Healthy Kids, Healthy Lives: The Effects of Exercise and Nutrition on School-Aged Children with Behavior and/or Attention Disorders

Jacqueline O'Hagan  
*Mentor: Sharon Wigal*

A pilot study was conducted at the UC Irvine Child Development Center in an effort to investigate the feasibility of studying the link between physical activity, nutrition, attention and behavior in school-aged children with attention and behavior disorders in a day-treatment program. By evaluating these factors, researchers may be able to find a non-pharmacologic way to effectively reduce disruptive and/or inattentive behaviors. Physical activity plays an essential role in overall health in children. Research has shown that exercise of sufficient intensity and duration may naturally stimulate neuroadrenergic mediators that are commonly impacted by Attention-Deficit/Hyperactivity Disorder (ADHD) therapy and possibly alter attention. To investigate the relationship between lifestyle parameters and behavior disorders, parents of children enrolled at the UC Irvine Child Development Center were asked to complete weekly forms regarding their child’s food intake and outside physical activity. Cortisol samples were collected via cotton swab immediately before and at 1.5 hours after a 30-minute exercise regimen, which occurred twice a week over the course of eight weeks. Specimen were obtained at weeks 1 (baseline), 2, 4, 6, and 8 of the study. At one hour post-exercise, subjects completed a permanent productivity test of productivity. PERMP results demonstrate increased problems attempted indicating greater seatwork compliance following regular exercise over the course of the study. Statistical analysis of the PERMP results and cortisol results are pending. We conclude that it is feasible to collect activity data by questionnaire for investigations of the effect of an exercise program on the attention and behavior of children with Asperger’s Disorder, ADHD, anxiety disorders and high-functioning Autism. However, families found the nutritional logs to be a deterrent to study participation. Thus, future studies will be designed with this in mind.

MEMS Plasma Pump

Justin Odisho  
*Mentor: John LaRue*

Using plasma capabilities to move gaseous fluids offers the possibility to build pumping systems without mechanical movement and without flow control valves. A plasma pump is convenient for implementation in MEMS technology for delivery of testing samples for MEMS sensor cells, including flow direction control to multiple sensors. Originally a smoke was used for testing the functionality of the pump. Since the original use of smoke in the channel was causing problems with plasma formation a different approach needed to be taken. Therefore a dry particle generator was created by using acoustic waves generated by a speaker to suspend micro particles to be used in the plasma pump chamber. Talc powder was used to prove that the particle generator was working. Once it was proved that the particle generator worked Hollow Glass Spheres (HGS) with a mean diameter of 10 microns were selected to be used in the plasma pump channel. In order to analyze the flow a laser pointer will be used to shine a sheet in the chamber and the reflection of light will help capture the flow on a camera. The next step of the project will be to proceed to smaller particles that are self illuminating, Quantum Dots. The Quantum Dots will have a longer settling time and will allow the particles to be more visible in the channel than the HGS.

What is Research in the Virtual World?

Madlyne Oliver  
*Mentor: Alka Patel*

Web-based research tools and online academic spaces were explored in order to understand how the virtual world is used for seeking and exchanging information. A widely accessed Web-based tool in the virtual world is the online archive. For this reason, an online archive of Associate Professor Alka Patel’s collection of scholarly sources was created through virtual interface provider Zotero. Approximately 900 bibliographic entries were archived labeled with the predetermined metadata tags in order to categorize each entry appropriately. At the same time, one-hundred digital images were selected from a personal photo collection documenting Andalucian architecture. These images were edited in Google Picasa and Lightroom, and then labeled with the appropriate metadata for submission to SAHARA (Society of Architectural Historians Architecture Resources Archive). Such Web-based tools for cataloging images and articles facilitated close observations of art historians’ use of the virtual space for personal research and the public exchange of visual data. Anthropological training in participant observation aided the exploration of these Web-based tools, revealing an encouraging intimate relationship between the researcher and his or her subject matter. Related literature indicated that academics frequently use Web-based tools for information-collecting purposes, in which disciplinary fields overlap.
While research in the virtual world provides a new intimate relationship with the subject and interdisciplinary interaction, its authority as a source is heavily questioned by academics who still prefer non-Web-based tools, or physically conducted research for seeking authoritative information.

**Activation of Catalytic Lysine in mRNA Capping Enzyme**

Chau Ong

*Mentors: Rommie Amaro & Rob Swift*

The mRNA-capping enzyme is a member of the nucleotidytransferases superfamily, which share a similar tertiary structure and catalytic mechanism. It catalyzes the synthesis of the 5' cap and is vital for the production of mature mRNAs. A key step in the mechanism is the formation of a lysine-GMP intermediate from a nucleophilic lysine (Lys72) and GTP in an S₈S₂-like process. In this study, we use molecular dynamics simulations and pKa analysis of the Paramecium bursaria chlorella virus mRNA-capping enzyme to examine possible general bases that may deprotonate the nucleophilic lysine. In particular, we focus on two key aspartates, Asp74 and Asp203, due to their proximity to Lys72. Moreover, previous structure and kinetic data suggest that Mg²⁺ plays a catalytic role. To explore the possible effects of Mg²⁺ on Lys72 deprotonation, we carried out our analysis on two models. The first contains Mg²⁺ coordinating α-phosphate of GTP, while the second lacks Mg²⁺. Our analysis suggests that the enzyme does not make Lys72 more acidic (pKa 11.4), but that Mg²⁺ does significantly alter the pKa value (pKa 8.4) of Lys72. Despite the greater predicted basicity of Asp74 (pKa 6.02), Asp203 (pKa -0.78) is closer to Lys72, making Asp203 the more likely general base. The predicted pKa values and MD conformations suggest that initial deprotonation of Lys72 by Asp203 may be followed by proton transfer to Asp74. On the other hand, proton transfer might occur between Lys72 and nearby water or a GTP α-phosphate oxygen atom, possibilities that we are currently exploring.

**Analysis of Neuronal Activation in Response to the Tobacco Smoke Constituents Nicotine and Norharmane**

Hilda Ortiz

*Mentor: Frances Leslie*

Tobacco smoking substantially increases the risk for disease and premature death. Pharmacological cessation aids available to help smokers quit generally target nicotinic systems. However, these therapies are not very effective. Additionally, nicotine is weakly reinforcing compared to other drugs of abuse, suggesting that nicotine alone might not be responsible for tobacco addiction. In a previous study, rats intravenously self-administered nicotine, norharmane, a non-nicotine tobacco constituent, or a combi-

**Expression and Purification of Channelrhodopsin-2 in Escherichia coli**

Dane Osmond

*Mentor: Hartmut Luecke*

Channelrhodopsin-2 (ChR2) is a photon activated selective ion channel responsible for low-intensity photocurrents in archaea, prokaryotes, and eukaryotes. The structure of ChR2 resembles the structure of G-protein coupled receptors due to the characteristic seven-transmembrane helices. Previous studies have expressed several isozymes of ChR2 as well as its homologues using HEK293, BHK, and Drosophila cell cultures in order to understand its mechanism and function. However, the structure of ChR2 is unresolved due to difficulty in expression and purification of integral membrane proteins. Using analogs of ChR2 discovered in several species of algae such as Tetraselmis striata and from *E. coli*, ChR2 can be derived by determining the amino acid residues necessary for the mechanism of activation and inactivation of ChR2. My goal is to purify ChR2, following expression of the membrane protein in *Escherichia coli* (*E. Coli*). Once the structure of ChR2 is determined, further studies can be carried out in drug design, determining mechanisms for activation and inactivation, and structure resolution of ChR2 homologues in other organisms.

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**Eighteenth Annual UCI Undergraduate Research Symposium**
Sibling Relationship Quality and the Acquisition of Theory of Mind in Children with Autism Spectrum Disorder

Lucila Osuna  
Mentor: Wendy Goldberg

Autism Spectrum Disorders (ASD) are characterized by deficits in socio-communication, and individuals with the disorder often have difficulty interacting socially with others. Additionally, the majority of individuals with ASD lack of theory of mind (ToM), or the ability to infer the mental states of others. This study strives to determine whether sibling relationship quality enhances theory of mind development in children with ASD as well as typically developing children, as previous studies indicate that typically developing children with siblings perform better on theory of mind tasks than children with no siblings. Positive sibling relationships have been shown to aid in the acquisition of socio-communicative abilities by improving children’s executive functioning. Conversations and interactions between siblings enhance executive functioning which may in turn contribute to the development of theory of mind. The Sibling Relationship Questionnaire was used to determine sibling relationship quality; a variety of ToM tasks such as the “Sally-Anne” and “Smarties” false-belief tasks were administered to measure participants’ verbal and non-verbal ToM performance. Multiple regression will be used to determine whether ASD diagnosis and sibling relationship quality predict ToM performance. A positive correlation between sibling relationship quality and ToM performance is hypothesized in both typically developing children and children with ASD; however, it is predicted that there will be a stronger relationship between these two variables in children with ASD.

Characterizing the 3-D Micro-Environment in a Strain Gradient Device Using Active Microrheology

Breanna Padilla  
Mentor: Elliot Botvinick

Understanding how mechanics direct cellular phenotype, proliferation, and migration, is crucial for developing and improving cellular based therapies. Previous studies have demonstrated that in a two-dimensional environment, cellular processes are influenced by extracellular matrix (ECM) substrate stiffness. Studying cellular behavior in a 2-D model neglects parameters including molecular diffusion through a fibrin network, therefore, cellular behavior must be studied in 3-D environments as they would be found in the body. A novel stress gradient device was created to apply a stress to the ECM in order to observe cellular behavior under the influence of 3-D ECM mechanics without hindering molecular diffusion. By using laser-tweezer particle tracking, we directly measure the mechanics of fibrin ECM as strain is applied. This technique allows for characterization of the strain gradient found in fibrin ECM, which is vital to the investigation of cellular behavior in response to a change in ECM mechanics. Active microrheology measures the local mechanics of a fibrin mesh network by observing the magnitude and phase difference between the probe particle position and oscillating laser trap during a frequency sweep; these measurements yield the local elasticity of fibrin fiber. We thoroughly characterize our stress gradient inputs using active microrheology to test the hypothesis that the stiffness of the fibrin network will see greater strain-hardening in the presence of Normal Human Lung Fibroblasts (NHLFs) in contrast to an acellular fibrin gel. Understanding the ECM mechanical inputs necessary for cellular control may be an integral part in the design of tissue engineered implantable materials where cells actively remodel their substrate.

