigate the effects of the phonological loop and semantic processing on verbal working memory. To be more specific, the study further explored whether there is a phonological influence when processing semantic information and a semantic influence when processing phonological information. Our focus was on the processing of English in the Spanish-English bilingual population, through the use of semantic working memory task and a phonological working memory task. Though data is still being analyzed, limited information shows semantic effects of phonological processing and phonological effects on semantic processing in verbal working memory.

Military Institutional Culture in an Era of Counterinsurgency

Nick Masellis

Mentor: Caesar Sereseres

The United States is engaged in a global effort to exterminate Al Qaeda and subdue others who plan on future terrorist attacks. However, in Iraq, the U.S. military proved that it did not prepare for an insurgency and ethnic civil conflict. Similar to many past operations, the most recent being Vietnam, the military did not use a strategy based on an unconventional effort. Instead, Iraq offered an opportunity to test the concept of net-centric warfare—high technology and precision guided missiles. This took precedent in drafting the planning efforts. Though this transformation proved sufficient during the attritional phase of Operation Iraqi Freedom (*shock and awe*), it was not sufficient to address the potential of insurgency and nation building efforts. There are many current studies pertaining to the nature of counterinsurgency, yet there have not been many regarding the military culture and its ability to create and implement appropriate doctrine. The goal of this study is to review the cultural dynamic within the military and

examine what approaches to counterinsurgency may be realistic given that culture. Normative data acquired from experts in the field has demonstrated that there are two methods that are most practical and realistic when looking at the military institutional culture in a counterinsurgency effort. These results provide an approach to counterinsurgency that iterates some of the key points and fallacies within the U.S. Army counterinsurgency manual.

The Impact of a Working Memory Load on Problem Solving by Analogy
Nairi Mathewsian
Mentor: Lindsey Richland

In an era in which students are consistently tested on their proficiency in mathematics, learning to recognize similarities between taught and novel problems is essential. The presence of many simultaneous demands on working memory during instruction challenges students' ability to retain and use information from instructional analogies under these conditions. This study observes the impact of a working memory load on learning from analogy by presenting undergraduates with instructional videos on mathematics (permutation and combination) problems using high supports for comparison of the problems in one video (designed to reduce processing demands), versus low supports for comparison of the problems in the second video. Participants also completed a short exam based on the instruction, which consisted of questions that appeared similar to the instruction presented in the video and questions in which the appearance of the problems was misleading. Participants in one condition performed a phonological working memory load task as they viewed the instruction, while participants in a second condition had to ignore irrelevant audio distracters. Results indicate that the two types of secondary tasks differentially impacted learning. The audio distracter differentially affected performance based on the amount of support received during instruction, whereas the phonological working memory load differentially affected performance on questions of misleading versus facilitory similarity.

San Francisco Conservatory of Dance and Jírí Kylián
Krystal Matsuyama
Mentor: Jodie Gates

The San Francisco Conservatory of Dance is an institution where advanced dancers have the ability to further their education in contemporary dance both mentally and physically. At this institution many ingenious contemporary choreographers' pieces are studied. One of these talented individuals is the brilliant Jirí Kylián. I decided to focus on Kylián because I was initially drawn to *Nederlands Dans Theater* (NDT), a contemporary ballet company at which he is the resident choreographer. Because of his choreographic creations, *NDT* has achieved critical acclaim nationwide. I was strongly attracted to his choreographic style as a dancer and wanted to learn more about him and his choreography. At the San Francisco Conservatory of Dance, I was able to learn some of Kylián's choreography and learn more about who he is from the former artistic director of *Nederlands Dans Theater,* Glenn Edgerton. At the Conservatory, students are immersed in contemporary dance classes and choreography classes six days a week, for eight to ten hours a day. Within this time, I had the opportunity to speak and learn from Mr. Edgerton about Kylián and his choreographic work. From my time at the Conservatory, I learned not only about Kylián and his choreographic genius, but also about other contemporary artists and how to challenge myself as a growing artist.

Staatsballett Berlin Assistance Project
Krystal Matsuyama
Mentor: Jodie Gates

The Staatsballett Berlin is a ballet company located in the heart of Berlin, Germany. The company is directed by Vladimir Malakhov, current principal dancer of American Ballet Theatre (ABT, located in New York). With new beginnings, recently merging three former German ballet companies into one in August 2004, Malakhov wanted the company to perform more contemporary ballet works. For this reason, Malakhov contacted my mentor, Professor Jodie Gates, to create a contemporary work for the company. With the workload this type of choreographic commission entailed, Professor Gates felt she needed an assistant. I accompanied Miss Gates for two weeks in Berlin to assist her in creating a new ballet, titled "Courting the Invisible," for the Staatsballett Berlin company. During this time I was able to assist my mentor because I have worked with her for the past two years in her choreographic process in the dance department at UC Irvine. In addition to assisting her with this, I also learned about myself as an aspiring professional dancer and growing artist. Miss Gates is currently in Berlin finalizing the choreography, and "Courting the Invisible" will be premiered on May 18 along with works by William Forsythe and Clark Tippet at the Deutsche Staatsoper in Berlin.