Epileptogenesis and Cognitive Deficits Provoked by Prolonged Experimental Febrile Seizures: Biomarkers and Mechanisms

Maria Pakhdikian  
Mentor: Tallie Z. Baram

Whether long febrile seizures (FSs) can cause epilepsy in the absence of genetic or acquired predisposing factors is unclear. Having established causality between long FSs and limbic epilepsy in an animal model, we studied whether: (1) long FS will induce MRI changes in the hippocampus within hours and days after the inciting FS in a subgroup of animals; and (2) these MRI abnormalities will predict which rat will develop spontaneous recurrent seizures (i.e. temporal lobe epilepsy) and/or cognitive dysfunction. EEGs were recorded and analyzed in order to observe spontaneous seizure activity. Cognitive tests were performed to test whether learning and memory performances were altered in rats that experienced long FS. We found that: (1) Long FS induce acute MRI changes in hippocampi of a subset of rats experiencing long FS (75%)—at this stage of the study we do not know whether they are predictive or not of epilepsy and/or cognitive deficits; (2) experimental long FS cause limbic epilepsy in 75% of the rats and interictal activity in all of them; and (3) Experimental long FS may lead to cognitive deficits that may progress over time.

The Influence of N Source and Fertilizer Application on Growth of a Tropical Pitcher Plant, Nepenthes sanguinea

Boyang Pan  
Mentor: Diane Pataki

Nitrogen (N) is essential for protein and chlorophyll formation; thus, N deficiency could result in a loss of plant productivity. A carnivorous species found in the nutrient-
poor region of Malay Peninsula, *Nepenthes sanguinea*, is able to subsidize the soil’s N supply by consuming insects. This species is also a popular horticultural cultivar. Although this species is adapted to obtaining N from insects, many nurseries recommend small amounts of nitrogen fertilization, while others recommend no fertilization. There has been very little research on the N dynamics of carnivorous plants, and we currently do not have a clear understanding of preferred N sources of *N. sanguinea*, or how different N sources affect the growth of carnivorous plant species. To improve our understanding of the N dynamics of *N. sanguinea*, we set up a factorial experiment in which different groups received insect prey and/or inorganic N fertilizer. We used natural abundance N isotopes to determine the amount of plant N derived from each source. We found that plants that received no insects and no fertilizer had very low concentrations of leaf N. However, leaf N in plants that received insects was unaffected by the addition of fertilizer. In addition, plants that received insects were greatly enriched in N isotopes, indicating uptake of insect-derived N. The measurements of biomass suggest that insect-derived N increased plant growth more than fertilizer-derived N. This information will improve upon the current cultivation methods of *Nepenthes*, and help growers to produce fully developed plants.

**Theory of Moral Choice: Case Study Application**

Erika Parkins  
*Mentor*: Kristen Monroe

Professor Kristen R. Monroe set forth the Theory of Moral Choice, which serves to explain why people choose to help others in time of great peril. Her book, *The Hand of Compassion*, explores her theory in the context of numerous interviews with rescuers of Jews during the Holocaust. The narratives provided by the rescuers supplied data that confirmed the theory. The goal of this study was to expand the application of the Theory of Moral Choice to people who demonstrated moral behavior in other conflicts. Three people were chosen as case studies: Romeo Dallaire, the force commander of the UN mission to Rwanda in 1993-1994; Brian Steidle, a U.S. military observer in Sudan; and Betty Bigombe, who has been involved in peace negotiations to end the insurgency of the Lord’s Resistance Army (LRA) of Uganda since 1994. All the case studies examined through the lens of the theory showed that the ethical perspective, shaped by identity that includes the view of self/others, world view, values, agency, categorization, and idealized cognitive models effects the menu of options available to the individual during precarious situations. The analysis of these case studies can be used to provide general support for the Theory of Moral Choice and to expand the scope of the theory’s application.

**Surfactant Induced Neuroprotection following Mechanical Injury during Cryopreservation**

Shaudee Parvinjah  
*Mentor*: Jorge Busciglio

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

**The Actor's Journey: Making a Career in Show Biz**

Ian Parmenter  
*Mentor*: Myrona Delaney

Thousands of theatre and drama students graduate every year, and many of them have aspirations to pursue a professional career in acting. Many of these hopefuls dive head first into one of the nation’s most competitive industries, gritting their teeth and hoping for the best. Popular belief among many in the entertainment industry is that an actor must move to Los Angeles or New York, the nation’s entertainment hubs, in order to sustain an acting career successfully. Young actors who choose to make this leap are often required to abandon any sense of security in their life and commit themselves to a career and lifestyle that is entirely absent of stability. In a series of interviews, I have asked actors pursuing professional careers to describe their experiences in New York and Los Angeles. They discuss the development of their journey in the entertainment industry, and describe the importance of training, nerves of steel, a sense of community, and friendship.
The Role of Lhx2 in the Development of Corpus Callosum in Mice
Fenil Patel
Mentor: Edwin Monuki

The development of corpus callosum, which is the bundle of nerve fibers connecting the two hemispheres of the brain, involves a precise arrangement of chemical cues and support structures, such as the glial wedge and indusium griseum. Disruption of any of these support structures leads to a condition called agenesis of corpus callosum observed in 1 out of 4,000 births in humans. In this study, the effects of Lhx2 transcription factor on the development of corpus callosum in mice using the Lhx2 conditional null mouse model driven by two Cre recombinase lines (Emx1-Cre and Nex-Cre) were studied. Moreover, the phenotype of agenesis was characterized at different developmental stages in mice. The agenesis of corpus callosum resulting due to the loss of glial wedge was observed in the Emx-1 mutant mice suggesting the important role of Lhx2 transcription factor in the corpus callosum development.

Heparin Neutralization by Synthetic Polymer Nanoparticles
Jiten Patel
Mentor: Kenneth Shea

Heparin is a natural anticoagulant used in many medical applications to prevent clotting, such as during renal dialysis or surgical procedures. Its presence can be problematic if it cannot be regulated properly, putting the patient at risk of hemorrhaging and prolonged bleeding. The current neutralization of Heparin is done by the highly cationic peptide protamine sulfate. However, the use of protamine sulfate carries the risk of allergic reactions and serious cardiovascular side effects. Past studies on the binding of Heparin with synthetic polymer nanoparticles, done using Isothermal Titration Calorimetry (ITC), show that certain nanoparticles have a strong affinity towards Heparin. To further develop the nanoparticle-Heparin interaction, we analyzed the ability of positively charged nanoparticles to inactivate Heparin by using the COATEST assay. The assay determines colorimetrically the amount of Heparin bound to nanoparticles. We have synthesized positively charged nanoparticles which have shown affinity to Heparin through the COATEST assay. Our data support earlier ITC studies and confirm the strong affinity of the nanoparticles to Heparin. The synthetic nanoparticles show their potential as an alternative Heparin inhibitor by effectively reducing Heparin’s capacity to inactive clotting factors.

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

Diabetes mellitus is a condition in which the body either does not produce enough, or does not properly respond to, insulin, a hormone produced in the pancreas. Patients with diabetes mellitus may develop a wide variety of problems, including high blood glucose levels, production of ketone bodies, or diabetic ketoacidosis. Our study sought to investigate what gases are exhaled by Emergency Department patients at UCI Medical Center who have diabetes mellitus. Although exhaled gas analysis in previous studies such as the Urea Breath Test for Helicobacter pylori infection and the Breath Hydrogen Test for intestinal malabsorption have been commonly used for decades, the precise quantities of the various gases have not been correlated with the patient’s disposition. If such a correlation exists, exhaled breath analysis might be developed into a diagnostic tool in the future. To address this question, diabetic patients were approached for consent. Patients were asked to breathe into a stainless steel canister through a Teflon straw. Additional gas samples of the room, a healthy control, and of Mr. Gartner were obtained for controls. The canisters were analyzed by three Gas Chromatography systems at the Rowland/Blake laboratory on the UCI main campus. Patients as a whole seemed to have higher levels of CH₄, CS₂, CH₃CN, CCl₄, DMDS, butane, 2-pentanone, acetone, and methyl nitrate. Higher levels of these gases could potentially be used as tracers for diabetic patients in the future.

Development of a Molecular Imaging Phantom for Diffuse Optical Spectroscopic Imaging
Payal Patel
Mentor: Albert Cerussi

Spectral fingerprints that identify malignant lesions in breast tissue represent small shifts in the environment and state of molecules such as hemoglobin, water, and lipids. We have recently discovered spectral fingerprints that only exist in breast lesions and separate fibroadenoma from infiltrating ductal carcinoma. The method used to measure these specific tumor components (STCs), appears to be unaffected by breast density and normal tissue heterogeneity. However, the molecular shifts manifest as small shifts in absorption spectra and the detection limits of the STC are not well understood. To model the detection limits of the STC, we have designed a tissue-simulating phantom that features small and controllable spectral shifts. The phantom simulates the optical properties of breast tissues in terms of overall scattering and absorption. The spectral shifts are controlled with two dyes that have similar but not exactly the same absorption spectra: Methylene blue as
normal tissue and Methylene green as malignant tissue. We used Diffuse Optical Spectroscopy Imaging (DOSI) to measure a series of phantoms containing very small (<1% absorption change) to very large (~ 50% absorption change) to see if the effective STC could be detected. The background optical properties and the effect of scattering were also considered. The implication of these results upon the detection of breast lesions will be discussed.

**Effect of Prenatal Exposure to Benzo-a-pyrene on Epidydimal Sperm Morphology**

Reshma Patel  
*Mentor*: Ulrike Luderer

Benzo-a-pyrene (BaP), commonly found in burned food and cigarette smoke, is a pollutant known to cause cancer and decreased fertility in mouse models. With its antioxidant properties, glutathione is a nutrient that reacts with such toxic chemicals to prevent damage to cellular functions. Previous studies have shown that exposing developing male mice to BaP in utero caused testicular damage and decreased fertility. We hypothesized that male mice with a deficiency in glutathione synthesis would be more sensitive to the in utero reproductive toxicity of BaP, and would, therefore, have more abnormal sperm morphology than their wild type littersmates. Female Gclm+/- mice were mated with Gelm+/+ male mice and were treated orally with either 0 or 2 mg/kg body weight of BaP in oil during days 7–16 of their pregnancy. Male mice born from those litters were sacrificed at 10 weeks and their epidydmal sperm was collected for assessment of sperm morphology. Abnormal sperm included immature sperm distinguished by the presence of a cytoplasmic droplet, abnormally shaped head, and abnormally shaped tail. There was no significant effect of Gelm genotype or BaP treatment on the percent of immature sperm or sperm with abnormal tails. The percent of sperm with abnormal heads was increased in the untreated Gelm-/- mice relative to the other groups. This study showed that overall there is no significant impact of prenatal exposure to BaP alone or BaP interaction with glutathione deficiency on sperm morphology.

**Analysis of CBP Regulation in CA3 Dependent Memory**

Rohan Patel  
*Mentor*: Marcelo Wood

Chromatin is a condensed form of DNA that is bound by associated proteins, including histone proteins, that regulate gene transcription. Gene regulation plays a major role in long-term memory formation and is modulated by acetylation and deacetylation of histone proteins. Histone acetyltransferase (HATs) and histone deacetylases (HDACs) play a pivotal role in regulating gene transcription in the hippocampus. One HAT that has been studied in the hippocampus is CREB Binding Protein (CBP). Genetically modified CBP-FLOX mice allow for a deletion of CBP in specific brain regions with AAV-Cre, which expresses Cre-recombinase, deleting CBP in these genetically modified mice. I deleted CBP in the CA3 region of the hippocampus because the CA3 has been shown to be associated with long term contextual spatial memory. With the deletion of CBP in the CA3, there should be a drastic reduction in long-term contextual spatial memory. CBP-FLOX and wild-type mice were infused with AAV-Cre into the dorsal CA3 region. This experiment ran into several problems ranging from incorrect infusion coordinates to not enough virus being infused into the region of interest. This is due in part to the region’s small size and the closely neighboring regions that should be avoided. This requires further research into other methods of how to infuse the mice to acquire the planned results.

**Transforming Growth Factor Beta-1: Comparative Analysis of the Gene Expression Pattern in Wound Healing and in the Formation of Ectopic Blastemas**

Pauline Pau  
*Mentor*: David Gardiner

Urodele amphibians are unique among adult vertebrates in their ability to regenerate many of their body parts following injury or amputation. Particularly interesting is their ability to heal wounds without scarring. One family of growth factors implicated in the control of all aspects of wound healing is the transforming growth factor beta family. TGFβ-1 has been shown to be essential for limb regeneration and is involved in the scarring process. In this study, fold changes of TGFβ-1 were analyzed in different stages of wound healing with and without nerve deviation. To avoid amplifying the wrong TGFβ isoform, primers specific to TGFβ-1 were designed within the non-conserved region of the sequence. Different time points were analyzed in wounds with and without nerve deviations and expression of TGFβ-1 have been found to be variable from each other. Variability in gene expression is suspected to arise from differences in wound healing. Absence of the nerve in the wound resulted in more collagen in the mesenchyme suggesting that the nerve may play a role in altering the levels of TGFβ-1 to confer scarlessness.

**Using MRI to Detect Connections in the Brain: Evaluation of “Shortest Paths Approach” to Tractography**

Edgar Pena  
*Mentor*: Frithjof Kruggel

DT-MRI is an imaging modality that allows visualization of physiological cross-sections by providing information about water diffusion. While we can extract more informa-
tion from the water diffusion data, such as directions of neural fibers, the processing techniques for doing so are limited by the low resolution and propagation of deviations from the true fiber path. We evaluate a novel proposed algorithm that purports not to suffer from this propagation of deviations. We implemented the algorithm to work in three dimensions, processing synthetic DT-MRI data at varying degrees of noise. With very low noise data, the algorithm exhibits certain systematic types of error. We found the principle shortcomings of the basic implementation of this algorithm when processing regions of very high anisotropy, where the true path does not follow one finite number of possible directions considered, and fibers with constantly changing direction. Finally, we propose modifications that may alleviate these shortcomings. By developing an accurate neural tractography, we can obtain information about neural connectivity in vivo, which would be useful in furthering medical research and diagnosis.

Automated Testing of Materials
Genaro Perez-Selsky
Mentor: Martha Mecartney

Automation is making a significant contribution to scientific research, since testing of materials involves many hours of monitoring, data acquisition and measurements. Computer programming tools, such as LabVIEW, can be employed to work in conjunction with data acquisition devices (DAQ) to perform measurements continuously for extended durations, resulting in efficient data collection. Three different types of experiments were selected for automation. Impedance measurements of fuel cell electrolytes to determine the ionic conductivity can take 10-1000 hours and, without automation, data collection requires constant supervision. Compression tests of superplastic ceramics at extremely high temperatures (>1000 °C) typically run from 12-72 hours while collecting data on deformation under load to determine the strain rate. The dissolution of ceramic matrices used to contain mosquito pesticide must be monitored for times up to 24 hours and data on temperature, pH, and conductivity are collected to determine dissolution rate. This research demonstrates, using these examples, that the use of automation tools greatly increases productivity and efficiency in the laboratory.

Mechanical Evaluation of Thermally Reactive Poly(N-isopropylacrylamide) as Sensors in Microfluidic Chips
Noemi Perlas
Mentor: Steven George

Poly(N-isopropylacrylamide), commonly referred to as PNIPAAm, is a thermally responsive hydrogel which undergoes changes in phase and structure based on the difference between its present temperature and its lower critical solution temperature (LCST). Such a capability makes it optimal for use in the controlled release and manipulation of fluids at smaller volumes, specifically in autonomous infusion systems. The Anton Paar MCR301 rheometer was used to assess PNIPAAm’s changes in volume, shape, and stiffness throughout multiple temperature sweeps from 0 to 50 degrees Celsius. At a rate of change of 2 °C per minute, the gel expanded dramatically widthwise and became less uniform in thickness as the temperature increased, acting in the opposite manner when decreased. Once the difference between temperatures reached and exceeded 35 °C, the change in the hydrogel’s physical qualities plateaued, retaining the same approximate volume and thickness. Graphical data of the storage and loss modulus also indicated a loss of energy over time as the sweeps changed direction in temperature.

Nevada's Unique Economic Experience 1930s
Syuzanna Petrosyan
Mentor: Gary Richardson

The Great Depression was the deepest economic contraction for most of America. Nevada was an exception. My research explores how Nevada’s unique economic and social characteristics insulated this state from the economic downturn. Everyone knows part of the story. Las Vegas, an entertainment capital of America, began to boom in 1930s. Nevada had other strengths that people are unaware of, which include a very stable and successful mining industry. Moreover, the services that this state’s citizens provided remained valuable through this current national turmoil.

Health Behavior Changes among Cervical Cancer Survivors Participating in a Randomized Clinical Trial
Lynh Pham
Mentor: Kathryn Osann

Women with cervical cancer experience profound emotional distress and compromised quality of life (QOL), which may further impact survival. Health behaviors including smoking, exercise, alcohol consumption and diet have been associated with QOL and may influence cancer recurrence and survival. This study investigates the ability of a psychosocial telephone counseling (PTC) intervention to improve health behaviors and QOL for cervical cancer survivors. Fifty women were randomly assigned to PTC or usual care (UC). QOL and health behaviors were assessed at baseline and four months post-enrollment in 36 participants. Health behaviors were compared between groups at baseline and follow-up using chi-square tests. Associations between change in QOL and change in health behaviors were investigated using repeated measures analysis of variance. Women who received PTC were more likely to im-
The Effect of Obesogens on Mesenchymal Stromal Stem Cells in Relation to Obesity
Nhieu Pham
Mentor: Bruce Blumberg

The prevalence of obesity in adults as well as in children is considered to be a public health epidemic in Western countries, particularly in the United States. The “environmental obesogen” hypothesis proposes that there are environmental chemicals that may alter lipid homeostasis and lipid accumulation, thereby contributing to the development of obesity. Among the many examples of environmental obesogens are organotin compounds. Here we were able to show that the commonly used fungicides, triphenyltin (fentin) and triflumizole, are potential obesogen candidates. We found that TPT and triflumizole both activate the hormone receptor PPAR, which is the major regulator of adipogenesis. Accordingly, results of in vitro adipogenesis assays showed that TPT and triflumizole both induce murine 3T3-L1 preadipocytes and human multipotent mesenchymal stem cells to become adipocytes. Both chemicals elicited increased lipid storage in and the induction of adipocyte marker genes in these cells. We concluded that TPT and triflumizole are likely to be obesogenic and may be contribution to the burgeoning obesity epidemic.