Search for Silver Bullets: 3- to 5-mer Peptides as Crystallization Additives
Stephen Mayclin
Mentor: Alexander McPherson

In the attempt to establish high throughput protocols for the advancement of structural biology by means of x-ray diffraction, the overriding barrier has been the (in)ability to produce crystals of macromolecules of sufficient size for x-ray analysis. Currently, this is overcome on a case by case basis. Our experiments seek to optimize this process by developing a screen of small molecules that might stabilize lattice structures and promote crystallization. Based on the

success of previous experiments, my project tested the efficacy of using 3- to 5-residue amino acid chains to stabilize the lattice, based on the hypothesis that the polar nature of the molecules might form non-covalent electrostatic interactions between the target molecules of the crystal. The major obstacle in this project was the synthesis and isolation of amino acid chains of the appropriate length. This was done by devising a modified solid phase peptide synthesis scheme that not only allowed the synthesis of small chains, but also included a limited degree of variance, so that in the 24 solutions produced, we might test a much broader spectrum of molecules. Subsequently, the molecules were isolated and tested as additives to crystallization solutions. The goal of this was to determine which, if any, peptides produced a general trend of incorporation into and enhanced formation of crystals of several target proteins, such that the relationship might be generalized into a commercially viable screen for the enhancement of crystal growth. Results from these crystallization screens are pending.

Role of Anti-TLR2 Ligands in Increasing Adriamycin's Breast Cancer Apoptosis

Vikram Mehta
Mentor: Sastry Gollapudi

Breast cancer is a leading cause of death in women. Identifications of novel compounds that induce apoptosis in breast cancer cells, activate the host immune system, and synergize with chemotherapeutic agents provide novel approaches for the treatment of breast cancer. Toll-Like Receptors, TLRs, are pattern recognition receptors that are known to activate the host immune system and induce apoptosis. In this study we investigated the expression of TLRs on breast cancer cells and the apoptotic activity of anti-TLR ligands .TLR expression was determined by flow cytometry. Breast cancer cells were cultured with anti-TLR2 or TLR4 monoclonal antibodies, and apoptosis was determined by MTT assay. Results showed that breast cancer cells express TLR2 and TLR4 on their cell surface. Anti-TLR2, but not anti-TLR4, induced breast cancer cell apoptosis. These results suggest that TLR2 ligands may serve as novel therapeutic agents against breast cancer.

A Spatial Analysis of Gang Crimes in Colorado Springs, Colorado

Claudia Mendoza
Mentor: Al Valdez

The gang lifestyle has become part of mainstream American youth culture. Not only has it negatively impacted the lives of individuals, is responsible for a disproportionate amount of criminal activity. The purpose of this study was to examine the geographic locations of reported gang crime in Colorado Springs, Colorado to determine any correlation between socio-economic status and ethnicity. A Geographic Information Systems (GIS) program was used to analyze the data, and the results were shown with data generated maps. The maps could be used by law enforcement to direct or redirect resources towards areas of the city with higher gang related crimes. The results clearly represented gang crimes in Colorado Springs; however, the correlations between socio-economic status and ethnicity need to be further analyzed.

Generation of a Targeted Insertion Model of Huntington's Disease in Drosophila

Kimia Menhaji
Mentor: J. Lawrence Marsh

We sought to create a new transgenic model of Huntington's disease in *Drosophila* that allows one to easily compare the effect of various modified transgenes free of the potential influence of chromosomal location. The existing system of making transgenic *Drosophila* operates through a random insertion of the transgene; therefore, various expression levels and patterns are obtained depending on location, and this translates into a range of phenotypes. A new integration technology based on a phage integrase with site specific insertion allows one to direct the transgene to a specific site in the *Drosophila* genome where the expression of the construct is under more controlled conditions.

C5a Receptor Expression in C5a Antagonist Treated Alzheimer's Disease Mouse Models

Todd Metzger
Mentor: Andrea Tenner

Alzheimer's Disease (AD) is a common age-related neurodegenerative disease associated with the accumulation of amyloid-beta plaques and neurofibrillary tangles in the brains of afflicted individuals. Fibrillar amyloid-beta, *in vitro*, is able to activate both the alternative and classical complement pathways, leading to the production of C5a, a potent pro-inflammatory mediator. As a complementary part of ongoing work assessing the role of C5a in the progression of AD, the objective of this project has been to determine the relative levels of the receptors for C5a, CD88 and C5L2 in the brain tissue of AD mouse models treated with an antagonist to CD88. We have also obtained human AD brain tissue for detection of these receptors in order to establish a correlation between mouse and human data. Our attempts to characterize the relative levels of C5a receptor (C5aR) expression in mouse models have been hindered by our inability to specifically detect the C5aR protein by Western blot and immunohistochemistry. Investigation of this problem has determined that our anti-CD88 antibodies only recognize CD88 in its natural state as determined by FACS analysis. Our lack of specificity may be due to an inability of the existing C5aR antibodies to recognize the receptor in its denatured or modified

state. Despite our inability to effectively pursue our intended goal in mouse models of AD, we were able to characterize the relative levels of C5aR expression in tissue from human post-mortem brains. Our results with anti-mouse CD88 antibodies shed doubt on the conclusions drawn in published data in which CD88 was detected by immunostaining or Western analyses.