Identification of Sequence Determinants that Regulate Nrf1 Stability
Diane Phan
Mentor: Jefferson Chan

Nrf1 is a transcription factor that plays a critical role in oxidative stress. However, little is known about how Nrf1 is regulated. Preliminary data indicates Nrf1 is an unstable protein. In order to identify sequences responsible for Nrf1 stability, N-terminal deletion mutants of Nrf1 were constructed. The stability of the N-terminal serial deletion Nrf1 mutants was assessed through a time-course treatment with cycloheximide and compared to wild type Nrf1 via Western Blotting. Deletions of 95 or 200 amino acids from the N-terminus of Nrf1 stabilized the protein, but deletions of 305, 400 and 492 amino acids resembled wild type Nrf1. These findings suggest different regulatory mechanisms for the stabilization of Nrf1. Nrf1 could be degraded in different locations inside the cell, and its association with other unstable proteins could also cause its degradation.

Human Embryonic Stem Cell-Derived Oligodendrocyte Progenitor Cells Express Growth Factors after Transplantation and Reduce Inducers of Astrogliosis
Kevin Phan
Mentor: Hans Keirstead

Astrogliosis represents the greatest barrier to central nervous system (CNS) regeneration. Repair processes such as neurite branching and long-distance axonal outgrowth, neovascularization and reestablishment of the blood brain barrier, and remyelination evoke the regenerative capacities of the CNS after trauma. However, these processes are limited by concurrent scar formation, and no treatments, to date, effectively treat astrogliosis. After CNS trauma such as spinal cord injury (SCI), scar formation is critical to suppress secondary degenerative processes, such as apoptosis and demyelination, and also to stimulate repair processes, such as angiogenesis. Based on the duplicity of astrogliosis, treatment for SCI will require a multifaceted approach to interact or interfere with scar formation and yet maintain a viable environment. Our laboratory has previously demonstrated that human embryonic stem cell (hESC)-derived oligodendrocyte progenitor cells (OPCs) pervade the injury cavity, interpolate with the host tissue, and promote tissue survival. Here, we further examine the interaction of hESC-derived OPC transplants on functional and histological outcomes and test the ability of transplants to affect astrogliosis in a SCI model. Neurotrophic factors, including BDNF and NGF, were expressed by transplanted cells in vivo, indicating that the transplants can support cell and axon viability. In addition, transplanted animals displayed downregulation of inducers of astrogliosis consistent with observed reduced scar thickness and density. These results indicate that hESC-derived OPC transplantation can both provide an effective treatment for astrogliosis and maintain a regeneration-permissive environment.
Comparison of Complementary and Alternative Medicine Use in Pediatric Patients with Chronic Diseases versus Healthy Pre-Surgical Pediatric Patients
Vivien Phung

Mentor: Michelle Fortier

Complementary and Alternative Medicine (CAM) is not considered evidence-based medicine and therefore is not widely used in the world of conventional medicine even though some methods are well-established and effective. Studies have shown that cancer patients commonly use CAM to relieve their symptoms and side effects of conventional medical treatments. In this study, the beliefs about CAM and CAM usage are compared between parents of pediatric patients with chronic illnesses and healthy pre-surgical pediatric patients. Three-hundred families of children with chronic diseases and 213 families of children about to undergo surgery participated in the study. The parents responded to questions about their beliefs in CAM and holistic health and their use of various forms of CAM. The results showed no significant differences in CAM beliefs between parents in the chronic illness group and the healthy surgical group. However, more parents in the chronic illness group reported they were currently using several different CAM modalities than parents in the surgical group. Therefore, although parents in the two groups did not differ in their beliefs in CAM, they did differ in their usage of various CAM treatments. Overall, people are starting to have more or less the same feelings about CAM, but parents of children with chronic pain may have more reasons to seek CAM treatments such as massage and herbal remedies. Further research on individual CAM modalities is needed to provide even patients with postoperative, acute pain equally effective CAM treatments that may be able to replace conventional prescription drugs.

Fathers’ Personality in Relation to Parenting of Children with Autism Spectrum Disorders
Lissett Pisfil

Mentor: Wendy Goldberg

From the broader developmental literature, parental personality has been shown to influence the quality of parent-child relationships. Although research on fathers has increased in recent decades, most knowledge about parenting is derived from studies of mothers; this is especially true in studies of children with Autism Spectrum Disorders (ASDs). Additional research examining the relationship between personality and parenting perceptions is needed, particularly for fathers of children with ASDs who may experience more challenges than other fathers due to the unique demands of this disorder. This study examined associations between the five-factor model of personality (the Neo-PI: openness, conscientiousness, extraversion, agreeableness, neuroticism) and self-reported parenting commitment and parenting stress in fathers of children with ASDs. Seventy-three fathers, recruited from community organizations, completed the NEO-PI, Parenting Commitment Scale, and Parenting Stress Index online. High neuroticism was significantly associated with lower parenting commitment and higher parenting stress. High extraversion and openness were significantly related to greater parenting commitment and lower parenting stress. High conscientiousness was significantly related to lower parenting stress but not commitment. Agreeableness was not significantly associated with paternal reports. These results suggest that fathers who are more socially engaged, conscientious, and open to new experiences report better adjustment in their parenting role. Findings have implications for support programs tailored to aspects of parent personalities.

18F-Festron: A Potential Serotonin 5-HT3 Receptor PET Imaging Agent
Neema Pithia

Mentor: Jogeshwar Mukherjee

Ligand-gated ion channels, serotonin 5HT3 receptors are involved in a number of brain functions such as anxiety, neuronal excitation, and emesis. We have developed 18F-Festron (N-[(2-pyrrolidinyl)methyl]-2,3-dimethoxy-5-(3’-18F-fluoropropyl)benzamide) and used in vitro and in vivo methods to evaluate its potential as a possible PET imaging agent. In order to synthesize 18F-Festron, Festron Tosylate ((R) or (S)-N-[(1-BOC-2-pyrrolidinyl)methyl]-2,3-dimethoxy-5-(3’-tosyloxypropyl)benzamide) was radio-labeled with 18F using Kryptofix and K2CO3 in acetonitrile at 96 °C for 30 min and deprotected with trifluoroacetic acid at 80°C to yield (R) or (S)-18F-Festron. In vitro binding was carried out on 10 μm rat brain slices. MicroPET imaging in rats (after 0.5-1 mCi iv) was performed on an Inveon scanner, and ex vivo autoradiographic studies on 40 μm brain slices were done on the rat brains. Ondansetron was used for nonspecific binding. Various brain regions were ascertained using the Optiqua Image analysis program, ASIPRO and PMOD. 18F-Festron was synthesized in two-steps with modest yields in specific activities of >2Ci/μmol (60%CH3CN-0.1%Et3N in water, flow rate 2.5 ml/min- C18 semiprep). In vitro binding studies indicated weak selective binding to serotonergic regions in the hippocampus, possibly due to the low concentration of 5HT3 receptors. Low brain uptake of 18F-Festron was seen in the rat. Ex vivo MicroPET analysis displayed binding in numerous brain regions consistent with SHT3 receptor binding. With respect to the cerebellum, ex vivo microPET ratios were: striatum = 3.3; hypothalamus = 2.2; hippocampus = 1.8; area postrema = 2.4 while autoradiographic ratios were 14,
9, 4 and 6 respectively. 18F-Festrone exhibited a unique binding profile to rat brain regions known to contain significant amounts of 5HT3 receptors. Efforts are currently underway to increase brain permeability and fully characterize the binding of 18F-Festrone to 5HT3 receptors.

The Role of the ZupT Transporter in Salmonella Typhimurium Pathogenesis

Adam Poe

Mentor: Manuela Raffatellu

Salmonella enterica serotype Typhimurium is a common gastrointestinal bacterium that causes food poisoning and inflammatory diarrhea. We hypothesized that S. Typhimurium can replicate in the host because of its capacity to acquire metal ions like zinc during inflammation. S. Typhimurium encodes for two zinc transport systems, ZnuABC and ZupT. Both transport systems may play a role in resistance to calprotectin, a zinc withholding antimicrobial peptide. The goal of this study was to determine the role of the ZupT transport system in mediating zinc acquisition in the inflamed gut. To test this, we constructed a deletion mutant of \( zupT \) by allelic exchange. We then tested whether the \( zupT \) mutant had a growth defect in minimal media containing trace levels of zinc. We found that the \( zupT \) mutant had a similar growth phenotype as the wildtype in vitro. We then tested whether the \( zupT \) mutant was attenuated in a mouse model. When mice were infected with equal numbers of the wild-type and the \( zupT \) mutant, the \( zupT \) mutant was attenuated in the mesenteric lymph nodes and the spleen, but not in the cecum compared to the wild type. Both the \( zupT \) znuA double mutant and the \( znuA \) single mutant were attenuated to comparable levels in all the organs sampled. These findings show that the ZupT transporter may have a role in promoting S. Typhimurium dissemination, while the ZnuABC transporter is likely the most important zinc uptake system for colonization of the intestine.

Developing the Virtual Focus Group: Rating Facial Attractiveness with Social Networks

Natalie Popenko

Mentor: Brian Wong

Defining facial beauty and unveiling the quantitative mysteries behind the perfect face has been a question humans have been trying to answer for centuries. With the field of facial aesthetics expanding, the methodology behind facial attractiveness research has become antiquated. The study of beauty commonly involves the use of focus groups, which is a time consuming process of acquiring attractiveness ratings from volunteers face-to-face. Using methods created from previous studies conducted by our group, 40 randomly selected synthetic images were rated for attractiveness using three different methods of subject recruit-

ment: (1) traditional focus groups, (2) Internet-based rating, and (3) a novel method of combining small focus groups and social network sites (SNS). A regression analysis was performed to compare each approach to the traditional focus group method. The most significant correlation in ratings was calculated between the focus group and the social network site raters. Following a thorough cost-benefit analysis of the three methods in terms of recruiting by subject age, demographics, time to accrue raters, labor required of the researcher, and others, this study shows the substantial benefits presented by the social network site method are superior to both Internet-based rating and the traditional focus groups.

Tri-Tryptophan Motif Mutation and Cryptochrome Importance in Drosophila Circadian Clock

Grant Porter

Mentor: Todd Holmes

In Drosophila melanogaster the protein CRYPTOCHROME (CRY) helps reset the 24-hour clock by detecting blue light, enabling it to regulate the degradation of circadian protein TIMELESS. Our lab has shown that CRY also serves a second function in the large lateral ventral neurons (l-LNv) of the circadian circuit—it imbues these neurons with acute light sensitivity, increasing their resting membrane potential and firing frequency upon direct exposure to bright blue light. Using the flavin-based oxidation-reduction reaction inhibitor diphenyleneiodonium (DPI) we have also shown that the acute light response depends on the functional redox capabilities of CRY. CRY possesses a tri-tryptophan motif, which has been shown to allow movement of a light-generated radical within the protein and transfer to nearby redox targets. We hypothesized that this tri-tryptophan motif was necessary for CRY’s ability to confer the acute light response to the l-LNv. To test this hypothesis, we used the UAS/GAL4 system to drive expression of wild type and WÆF mutated CRY in flies with a genetic null background (cry01/cry02) to see whether these proteins could still drive the light response. We also tested these mutants behaviorally in order to ask whether the redox mechanism is important for basic circadian function. Surprisingly, we found that the mutation of the tri-trp motif had no effects on either the acute light response of the l-LNv or behavior properties of living flies, leading us to conclude that for these functions of CRY, an as yet uncharacterized mechanism must underlie the crucial redox reaction.
The Social and Political Phenomenon of the Diligent-Work Frugal-Studies Movement in France

Jessie Qu
*Mentors*: Kai Evers & Jane Newman

Zhou Enlai, Deng Xiaoping, and Can Hensen were all significant political figures within the modern Chinese political sphere that studied under the name of the Work-study movement. The original idea of the Work-study movement (1911-1927) in France was to find a way to help promote the importance of the working class and education for Chinese students abroad. It was established with the idea that the students would be able to work within French factories in the day and study with their spare time in colleges. This seemingly perfect idea was forever changed following the First World War with the Treaty of Versailles. It removed China from the victorious group despite their war efforts and gave away part of China to Japan instead. Because of this loss, the students within China as well as those who were abroad all struggled against the government. The May Fourth Movement (1919) took place in China as a movement against the Chinese government, which was too weak to take control of its own political and social status within the world. From this movement spun the last group of work-study students, also known as the Diligent-work Frugal-study movement. These students became more involved with the political phenomenon of the time and were more interested in the renovation of the Chinese government. Unlike the previous groups who traveled to France, these students were involved with the ideas of revolutionizing China. They struggled through a time of political turmoil and social unrest within both France and China. Despite their disillusionment and the struggles of a newly established France after the war, they were able to create a noticeable political, social and cultural impact within both nations.

Kinematic Analysis of the Hip Joint’s Contribution to Total Turnout

Amy Quanbeck
*Mentor*: Jeffrey Russell

Turnout is an essential component of ballet and has been measured in a variety of ways including with goniometry, photography, and retro-reflective markers. A gait laboratory offers an integrated ability to measure dynamic total turnout and allows measurement of the hip’s contribution to this ballet movement. The purpose of this study was to use physical examination findings, plantar pressures, and kinematic data from gait laboratory analysis to determine the relative contributions of hip rotation, femoral anteversion, tibial torsion and other sources of total turnout. We hypothesized that most of total turnout would result from external rotation at the hip. Ten pre-professional/professional, injury-free, female dancers volunteered and consented for the study. All dancers completed a demographic survey and were examined by a gait lab physical therapist skilled at lower extremity alignment measurement. Measurements included passive hip rotation, femoral anteversion by Craig’s test, tibial torsion, weight-bearing foot alignment, and Beighton hypermobility score. Turnout was assessed using plantar pressure plots and three-dimensional motion analysis system with subjects performing turnout to ballet first position. Kinematic turnout data were obtained on both friction reducing turnout discs and linoleum flooring over a force plate. Overall hip external rotation contributed a mean of 33% of total turnout when calculated with kinematic data. The contribution of hip external rotation to total turnout measured kinematically was less than expected when compared to other studies in which the amount of hip external rotation was determined by physical examination. This pilot study offers three-dimensional motion analysis as a viable method for assessing dancers’ turnout. Although this technology is expensive, requires high technical skill, and currently is not widely used in dance, it has the potential to advance the understanding of turnout mechanics in dance medicine and science.

An Evaluation of the Long-Term Effectiveness of the COPE Model of CUIDAR

Pooja Raja
*Mentor*: Sharon Wigal

One form of treatment for Attention-Deficit/Hyperactivity Disorder (ADHD) is the behavioral approach. One form of this approach is the Community Parent Education (COPE) model. COPE focuses on parent discussion and on the idea that parents are experts on their own children. This model is integrated in to the Children’s Hospital of Orange County-University of California (CHOC-UC) Irvine Initiative for the Development of Attention and Readiness Program (CUIDAR). This pilot project measures the effectiveness of the COPE model by following-up with families that participated previously (four years ago) in CUIDAR. Effectiveness was measured by having the parents evaluate their child’s behavior and symptoms as well as their own parenting ability. The following questionnaires were used to collect data: Strengths and Weaknesses of Normative and ADHD Behavior Rating Scale (SWAN), Parents. The analyzed results of these data will be discussed in the context of demographic background information and follow-up outcome measures.

Optimization of Stem Cell Differentiation into Retina

Sabhya Rana
*Mentor*: Hans Keirstead

Various retinal diseases like Macular degeneration and Retinitis Pigmentosa have led to loss and impairment of...
vision in a large population globally. A promising therapeutic strategy is to replace differentiated functional photoreceptors and retinal pigment cells (RPCs) into the subretinal space. This may be achieved by making such a transplant in vitro using a 3-D retinal tissue construct. This study focuses on optimizing the initial part of the protocol in which human embryonic stem cells (hESCs) are differentiated into retinal progenitor cells before the co-culture step with neural retina. Variations of duration of exposure and concentration of various culture substrate components like Retinoic Acid (RA), Dkk1/LeftyA, ActivinA, Hyaluronic Acid and Fgf8, and plating time were performed. Analysis of extent and success of retinal progenitor cell (RPC) differentiation was done using immunohistochemistry for various cell markers and transcription factors. Culture conditions like a short RA regime, early and high dose Dkk1/LeftyA exposure, late plating onto adherent culture, delayed Hyaluronic Acid addition and early Activin A addition gave good Nrl, Crx, Chx10 and ret-Rx marker expression. The conditions found can now be incorporated into one protocol to assess success of hESC differentiation into RPCs.

**Public Spheres 2.0**
Laura Rensing
*Mentor:* Susan Jarratt

In this age of digital dominance, it can be hard to place where traditional rhetoric fits into the virtual landscape. To better understand how rhetoricians today use modern developments in technology and conceptions of self, I decided to look backwards as well as forwards by placing popular Internet sites YouTube and Facebook within the context of Jurgen Habermas’ *Structural Transformations of the Public Sphere*. Habermas’ theory is flexible enough to encompass the more classical forms of rhetoric in a 21st-century format. My paper explores a possible new transformation of Habermasian public spheres in which YouTube and Facebook replace the coffee houses of the 18th century, combining elements of the traditional spheres with the far reach of mass media to create a new space for critical-rational debate. Using the 2008 U.S. Presidential Election as a backdrop, I examine how President Obama crafted his rhetorical strategies to take advantage of this space and reach out to the under-represented demographics, specifically voters aged 18-25, and minorities. Though the campaign did not necessarily bring more voters to the booths, the sites did allow for debate and discussion to develop within these less-represented groups, indicating that participation within a democracy can extend beyond the poll box and into the (Facebook) Inbox. Though technology is a constantly evolving variable, the original components of rhetoric can still be applied to even the most recent developments so long as its users are aware of the updates along the way.

**Super-Elasticity and Energy Dissipation of Nickel Micro-Architected Lattices Under Cyclic Compression**
Christopher Ro
*Mentor:* Lorenzo Valdevit

Micro-architected lattice materials are a novel class of ultra-light macroscopic cellular solids characterized by topologically designed features at the micro and nano scale. By carefully optimizing the topology of the architecture and by exploiting beneficial size effects in plasticity and fracture (materials generally get stronger when the sample scale is reduced to sub-micrometric scales), unprecedented combinations of properties are expected. In this work, we experimentally investigated the compressive behavior of micro-architected nickel hollow trusses. These micro-lattices, fabricated at HRL Laboratories with a novel manufacturing approach, represent the lightest metallic structure ever made. A custom-built mechanical test frame was built and used to cyclically compress the micro-lattices in air and in vacuum. Surprising super-elastic behavior was observed, coupled with substantial energy dissipation upon cycling. To fully investigate the mechanical properties of these structures, unit-cell experiments are required. This motivated the development of a micro-mechanical test frame with nano-Newton resolution. Some aspects of this development will be presented.