Studying Diverse Dance Techniques in Relation to Creating Movement Form, Function, and Aesthetic Shaping of Personal Expression

Julie Ann Minaai

Mentor: Lisa Naugle

Art can be a window to the heart and soul of expressing one's self, and through this medium a person can communicate to others ideas, concepts, artistry, or emotions. Dance and choreography have been my way of personal expression, which I wanted to explore and understand further. This past summer, I was given the opportunity to conduct a research project on developing choreographic skills and dance techniques while attending the American Dance Festival's six-week summer dance program. I wanted to learn and observe the way other choreographers and artists manipulated space, energy, time, movement and artistry. I attended three classes daily for the six weeks: Repertory workshop with Doug Nielson and Andrea Woods, focusing on the process of collaboratively developing a piece; Repertory workshop with Ursula Payne, researching the life and work of Dr. Pearl Primus; and modern technique with Ming-Lung Yang, concentrating on the kinesthetic values, momentum, weightiness of the body and origin of motion. After the festival, I began to choreograph works of my own, three movement study based pieces: *Observations* (study of fluidity), *Imprints* (breath and movement), and *[incomplete]* (study of athleticism, theatricality and props). They developed into pieces that focused on setting an environment, displaying kinesthetic aspects of dance, or weaving pedestrian movement with dance. My choreographic process and ways of approaching movement have changed in the sense that I focus on crafting movements with motifs and designing a piece with elements that structure different concepts, instead of only developing narrative dances.

Soccer and Fan Identity: A Fan Typology

Natasha Mirc

Mentor: Edwin Amenta

I examine the relationship between soccer team affiliation and identity in the U.S. Previous literature has examined the importance of fandom to identity in Europe and South America. Giulianotti created a typology for fan identity with four ideal types—supporters, followers, fans, and flâneurs—based on individual investment in a club, whether someone is more traditional or a consumer; and the degree to which the club is the central to self formation, hot or cool. While appropriate for European fans, Giulanotti's typology does not adequately explain soccer fans in the United States because there is too much emphasis on tradition and topophilic spaces, which is inappropriate in the United States where the league is still young and soccer is just beginning to gain popularity. Also, because the United States did not have a league until the mid 1990s, soccer fans could not form affiliation to local teams in the same manner as in Europe. I conducted ethnographic interviews and analyzed the different types of attachment and behavioral patterns of soccer fans in the U.S. to create a typology that addresses fans on a continuum of different levels of seriousness. I have created four ideal types: bandwagon fans, casual fans, serious fans, and supporters based on the ethnographic interviews. I have looked at fan behavior, processes of entering soccer culture, and group membership.

Generation of Concentration Gradients Using Microfluidic Devices

Wael Mismar

Mentor: Noo Li Jeon

The interactions between concentration gradients of guidance factors and nerve growth cones of growing axons are not fully understood. Current information comes from *in vitro* studies that deal with diffusible gradients of guidance factors that elicit repulsive and attractive response from the growth cone. However, it does not address the fact that most guidance factors in the nervous system are bound to cell membranes or the extrracelllular matrix. More *in vitro* studies dealing with substrate bound gradients are needed to help simulate this type of environment. To address this problem, microfluidic devices made of Polydimethylsiloxane (PDMS) were used. Solutions of Poly-L-Lysine (PLL) and Collagen were depleted in the PDMS devices on glass cover slips to generate desired gradients in the channels of the devices. These gradients were generated in single channel and multi-channel devices of varying designs. Decreasing concentrations of PLL and Collagen resulted in lower distances covered in the channels as well as decreased intensities. The generation of gradients was able to be made in a reproducible matter, which can be applied to future studies of neuron cell growth.

Quartz Crystal Microbalances as a Probe of Friction at the Microscale Level

Vishnu Vivek Mittapalli

Mentor: Peter Taborek

The goal of this experiment is to understand better the underlying physics of friction at the microscopic scale. We analyze friction at this scale with Quartz Crystal Microbalances (QCMs), which are high Q piezoelectric mechanical oscillators driven at resonance. The high quality factor of

unloaded crystals allows them to resemble a near-perfect harmonic oscillator without significant energy dissipation that would affect the response of the oscillator. The experiments measured the response of the crystal oscillator when perturbed by various loads in the time domain using a high speed oscilloscope, and in the frequency domain using a network analyzer. The results indicated that the response depends on the location of the applied load on the crystal, where a maximum response occurs at the center of the gold electrode atop the oscillator. Additionally, the response of the oscillator indicated a predisposition towards higher damping when softer loads such as rubber were applied, whereas harder materials such as Boro-Silicate glass and Teflon showed comparably insignificant damping responses. Ring-downs of the oscillator were studied by using a special high-speed IC mixer to discriminate between a viscous, velocity-dependent coupling of the applied load, leading toward an exponential decay of ring-down amplitude, and a velocity-independent friction that is proportional to the normal load, leading to a linear decrease in the amplitude.