**“English for the Children”: Living Memories for Proposition 227**
Irais Rodriguez
*Mentor:* Ana Rosas

Chicana/o-Latina/o experience within education must deal with anti-immigrant sentiment. Americanization campaigns have targeted the use and retention of Chicanas/os’-Latinas/os’ native language Spanish. In June 1998 passage of California’s Proposition 227, which mandated English-only instruction classes created tension and dismayed the Chicana/o-Latina/o community. Reconsideration of Proposition 227 through archival collection investigation and oral histories begin to compel a comprehensive history, inclusive of Chicana/o-Latina/o parents, students, and teachers who endured Proposition 227; their voices are at the heart of this research. The quest for assimilation requires compromising self-identity, and students’ recollections are reflective of this. Their recollections affirm that the memory of Proposition 227 still lingers in of those who endured its implementation.
Designing Affinity Reagents for Crystallization of the *Shigella dysenteriae* Heme Transmembrane Receptor ShuA

Johnny Rodriguez  
*Mentors:* Cathie Overstreet & Gregory Weiss

Biological laboratories commonly use antibodies as affinity reagents due to their high affinity and specificity. Such immunoglobulins include both a scaffold core and flexible antigen-binding loops called complementary determining regions (CDRs) that can be modified to recognize many different targets. Despite the near universal applicability of antibodies, their complicated structure and manufacturing limits practicality. This research aims to engineer protein scaffolds into high affinity reagents that serve as readily accessible alternatives to antibodies for use in biomedical applications. Echistatin has been selected as the preliminary scaffold due to loop regions that can accept diverse sequences without altering structural stability. Echistatin libraries are predicted to generate high affinity binders to the heme transmembrane receptor ShuA that will be used as co-crystallization proteins to stabilize ShuA during crystallization. FLAG-tagged libraries using the degenerate codon NNS, which encodes for all twenty amino acids in the loops of Echistatin, were displayed on M13 bacteriophage as a fusion to the minor coat protein P3. An ELISA showed that the FLAG-tagged affinity reagents display robustly on phage. Library members were selected for binding to ShuA using biopanning and assessed using an ELISA. The highest affinity binder was subcloned into the pET28c expression vector to assay for solubility and use in target selections. Currently, the highest affinity binder is being overexpressed to assay off-phage affinity to ShuA.

**Latino Male Undergraduates Coping Strategies and Well-Being**

Oscar Rojas Perez  
*Mentor:* Jeanett Castellanos

The representation of Latina/os in higher education continues to be low compared to other racial ethnic minority groups. Examining the unique experiences Latina/os encounter in higher education, research primarily focuses on factors that lead to attrition, while limited work emphasizes academic success, student satisfaction, and the maintenance of well-being. While examining the experiences by sex, literature undergirds that Latino males not only lag in attaining fewer degrees but also report higher sense of marginalization, isolation, and perceive the college environment more negatively. Minimal research has comprehensively investigated the coping processes of Latino males and their well-being. Using the psychosociocultural framework, the study examined the specific psychological (forgiveness, anger, coping responses), social (microaggressors, educational barriers), and cultural factors (cultural congruity, university environment, ethnic identity) that played a role in the Latino male undergraduates’ educational experiences and their well-being. Findings will provide insight regarding coping strategies Latino male college students use in order to maintain their wellbeing. In addition, findings will serve to develop culturally sensitive programs to help Latino undergraduates navigate through the educational pipeline.

**Single Mothers’ Influence on the Latino Male Undergraduate Academic Success and Life Experiences: A Psychosociocultural Analysis**

Oscar Rojas Perez  
*Mentor:* Jeanett Castellanos

The educational status of Latinos in the United States has steadily improved over the past couple of years. Despite the minimal gains of educational progress, Latino males continue to be underrepresented in higher learning institutions and continue to be perceived merely as providers and protectors of their family. It is necessary to investigate the persistence of Latino male students who take on the task of balancing the competing demands of school, work, and family responsibilities. Using the psychosociocultural framework, the study examined the relationship between Latina single mothers and their sons, and the impact the bond has on Latino male undergraduates’ academic persistence, success, and overall well-being. A qualitative design was implemented by interviewing five Latino undergraduates regarding their experiences of being raised in a single parent household, the unique challenges faced as a result of this family system, their social support systems, the role of gender role expectations and culture in their upbringing, and its influence in their educational decisions, coping processes, sense of well-being, and general academic success. Findings will provide insight regarding how being raised by a single mother impacts the overall development of Latino males, as well as their persistence and retention relative to their educational journey and well-being.

**Embodied Reactance and the Paradox of Persuasion**

Corrie Rollison  
*Mentor:* Peter Ditto

Recent research has demonstrated that cognition involves the entire body, such that merely holding a warm cup of coffee can cause people to believe that a job applicant is, in fact, a warm person. Additionally, research has empirically established a reactance phenomenon in which individuals told not to do something simply want to do it more. This study combines these theories of embodied cognition and psychological reactance in order to determine whether participants who are physically restrained would be more likely than unrestrained participants to engage in reactance and refuse to be persuaded by a passage. Participants were
randomly assigned to either a restraint condition, in which their dominant arm was restrained with a strap, or non-restraint condition before reading a persuasive essay. In Study 1, restraint had no effect on the persuasiveness of a passage arguing against the use of capital punishment. Participants in Study 2 read about the benefits of chewing gum. Restrained participants were significantly less persuaded by the passage than unrestrained participants. Interestingly, participants did not differ in their explicit ratings of the persuasiveness of the essay, suggesting that the persuasion effect is implicit in nature. Though somewhat inconsistent with classic reactance research, these results provide support for the phenomenon of embodied reactance and have the potential to dramatically alter our underlying beliefs about how (and where) human beings think.

**Workers’ Organizations, Demonstrations and Militias in the Russian Revolution**

**John Romero**  
*Mentor: Lynn Mally*

Between February and October of 1917, workers and workers’ organizations played a pivotal role in the direction of the Russian political system. Even after Tsarism was overthrown in late February after massive worker demonstrations in Saint Petersburg (Petrograd), workers continued to stage massive demonstrations, which helped to widen the divide between the new Provisional Government and the Petrograd Soviet. In addition to staging street demonstrations and protests, workers’ organizations mobilized workers’ militias, trade unions, and other groups which sought to advance the political goals of the working class. To this end, the Petrograd Soviet became the leading political institution, which eventually came to be seen as the legitimate source of authority in Russia. Within the Soviet various socialist parties, notably the Bolsheviks, Mensheviks, and Socialist Revolutionaries struggled to be seen as the true voice of the working class. As the political situation in Russia developed, these political parties began to grapple with the products of workers’ organizations, especially demonstrations and militias, and had to carefully maneuver between maintaining the stability of the government and supporting workers’ interests. The balancing act between political stability and appealing to workers, often openly discussed in the newspapers of the political parties, eventually allowed for the resurgence of the Bolsheviks after July of 1917 and their eventual seizure of power in October of that year.

**A Novel TAZ Mutation Associated with Barth Syndrome in a Boy and Non-Compaction in his Great Uncle**

**Diti Ronvelia**  
*Mentor: Michael Zaragoza*

Cardiomyopathy is literally defined as “heart muscle disease,” and referred to as weakening of the heart that may eventually lead to a heart failure. Rare mutations in the Tafazzin gene (TAZ) cause this degenerative disease that has several forms, such as non-compaction, in which the sponge-like interwoven myocardial fibers fail to compact during development, and Barth Syndrome, a rare dilated cardiomyopathy and neutropenia known to affect infants. In a family where a great uncle has non-compaction cardiomyopathy and his nephew has Barth Syndrome, we hypothesize that both of their conditions are due to a rare X-linked mutation in TAZ. By DNA sequencing TAZ in both, we found the same novel mutation in exon 7 (c.887G>T) that resulted in a stop codon where Glycine is normally found (p.Gly195X). A great uncle and his nephew share only 1/8 of their genome, yet out of all the wildtype genes they could have shared, they share this common mutation known to cause cardiomyopathy. Putting these findings into perspective, it is essential to understand and learn why the nephew’s onset and type of the disease is significantly different than the uncle’s for the same mutation. Additionally, even though they both have the same mutation, they have distinctive phenotypes for the same disease, which suggests that there may be other factors and/or mutations contributing to the rise of cardiomyopathy in each individual.

**Controls on the Attenuation of Particulate Organic Carbon**

**Angel Ruacho**  
*Mentor: Francois Primeau*

The sinking flux of particulate organic carbon, POC, in the ocean is a key process controlling the partitioning of carbon dioxide between the ocean and atmosphere. As such, POC fluxes regulate an important greenhouse gas and subsequently Earth’s climate. Using POC flux estimates derived from particle size distributions, collected with an underwater video recorder, we estimated the parameters $J_0$ and $b$ for the Martin equation, $J(z)=J_0(z/\alpha)^{-(b+1)}$, where $J(z)$ is the POC flux as a function of depth $z$, while modifying $b$ to be a function of an environmental variable $a$, $b=b_0+m^*a$, such as oxygen or temperature. We then implement a Bayesian model comparison test to find out which of the models are more probable. Through this method we find that when oxygen is used as a control, $\alpha$, the $m$ value is $-0.0031\pm0.0036$, while the $m$ value when $b$ depends on temperature is $0.0051\pm0.0036$. The models suggest that oxygen does not appear to be a significant control on the
Control of Colon Carcinoma Cell Growth Through Quantification of Colony Numbers in Soft Agar by Resveratrol and Resveratrol-Derivatives

Jose Ruiz

Mentor: Randall Holcombe

The Wnt pathway is not only implicated in $85\%$ of sporadic colorectal cancer cases, but regarded as the initial event in tumor formation. Previous studies have shown that resveratrol inhibits throughput in the colon cancer cell line RKO. Various derivatives of resveratrol modified with methyl and borolane functional groups were tested using MTT and soft agar assays to quantitatively assess cell growth and colony formation ability. *In vitro* results indicate reduced cell growth under resveratrol treatment versus DMSO controls.

Perceived Control, Affective Reactivity, and Stress in Populations Living with Spinal Cord Injury

Gianpaolo Russo

Mentor: Susan Charles

Perceived levels of control have been linked to decreased symptoms of anxiety, lower risk of depression, and lower perceptions of stress. People living with Spinal Cord Injury (SCI) have functional limitations and often report less objective control over their environment and poorer subjective well-being. Although disability levels have been linked to lower subjective well-being, it is not clear whether this association is explained by reductions in perceptions of control (POC) among people with SCI. One aim of the study was to test this prediction. In addition, because control is associated with how threatening people perceive stressors to be, POC may play an especially important role in dampening the effect of stressors for people with SCI. However, it can be argued that SCI patients may have such high levels of objective disability that POC cannot compensate for the negative effects of stress. In this study, POC were hypothesized to buffer individuals from the negative affect associated with stressors for people both with and without SCI. Two samples, one able-bodied, the other with SCI, completed nightly telephone interviews and were examined for associations between control, number of stressors, satisfaction with life, and positive/negative affect. Contrary to the first hypothesis, control partially buffered the impact of stressors only in the able-bodied population. Consistent with the second hypothesis however, the relationship between disability levels and well-being was explained by POC. This study will help inform healthcare professionals about possible interventions that may help increase the well-being of patients with SCI.

Give A Little, Take A Little: Examining the Relationship Between Emotional Support and Affect among People with Spinal Cord Injury

Lauren Sakakibara

Mentor: Susan Charles

Studies show that social support is associated with greater positive affect and less negative affect, appearing as though support has only positive effects on well-being. Receiving support, however, can undermine one’s self-esteem and sense of independence, especially when one cannot reciprocate. Thus, researchers have generally concluded that giving support is better than receiving it. But because people with a spinal cord injury (SCI) are at greater risk for depression and loneliness, they may have a greater need for receiving emotional support. As a result, reciprocating support may be especially important for people with SCI. This study examined the association between giving and receiving emotional support and experiencing positive and negative affect across 15 days among people with SCI. I first hypothesized that those with higher levels of giving and receiving emotional support would report greater positive affect and less negative affect than those with lower levels of giving and receiving support. Using multiple regression analyses and controlling for gender, age, physical health, mean number of stressors, and depression level, I found that, contrary to this hypothesis, receiving more support was associated with greater negative affect. I also hypothesized that giving support could reduce the negative affect associated with receiving support; according to equity theory, people are most satisfied with an equal exchange of support. Consistent with this hypothesis, giving support partially buffered the negative effects of receiving support, suggesting the importance of creating resources to provide people with SCI the opportunity to engage in both giving and receiving support.

Morphological and Electrophysiological Analysis of Specific Cortical Neuronal Types in Layer IV of the Primary Somatosensory Cortex of Mice

Andrew San Antonio

Mentors: Taruna Ikram & Xiangmin Xu

The somatosensory cortex (S1) of mice has a variety of cell types that can be classified according to their morphology,
immunohistochemical properties, electrophysiology, and other parameters. So far, there have not been extensive studies of the cells in layer IV of mouse somatosensory cortex (S1). In this study, morphological and electrophysiological analysis is done with excitatory and inhibitory neurons in layer IV by using GFP expressing transgenic mice G42, GIN (“GFP-expressing Inhibitory Neurons”) and G30 mice to record specific inhibitory neurons. Specifically, excitatory pyramidal neurons and spiny stellate cells, and 4 distinct types of inhibitory neurons were analyzed. GFP cells in G42, GIN, and G30 mice were immunopositive for PV, SST, and CCK, respectively. GFP cells in G42 mice were generally fast-spiking (FS) basket cells, GIN cells were adaptive-spiking that resembled Martinotti cells, and G30-GFP cells had two electrophysiologically distinct subtypes—regular spiking and irregular spiking, that were mainly multipolar cells, and to a lesser extent, bipolar and neurogliaform cells. Quantitative analysis of the intrinsic physiology revealed that the parameters such as input resistance, spike half-width, spike adaptation, and spike rate could be effectively used to distinguish excitatory neurons and different inhibitory cell types. In the physiological scatterplot, FS/PV+ inhibitory cells and excitatory neurons formed two non-overlapping clusters as FS cells had the narrowest spike width and the fastest spiking rate with the lowest spike adaptation among all the cell types examined, while excitatory neurons had opposite results. Many parameters of SST+ and CCK+ cells lied in between. Over- all, this study provides further knowledge about morphological and physiological properties of specific types of neurons in the cortex and will to lead to better understanding of their functions in the brain.

Yugonostalgia and Yugo-Rock
Bojana Sandic
Mentors: Alice Fahs & Amy Wilentz

Yugonostalgia, nostalgia for the former Yugoslavia, is elicited by a number of cultural symbols and memories. The strongest among these is Yugo-rock, the Yugoslavia rock ‘n’ roll of the 1980s. It created an imagined community among youth across Yugoslavia’s states, today separate nations, and remains a nostalgic emblem of what it was to be Yugoslavian. It is an exercising of identity, investigated through the eyes of journalists, scholars, and former Yugoslavians themselves. In the experience of Yugo-rock, memories of individual and community narratives blur into one in a way that forever connects the members of this generation. Today, Yugonostalgics gather at concerts and relive the past through their music, thinking back on times of prosperity, youth, and hope. The narrative that they long for is one that was heavily mediated by this music, which is what in the end makes it such a potent vehicle for Yugonostalgia.

The Role of Endothelial-Derived Wnt-5a in in Vitro Angiogenesis
Daniel Sandoval
Mentor: Christopher Hughes

Wnt 5a is a signaling molecule involved in polarization, migration, and proliferation of cells during embryonic and adult development. In order to investigate the role Wnt 5a may have during angiogenesis, qRT-PCR was used to measure the gene expression of Wnt 5a in human endothelial cells on days 0, 2, 4, 6, and 8 of an in vitro model of angiogenesis. siRNA was then used to knockdown the gene expression of Wnt 5a in human umbilical vein endothelial cells to investigate any changes in endothelial sprouting or lumen formation that may occur in the this assay. Wnt 5a was up regulated on day 2, 4, and 6 of in vitro angiogenesis. Wnt 5a knockdown in endothelial cells resulted in a significant decrease in the number of lumenized sprouts. The finding suggests that Wnt 5a may have an important role in lumen formation during angiogenesis.

Pyroelectric Crystals as Novel X-Ray Sources for Brachytherapy
Vladimir Satchouk
Mentor: Sabee Molloi

Low Dose Rate (LDR) Brachytherapy has existed for the past 100 years; it is a localized radiation therapy technique for cancers of the prostate, breast, cervix, and skin. Traditionally, radioactive isotopes are implanted directly into tumors to kill cancerous cells. Although this is effective in treating cancer, the dosage cannot be changed and transport of the radioisotopes is both costly and hazardous to medical staff. We have demonstrated the feasibility of an alternative radiation source with the use of Lithium Niobate pyroelectric crystals—which emit electrons when heat is applied—in miniaturized and implantable x-ray tubes. In order to heat these crystals while inside the body we have built and modified an open source induction heater that uses electromagnetic induction to heat our components quickly, without contact with the devices or skin, and without heating the surrounding tissue. The heater was designed by the Fluxeon™ corporation and operates at a frequency of 62kHz. Using a 1 cm crystal mounted on a 0.2 mm thick substrate of high-carbon steel inside a glass chamber held at 1x10^-3 torr with a 35-degree copper target wedge mounted 0.8 cm away from the face of the crystal, maximum x-ray emissions of 39 keV were observed. Emissions calculations indicate 7.8x10^11 electrons were produced, which corresponds to a peak source activity of 0.6 mCi, assuming 1% conversion of electrons to X-ray photons. This dosage is of an amount consistent with LDR brachytherapy, meaning that pyroelectric crystals show promise as a relatively inexpensive and potent brachytherapy source.
A Hop Skip and a (insert movement here) & So You Think You Can be an Artistic Director
Shane Scopatz
Mentor: Loretta Livingston

Imagine drowning yourself in a pool of information with the sole purpose of climbing out to see what stuck. This is essentially the process I used in my research of contemporary dance this past summer. I immersed myself into dance communities around the world and analyzed the different methods of creativity I encountered. I saw more than ten live performances, took more than 50 classes, and had countless conversations with artists. I was exposed to topics ranging from Dance Theater works that challenged audiences with a manipulation of the ambiguous to Gaga technique classes that encouraged dancers to find more somatic awareness through imagery. Since being back at school for this academic year, I have been able to articulate how my creative summer research has informed and shaped me as a dancer and choreographer. The kind of research I did this summer is necessary for becoming the kind of artist that develops an advanced cognitive practice. I have realized that this research is something I will do for the rest of my life; it is simply part of my job description as a dancer and choreographer.

Dialogue and Internal Monologue: Modes around the Limitations of Self in Literary Journalism
Emma Seemann
Mentor: Daniel Gross

A rhetorical theory assessment of how literary journalists form their ethos through characters’ dialogue and internal monologue is presented herein by analyzing a literary journalism piece titled “Limitless Possibility.” Literary journalism, also called intimate journalism or narrative nonfiction, refers to the literary hybrid of news article and fiction. Current literary journalism discussion shies from a rhetorical theory analysis of the genre. Discussed indirectly by Aristotle and in rhetorical theory, building ethos by using others’ words, such as quoting famous individuals or channeling the voice of God, can shape a writer’s authority. Not many current texts address what rhetorically occurs when literary journalists allow their characters to speak: the uncertainty of if the voice is that of the reporter or the subject and how exactly that affects the writer’s ethos. My findings address this issue. In literary journalism, dialogue captures the subject’s voice and allows the author to write what the subject feels. Similarly, internal monologues present an unadulterated piece of how the characters view scenarios. Presenting the perspective of multiple characters can allow an audience to see the various sides of a story, providing the reporting with depth and validity. Both qualities help boost a writer’s ethos. My research demonstrates that dialogue and internal monologue present modes around the limitations of self of the literary journalist, enhancing the writer’s ethos.