Health Insecurities and Deficiences Affect the U.S.-Mexico Border

Jason Molina

Mentor: Caesar Sereseres

The purpose of this study is to assess health conditions and bi-national collaboration addressing health along the almost 2,000 mile stretch of the United States-Mexico border as a bi-national priority concern. The border has about 11.5 million people residing in 42 U.S. counties and 39 Mexican municipalities. There is a growing border population facing health insecurities; an increasing percentage regularly cross the border from Mexico to the U.S. and vice-versa. There are four major problems I found affecting border populations health in the U.S. and Mexico congruently: poverty, population growth, lack of health education, and lack of affordable quality health care. Population growth in condensed areas and lack of medical resources are major contributing factors to increased rates of Type II diabetes and HIV. In addition, due to lack of organization towards curable communicable diseases potential pandemics widely affect the population, including: maternal/infant/child health, infectious diseases, oral health, communal diseases, lack of immunizations and mental health; these are normally curable or controlled with minimal medical technology intervention, not costly investment. The departments of health in the U.S. and Mexico find themselves constrained by limited bi-national collaboration and resources, posing challenges for U.S.-Mexico rural health. In conclusion, substantial progress creating quality health care options along the U.S.-Mexico border remains challenging. Alternatives such as university care programs along the border are filling health care demand gaps from the growing border population in U.S. and Mexico. A bi-national border requires a bi-national solution. Bi-national collaboration between U.S. and Mexico is essential for an improved, developed and healthy shared U.S.-Mexico border.

Godspell

Michael Morales

Mentor: Daniel Gary Busby

Godspell was an endeavor by a group of undergraduate drama students to produce, prepare and perform a musical on campus outside the direct aid of the Drama department. The purpose was to give undergraduate actors, designers and directors the opportunity to work on a musical—a rare opportunity for BA students at this school. Developing this project, we came across all the financial and artistic obstacles one would expect of a musical, and discovered a few new ones, but in the end delivered a well received and artistically invigorating production to more than three hundred audience members. The fruits of our labors are evident already. We asked whether undergraduates could produce their own musical, and the conclusion was that they can and should. Already there is another production in rehearsals led by an all-freshman production team. Opportunities like *Godspell* can and should exist.

Evaluating α-Lipoic Acid as a Candidate Anti-Aging Compound

Marlene Morcos

Mentor: Mahtab Jafari

Among the oldest avenues of scientific research, the study of aging is now at the frontier. According to the free radical theory of aging, the process of aging is said to be the result of the accumulation of reactive oxidative species (ROS). ROS-caused damage to lipids, proteins, and nucleic acids leads to a decrease in cellular function, and consequently a decrease in overall organ function. Evaluating this theory, the study attempted to differentiate the potential of the antioxidant α-lipoic acid (LA) as a candidate anti-aging compound. Using *Drosophila melanogaster* as a model system in three assays, 75 μL of an LA/yeast mixture at various dosages was added onto the surface of the standard banana food supplement, allowing regular feeding patterns of the flies to ensure uptake of the compound. The flies were transferred onto a fresh food/drug medium every other day for a 28-day period, while the number of deaths of males and females was recorded with each transfer. While the three assays did not produce consistently significant data, they showed a decreased fraction of flies dying in males at 0.001 mg LA/mL yeast solution and 0.01 mg/mL, and in females at the 0.05 mg/mL dose. The inconsistent results of the assays highlight the importance of replicating scientific experiments and minimizing human error. Gaining promising results in the future will contrib-

ute to general conceptual understandings of the aging process, while providing valuable information for a potential drug candidate whose mechanism of action could successfully delay the aging process.

Iranian Female Undergraduates' Body Image Perceptions: A Psychosociocultural Perspective
Nicole Moshfegh
Mentor: Jeanett Castellanos

The recent increase in prevalence of eating disturbances encourages further examination of body image perceptions. Given the emergent population of Iranian undergraduates, it is important to observe the physical and mental consequences of negative body image perceptions. The purpose of this study was to examine the factors that contribute to Iranian female undergraduates' perceptions of body shape. Using a psychosociocultural framework with a survey design, the role of psychological (self-esteem and body image), social (body stereotypes and societal pressures) and cultural (ethnic identity, acculturation, and cultural congruity) variables were examined. Surveys were distributed to 100 Iranian female undergraduates at the University of California, Irvine. Preliminary findings support no differences by class standing for body shape perceptions. Significant correlations between body stereotypes, societal pressures, and perceptions of body shape may suggest that women who experience low self-esteem are more likely to perceive sociocultural pressures to become thinner, increasing the tendency to internalize the thin image as the ideal body type, resulting in body image disturbances. Findings provide insight for university centers to better address eating disorders when working with racial ethnic minority women, particularly Iranian undergraduates. Specifically, results can assist clinicians in understanding Iranian undergraduates' emotions, social systems, and cultural continuity as they relate to body shape perceptions. Directives for future research in working with Iranian student populations, given the limited literature on this student group related to college experiences and their educational barriers, were also highlighted.

Hardiness and Psychological Well-Being in College Students
Nicole Moshfegh
Mentor: Salvatore Maddi

The staggering increase in undergraduates seeking counseling services invites the examination of perceived stressors and coping mechanisms in the university setting. Some of the stressors that contribute to the development of mental health problems in college students include barriers to education, such as lack of finances a lack of familial support, a lack of mentors, cultural stereotypes, inhospitable campus climates, and a sense of cultural misfit. In dealing with the perceived barriers and stresses of higher education, the responses or personality factors that may help students cope must be assessed. Hardiness, an aspect of personality consisting of commitment, control, and challenge, has been shown to enhance performance and health despite stressful changes. The purpose of this study is to examine the impact of hardiness on the perceived educational barriers, cultural fit, and psychological well-being of undergraduates. A quantitative survey composed of measures of hardiness, perception of barriers, university environment, cultural congruity, and subjective well-being was distributed to 200 undergraduate students at the University of California, Irvine. As data analysis unfolds, it is hypothesized that hardiness acts as a buffer for the stressors undergraduates may experience while enrolled in college. Therefore, a hardy attitude will have a positive impact on subjective well-being.

Ethnic/Racial Differences in Medication Adherence Due to Cost Among Patients with Type II Diabetes
Shamik Mukherji
Mentors: John Billimek, Quyen Ngo-Metzger & Shamik Mukherji

Adherence to prescribed medication is integral to the effective management of Type 2 diabetes. Cost is a barrier to medication adherence, and the effect of cost on medication adherence across different ethnicities/races has not been examined. This study examined the disparate effects of financial burden on diabetes medication adherence across Non-Hispanic White, Hispanic, and Vietnamese patients with Type 2 diabetics and determined the effects of medication non-adherence on patient HA1c levels. 863 patients from five UCIMC family health clinics were given survey measures asking of their degree of medication adherence in response to financial burden. HA1c laboratory values were obtained from patient records. Vietnamese and Non-Hispanic White patients had high medication adherence averages (73.5%, 73.7%) despite financial burden, while Hispanic patients exhibited much lower medication adherence (39.6%). Good medication adherence was determined to be one of many factors contributing to positive glycemic control. Access to healthcare and sociocultural factors may contribute to medication non-adherence.

Control Beliefs when Faced with the Uncontrollable: Perceptions Influence Emotional Outcomes
Elizabeth Munoz
Mentor: Susan Charles

Perceived mastery is a powerful coping resource linked to positive mental and physical health outcomes, and is particularly beneficial when people are confronted with stressful life circumstances. In contrast, high levels of perceived constraints are negatively associated with mental and physical health outcomes, and are related to greater emo-

tional reactivity in response to daily stressors. This study extends these findings by examining the extent to which perceived mastery and perceived constraints influence how people react to an uncontrollable laboratory stressor. Participants included women over the age of 65 who underwent the Trier Social Stress Task, an acute laboratory stressor designed to elicit a stress response. In response to the task, individuals with high levels of perceived mastery reported higher levels of positive emotions, and reported feeling more accepted and liked during the task than those low in mastery. Individuals reporting high levels of perceived constraints were more likely to report feeling rejected and disliked during the task, and reported less intense positive emotions in anticipation of the task. These findings indicate that high levels of perceived mastery and low levels of perceived constraints buffer the negative emotional effects of acute, uncontrollable stressors.

The Performance of Hegemonic Masculinity: "Zuluness" and the Jacob Zuma Rape Trial

Jessica Newman

Mentors: Robert Moeller & Victoria Silver

While researching the current rape crisis in South Africa, I became interested in the popular support for South African politician and apartheid struggle veteran Jacob Zuma in his 2005–2006 rape trial. Moreover, I came to view the demonstrations outside the courthouse and media coverage of these demonstrations as pieces of a larger performance of a hegemonic expression of a specific Zulu masculinity. I consider how discussions of the trial became discussions of Zulu culture, and which tropes constitute this particular construction of the Zulu masculine identity. I examine the ways in which the news coverage of the demonstrations follows in a tradition of media representations of the Zulu nation in South Africa, unpacking and denaturalizing the pop-culture portrayal of the violent Zulu male "warrior." News coverage focused on moments of violence and radical support for Zuma, reiterating stereotypes about Zulu culture. Ultimately, I reject naturalizing and reductionist explanations of the "violent" Zulu male, and instead conclude that the construction of this hegemonic masculinity is the work of certain Zulu males and the popular news and media portrayals that mystify "Zuluness." Although images of Zulu masculinity are socially constructed and in essence immaterial, these stereotypes have material consequences for Zulu men and women. My primary example of such a consequence is Zuma's acquittal and the exile of his accuser. The emphasis on certain kinds of "Zuluness" and Zulu masculinity created a hostile climate that has serious implications for fighting rape in South Africa.

Yttrium-90 Therasphere® as a Therapeutic Modality for Unresectable Hepatocellular Carcinoma

Au Co Nguyen

Mentor: David Imagawa

Hepatocellular carcinoma (HCC) is one of the most lethal malignancies worldwide. The high mortality rate from HCC is primarily due to the reason that 90% of the cases are diagnosed when curative surgical resection is no longer an option. There is a need for effective treatments that increase survival while keeping toxicity low. In this study, findings of a restrospective analysis of yttrium-90 microspheres (TheraSphere®) as a treatment modality for unresectable HCC are determined. Thirty-five patients with unresectable HCC were considered for treatment. Nine were omitted because of high bilirubin levels, significant pulmonary shunting, or gastrointestinal bleeding. One patient declined treatment. Twenty-five patients were treated with hepatic arterial yttrium-90 microspheres from July 2002 to October 2007. Baseline, treatment, and follow-up data were collected and analyzed for each patient. Response was measured with CT or MRI imaging and evaluated by a modified RECIST criterion. Survival was analyzed with a Kaplan-Meier survival curve. Five percent of the patients had a complete response, 14% classified as partial response, and 30% classified as progressive disease. Kaplan-Meier analysis shows that one-year survival is 35%, and median survival was 188 days for the entire cohort. The data suggest that intra-arterial Yttrium-90 microspheres are relatively safe and appear to be an effective therapy for unresectable HCC. A multi-center randomized controlled trial is needed to further understand the efficacy of Therasphere.

Theta Burst Stimulation Increases Phosphorylation of Ampa Receptors in Dendritic Spines

Jennifer Nguyen

Mentor: Christine Gall

The phenomenon of long-term potentiation (LTP) is proposed as a model for memory. The AMPA-class glutamate receptor is responsible for the synaptic transmission and the induction of LTP; it is also proposed that the AMPA receptor play a role in maintenance of LTP expression. This study investigates the effects of LTP-inducing afferent stimulation on AMPA receptor phosphorylation in adult hippocampal synapses. LTP, induced by theta burst afferent stimulation, increases the level of phosphorylated AMPA receptor subunit GluR1, by several times. This increased GluR1 phosphorylation was observed at 30 min post-stimulation. Based on the results, we conclude that the strengthening of synaptic transmission during LTP expression involves a mechanism that includes AMPA receptor phosphorylation. Our next aim will be to determine the effects of LTP induction on the total number of membrane-bound AMPA receptors on post-synaptic synapses.

OPA1-Mediated Optic Atrophy in Drosophila Model
Kimberly Nguyen
Mentor: Taosheng Huang

Our goal is to establish a *Drosophila* model to study optic atrophy. This model may facilitate our understanding of pathogenesis of the disorder and the development of new therapies. Autosomal dominant optic atrophy is the most common hereditary form of optic atrophy. This disorder is characterized by central vision loss, color vision abnormalities, and degeneration of the retinal ganglion cells. The majority of autosomal dominant optic atrophies have been associated with mutations of the optic atrophy type 1 (OPA1) gene, a nuclear gene that encodes a mitochondrial protein. It is expressed ubiquitously and functions in processes including mitochondrial fusion, ATP production, and cytochrome-c mediated apoptosis. To establish a *Drosophila* model to study OPA1, we used several different *Drosophila* lines containing mutations in the *Drosophila CG8479* homologue of *OPA1* (*dOpa1*). We used a flippase/FRT genetic technique to generate somatic clones in the eye to study the effects of *dOpa1* mutation. Through this method, we found that somatic homozygous mutations in *dOpa1* resulted in a rough and glossy eye phenotype in the adult *Drosophila* eye, while heterozygous mutations in *dOpa1* resulted in no observable gross abnormalities. It was also found that the glossy phenotype present in *dOpa1* large mutant clones can be to some extent, reversed by the overexpressing human superoxide dismutase 1 (*hSOD1*). These results suggest the possibility of antioxidants as an effective treatment for OPA1-mediated optic atrophy.

Single-Cell Platforms for Microbiomechanics
Minh Guong Nguyen
Mentor: William Tang

Physiological changes in an individual cell are indicators of healthy and abnormal cell activities. Micro-biomechanics aim to leverage microtechnology to contribute the understanding of mechanical aspects of physiological behaviors at the cellular levels. The aim of this research is to develop the techniques to culture individual cells inside a microfluidic platform with parallel arrays of micro chambers, each of which is able to interrogate the mechanical properties of a cell at the micron scale with a custom-designed piezoelectric transducer. Successfully culturing cells inside the micro-environment is a crucial step towards demonstrating the effectiveness of the platform. This study presents the techniques developed for culturing cells in the microfluidic chamber for that purpose. The platform consists of an array of circular chambers, each connected to a cell loading channel and flanked by two perfusion channels. The cell loading channels introduce cells into the chamber while the perfusion channels replenish culture media. Culture media perfuse to the circular chambers through a 2 μm gap. Human carcinoma (HeLa) cells were successfully loaded into the microfluidic chamber, where cells were kept viable and continued to grow with temperature controlled at 37 °C. CO_2 independent culture media is supplied continuously. Cell growth inside each chamber is monitored regularly under an optical microscope. The preliminary results indicated the feasibility of using the microfluidic platform to monitor the different phases of cell growth kinetics. These promising results will lead to further investigation of cellular activities with improved future generation of the prototype devices.

The Significance of Inbreeding Depression in the Evolution of Distyly in *Oxalis alpina*
Nhu Nguyen
Mentors: Ann Sakai & Stephen Weller

A comprehensive investigation was carried out to determine the extent of inbreeding depression within a tristylous population of *Oxalis alpina* occurring in the Pinos Altos Mountains of New Mexico, an area where incompatibility relationships are highly modified from typical tristylous species. Modifications in the incompatibility system favor the short- and long-styled morphs while selecting against the mid morph under normal outcrossing conditions. Mid morphs may be retained in population through self-fertilization. The level of inbreeding depression was measured for different life history stages of *O. alpina* to determine whether self-fertilization can counteract the selective disadvantage resulting from modified incompatibility relations of the short and long morphs. Analysis of variance showed significant or nearly significant differences between selfed and outcrossed offspring for measures of germination, average flower number per scape, and survival. For these traits, the progeny of mid morphs showed less inbreeding depression than the progeny of short and long morphs derived via selfing, suggesting the possibility of purging in this morph.

Lipopeptide Immunization Combined with CD4+CD25+ Regulatory T Cells Depletion and CTLA-4 Blockade Protect Against Herpes Simplex Virus Type 1
Quan Nguyen
Mentor: Lbachir Benmohamed

HSV glycoprotein D (gD) is one of the major HSV Ags that produces protective immunity in animal models and humans and has great potential as a vaccine candidate against both ocular and genital herpes. As part of the development of a self-adjuvanting T-cell epitope-based vaccine against herpes, we have designed a novel T helper, T cytotoxic (HTL-CTL) chimeric lipopeptide prototype vaccine containing one immunodominant CD8+ T-cell human epitope (gD_{53-61}) covalently linked to the promiscuous CD4+ T-cell human gD epitope (gD_{49-82}) and extended by a palmitic acid moiety, as a built in adjuvant. The immuno-

genicity of this self-adjuvanting lipopeptide vaccine was studied in HLA-A*0201 Tg mice with or without CD4+CD25+ regulatory T cell depletion or CTLA-4 blockade. CD4+ and CD8+ T cell responses were quantified using: IFN-gamma ELISpot; *in vitro* CFSE proliferation, and cytotoxic CD107a/b degranulation assays. Based on the magnitude of induced T-cell responses, the HTL-CTL chimeric lipopeptides induced a potent HSV-1 gD_{53-61}-specific antiviral CD8+ T cell response in HLA-A*0201 Tg mice . In addition, a strong gD_{49-82}-specific CD4+ T cell response was detected by a CFSE proliferation assay. A high frequency of HSV-specific IFN-gamma-producing CD8+ T-cells were induced after administration of HTL-CTL lipopeptides. Depletion of CD4+CD25+ Treg cells before immunization with lipopeptides improved the induced T-cell responses. Interestingly, CTLA-4 blockade during lipopeptide immunization shows a synergistic effect and increases the protective efficacy of lipopeptide vaccination against ocular herpes challenge. We have demonstrated that a self-adjuvanting HTL-CTL lipopeptide prototype vaccine induced a strong HSV-specific CD8+ and CD4+ T cells responses. In addition, we demonstrated that a combinatorial vaccine strategy using CD4+CD25+ Treg depletion and CTLA-4 blockade provides better protective immunity against ocular herpes.

Stellar Occultation Light Curves

Thong Nguyen
Mentor: Asantha Cooray

This research describes a method to calculate the flux of a light curve during a stellar occultation by a planetary atmosphere with an arbitrary atmospheric pressure and temperature profile. To calculate the flux, simplifications are made to the model, which make the numerical calculations easier. This method calculates the flux for a light ray propagating through the atmosphere by using the first two derivatives of the refractivity at different radii along with the classical fourth-order Runge-Kutta approximation to the angle and its derivative. This code is shown to be a fast and efficient method to calculate the flux; furthermore, it will help show how different types of planetary atmospheres can affect the path of a light curve. The graphs of Flux vs. Radius that are shown in this paper will be for a power law and sinusoidal refractivity.

Assessing Methodology in a Comparative Study Between Tigecycline and Ceftriaxone Sodium Plus Metronidazole in Treating Patients with an Intra-Abdominal Infection

Tuong Van Nguyen
Mentors: Michael Burns & Shahram Lotfipour

Tetracyclines are antibiotics, available since the mid-1900s, that have been successful against serious bacterial infections such as intra-abdominal infections. Recently, however, resistance in bacterial organisms has become a great concern in community acquired infections. As gram-positive organisms continue to increase in resistance, very few agents are able to treat the infections they cause. This study looks at the effectiveness of tigecylcine, a glycycline, in treating patients with complicated intra-abdominal infections, in comparison to a commonly administered drug, sodium plus metronidazole. Qualified patients are randomized in either Group A or B. Subjects participate in the study for three to five weeks. This includes up to two days for screening and baseline visits for physical exams and medical history; two weeks for testing administration; and 10–21 days after the last dose for treatment-of-cure visit. Group A received an initial dose of 100 mg tigecycline, and 50 mg every 12 hours intravenously thereafter. Group B received ceftriazone sodium 2 g once daily intravenously plus metronidazole 1 g to 2 g daily intravenously. Previous research and studies have confirmed the effectiveness of tigecycline. Analysis of the results will be made for this double-blind randomized, Phase III study to confirm efficacy. This project assessed the methodology of this clinical trial and its essential role in the reliability of the results.

The Role of Valosin Contain Protein (VCP) Mutation in Frontotemporal Dementia: Characterization of a Novel Transgenic Mouse Model of FTD

Miriam Nojan
Mentor: Frank LaFerla

The intent of this study is to develop and characterize a novel transgenic line of VCP mutation in mice in order to map the pathological progression of FTD. A transgenic mouse model was generated that specifically overexpressed VCP neuronally, and immunohistochemistry was performed to assay histological patterns in transgenic and nontransgenic littermates six and twelve months in age. We found that the successful incorporation of the VCP trangene in mice contributed to age-dependent pathological disparities between experimental subjects and controls and moderate disease progression in mice up to twelve months of age. The results suggest that the pathological import of VCP mutation is likely age-dependent and requires additional investigation using subjects further in development to more completely probe the manifestations of the mutation. Additional studies assaying behavior concurrently with histopathology may be valuable in establishing a causal relationship between mutation and disease onset and ascertaining a timeline for the evolution of symptoms. In the future, such animal model paradigms could be applied clinically to map pathology patterns in patients, provide a subject base for experimental pharmacological agents, and investigate the interactions of VCP with other cellular components that could modulate pathological outcomes.

Would You Give your Memories a Facelift? Attitudes Toward Cosmetic Neurology

Guita Nouranian
Mentor: Kally Nelson

Research shows that if a person who has had a traumatic experience is given a certain drug (propranolol) within hours of that experience, the drug can dampen the memory of that event and minimize effects of post-traumatic stress disorder (PTSD). To assess people's attitudes toward propranolol, participants in California and New Zealand read a scenario about a traumatic assault. Our results reveal that although a substantial number of participants wanted the choice of receiving the drug, the majority of participants did not want to take the drug.

Screening *Rhodiola rosea* as a Potential Anti-Aging Drug in *Drosophila melanogaster* by Determining RNA and DNA Oxidation by HPLC-ECD

Pamela Ny
Mentor: Mahtab Jafari

The intent of this study is to determine the effects of the botanical, *Rhodiola rosea*, on nucleic acid oxidation. Studies have shown that *Rhodiola* is effective in slowing the progression of aging in *Drosophila* by decreasing the animal's mortality rate and increasing lifespan. The botanical is assumed to work as an antioxidant; therefore, we propose that it retards aging by protecting DNA and RNA from oxidative damage. We hypothesized that *Rhodiola*-fed *Drosophila* will have less DNA and RNA oxidation than flies fed without *Rhodiola*. Flies fed *Rhodiola* and flies fed without the supplement over a 1-, 2-, 3- and 4-week period had their nucleic acids collected by GTC-phenol-chloroform method and analyzed by high pressure liquid chromatography with electrochemical detection. These data show that *Rhodiola* has no affect on DNA oxidation, but significantly decreases RNA oxidation, and thus should be further explored in mechanism based studies.

Analysis of Dinitroaniline Resistance: The Effects of Double Mutations in *Toxoplasma* Alpha-tubulin

Roxanna Ochoa
Mentor: Naomi Morrissette

Protozoan microtubules can be disrupted by dinitroanilines. These compounds may provide insight for development of new anti-parasitic drugs, because dinitroanilines inhibit *Toxoplasma gondii* parasites without affecting microtubule function in vertebrate host cells. We previously isolated *Toxoplasma* lines resistant to dinitroanilines due to mutations in the parasite alpha-tubulin gene. In this study, we investigate the effect of paired mutations in the *Toxoplasma* alpha-tubulin gene. The mutations that we are most interested in understanding are located in the putative dinitroaniline binding site. A second mutation was introduced into a *Toxoplasma* alpha-tubulin gene containing a single mutation, and this gene was introduced into parasites using established methods. Parasites containing a homologous integration of the altered tubulin gene were characterized by measuring their resistance to increasing concentrations of oryzalin, profluralin, pendimethalin and amiprophos methyl (APM) using a previously established microscopy-based assay, and inhibitory concentration at 50% (IC_{50}) using a plaque assay. We also characterized the sensitivity of wild-type parasites and parasites with single point mutations in these compounds. Our current data indicates that in most cases the single mutations confer different resistance levels to distinct dinitroaniline compounds. This is consistent with a model in which unique functional groups on dinitroanilines interact differently with binding site residues. Moreover, in most cases double mutants do not synergize to increase resistance levels. We have generated many additional lines to assess for this study and will continue to measure resistance of the remaining parasite lines. This study will help us understand how specific amino acids in the alpha-tubulin protein interact to influence dinitroaniline resistance.

A Pan HIV Proteomic Chip for Subtype Specific Diagnosis of Viral Infection

Vladimir Ochoa
Mentor: David Camerini

Approximately 33.2 million people are currently living with the human immunodeficiency virus (HIV) worldwide. Over two thirds of these individuals live in Sub-Saharan Africa, which is also home to the highest genetic diversity of HIV-1 subtypes currently identified. Subtypes A1, A2, B, C and D are estimated to account for 75% of HIV-1 incidence worldwide. HIV-1 subtype-associated differences include antiretroviral drug resistance, transmissibility, pathogenicity, and effects on HIV-1 testing. There are currently no commercially available diagnostic tests for subtyping HIV-1 infection. The current approach on HIV subtyping is both expensive and time consuming and many attempts at surveying the molecular epidemiology of HIV has been biased by epidemiologic constraints. The purpose of our research is to develop a proteomic chip consisting of a complete array of the proteins of HIV-1 subtypes A1, A2, B, C and D that can be used to diagnose the subtype specificity of infection from human sera. We designed subtype specific primers to amplify HIV-1 genes via PCR. We used a high-throughput process for gene cloning and expression and printed proteins on nitrocellulose membranes. Results from immunofluorescent assays of the chip with monoclonal antibodies against HIV-1 and human sera from gp120 vaccinees showed a high degree of protein specific reactivity. To examine the diagnostic power of the proteomic chip we will assay the chip with subtype specific inactivated human sera from HIV-1+ individuals.