Estrogen Receptor Alpha (ERα) Mediates Endothelial-Independent Relaxation of Cerebral Arteries
Brianna Segura
Mentors: Sue Duckles & Diana Krause

Estrogen has protective effects in females. Studies have shown that women are less prone to cardiovascular disease than men and that postmenopausal women are at greater risk of getting cardiovascular disease than the women that still have their menstrual cycles, and produce more sex hormones. This can be linked with estrogen, which has the ability to protect against age-related diseases such as dementia, stroke, and cardiovascular disease. The cerebral blood vessels are an important target tissue for estrogen due to the expression of estrogen receptors ERα and ERβ in endothelial cell layers of cerebral blood vessels and smooth muscle. Estrogen acts on the cerebral endothelium to stimulate the production of vasodilators nitric oxide.

Given that estrogen plays a role in the regulation of cerebrovascular function, the rapid dilatory effects of 17β-estradiol and estrogen-related agonists and antagonists in isolated mouse basilar artery were tested and the effects were compared to those in the aorta. 17β-estradiol, PPT, and DPN caused relaxation in both arteries, however 17β-estradiol and PPT was more potent in the basilar artery than aorta, which suggests that the cerebral arteries are more sensitive to vasorelaxant effects of the hormone. Although no effect was seen in the basilar to the inhibition of vasodilators nitric oxide and prostaglandins, a partly blocked response was seen in the aorta. This finding correlates with the lack of functional endothelium in the basilar and indicates that the response is smooth muscle mediated and independent of ERα effects on endothelium-dependent vasodilators.

Host-Based Intrusion Detection Using an FPGA
Michael Sevilla
Mentor: Ian Harris

Unauthorized attacks on computer systems by malicious software have been combated with Network Intrusion Detection Systems (NIDS), which focus on traffic (firewalls, network packet analysis, etc.), and Host-Based Intrusion Detection Systems (HIDS), which address events (file access, application execution, etc.). Because these methods and techniques run on a software platform, they inherit its drawbacks: the processor is continually halted and wasteful information is gathered. Instead, this project uses a hard-
The family is interconnected. The objective of this study is to examine associations between parental division of labor and marital quality in families with and without a child with an ASD. Specific hypotheses were: (1) mothers raising children with ASD would report greater division of labor than mothers raising a TD child, (2) mothers with an unequal distribution of labor, in which they hold a heavier burden of care, would report poorer marital quality, and (3) there will be a stronger correlation between division of labor and marital quality in mothers raising children with ASD. Mothers of children with and without ASD completed parenting measures, the Who Does What Questionnaire, and the Marital Adjustment Test. Preliminary analysis indicated that mothers of TD children share significantly more child care labor with their spouses than do mothers of children with ASD. However, marital quality does not seem to benefit when mothers do less of the household and childcare tasks. The findings are relevant for marriage and family counselors who work with couples raising children with ASD.

Sensory Appendage Proteins (SAPS) in Anopheles gambiae
Amir Sharim
Mentors: Anthony James, Osvaldo Marinotti & Marika Walter

The goal of this study is to develop a novel method to control the population of Anopheles gambiae. The blood-feeding female of this species transmits malaria, which kills millions of people each year. Since sensory appendage proteins (SAPs) are vital to the survival of this organism, these proteins were used throughout the study in order to create an insecticide against mosquitoes. The primary sequence and gene model of each sensory appendage gene was determined by extracting RNA from mosquitoes, subjecting it to RT-PCR and sub-cloning the resultant cDNA products. Expression of the various SAP genes differed among sexes, developmental stages, and body segments. The amplified portions from each SAP gene will be used to create dsRNA, which will be used in RNAi experiments to knock-down specific SAP genes, ultimately leading to death of the organism.

Marital Quality and Division of Labor among Mothers of Children with and without an Autism Spectrum Disorder
Camille Shehadeh
Mentor: Wendy Goldberg

Raising a child with an Autism Spectrum Disorder (ASD) is accompanied by considerably more household labor than raising a typical developing child (TD). Mothers in particular feel the extra burden and stress associated with having a child with ASD. Family systems theory indicates that the function of individuals and dyadic relationships in the family is interconnected. The objective of this study was to examine associations between parental division of labor and marital quality in families with and without a child with an ASD. Specific hypotheses were: (1) mothers raising children with ASD would report greater division of labor than mothers raising a TD child, (2) mothers with an unequal distribution of labor, in which they hold a heavier burden of care, would report poorer marital quality, and (3) there will be a stronger correlation between division of labor and marital quality in mothers raising children with ASD. Mothers of children with and without ASD completed parenting measures, the Who Does What Questionnaire, and the Marital Adjustment Test. Preliminary analysis indicated that mothers of TD children share significantly more child care labor with their spouses than do mothers of children with ASD. However, marital quality does not seem to benefit when mothers do less of the household and childcare tasks. The findings are relevant for marriage and family counselors who work with couples raising children with ASD.
Nbs1 allow us to conclude that the appearance of Nbs1 is dependent on the presence of phase dark material.

**Omitted Stimulus Response in the Rat Auditory Cortex: Cortical Response in the Absence of Expected Stimulus**
Natalie Shum  
*Mentor:* Ron Frostig

When a series of stimuli is delivered in a periodic manner and a subset of stimuli is randomly omitted, a cortical response, called an omitted stimulus response (OSR), may still be evoked. The intent of this study is to determine whether omitted stimulus response occurs in the auditory cortex of rats. Intrinsic signal optical imaging (ISOI) was used to assess activity from a large cortical region with high spatial resolution. Three groups of experiments were conducted in which no stimuli were delivered 100% of the time, intentional stimuli were delivered 100% of the time, and delivered stimuli were randomly interlaced with omitted stimuli. When no stimuli were delivered 100% of the time, the averaged response showed no evoked activity. In contrast, the averaged response when a stimulus was omitted appeared the same as when stimuli were delivered 100% of the time. A response was evoked in 4.53% of single trials when no stimuli were delivered, and in 32.66% of single trials when stimuli were delivered 100% of the time. A response was evoked in 21.98% of single trials when stimuli were delivered 100% of time. A response was evoked in 21.98% of single trials when stimuli were delivered 100% of time. A response was evoked in 21.98% of single trials when stimuli were delivered 100% of time.

**Islam and the Challenges of Modernity**
Hamza Siddiqui  
*Mentor:* Daniel Brunstetter

The nineteenth and twentieth centuries ushered in perhaps the most challenging times in Muslim history. Already Muslim empires had been declining since the sixteenth and seventeenth centuries and sought reform through European examples of bureaucracy. This deterioration went a step further when, through scientific and technological advancements, Europe was able to dominate the Muslim world either directly or indirectly through colonization and imperialism. Coupled with ideas of post-Enlightenment rationalism, many Muslims had to contend with why the Muslim empires declined, and questions about how to deal with European encroachment, and the ideas and technologies that accompanied it. This paper attempts to document how Muslims dealt with this phenomenon—broadly labeled as Modernity—through Islam by examining three generalized responses; first by the Muslim Modernist, then the Islamist and finally the traditionally trained scholars known as the Ulama. Their articulations sought either to reconcile Islam with Modernity, denounce aspects of Modernity or just to retain and preserve age-old authority profoundly ingrained in how the religion was articulated in the pre-Modern era. Based on previous works documenting this subject, along with some analysis of primary texts, Modernity’s effect on Islam can be said to have just as much to do with how Muslims responded to the external challenges of European dominance as it did with looking internally to reform their own religious tradition. These responses need to be viewed not as a reaction, but rather as charting a new approach to understanding the religion.

**Analysis of Neuronal Sparing in a Δ7SMN Mouse Model of Spinal Muscular Atrophy following Transplantation of Human Embryonic Stem Cell-Derived Motor Neuron Progenitors**
Puneet Sidhu  
*Mentor:* Hans Keirstead

Spinal muscular atrophy (SMA) is a neurodegenerative genetic disease characterized by motor neuron loss and profound infantile death within two years of age. Human embryonic stem cell-derived motor neuron progenitors (hMNs) secrete a variety of neurotrophic growth factors, which may aid in neuronal survival for a variety of neurodegenerative diseases, SMA in particular. To assess whether hMNs can be used to aid in neuronal survival in patients with SMA we transplanted hMNs into a murine model of SMA. Behavioral assessment was performed on SMA mice following an intraspinal transplantation of hMNs. Immunohistochemistry (IHC), specifically with an antibody to neuronal nuclei (NeuN), was used to count neurons within the spinal cord and therefore assess endogenous neuronal sparing. Thus far, the data indicates that there is a significant difference in neuronal sparing of SMA mice in the transplanted group as compared to the control group. This study indicates that hMNs may serve as a good starting point in finding a treatment and eventual cure for victims of SMA.

**Isolation and Purification of Kinesin from Drosophila Embryos**
Robilyn Sigua  
*Mentor:* Steve Gross

Motor proteins are responsible for moving cargos along microtubules and transporting them to specific locations within the cell. Understanding the mechanism of microtubule-based motor transport and its regulation will help explain the link between disease and transport. Kinesin-1 is a eukaryotic motor protein which shows anterograde microtubule motion, powered by the ATP hydrolysis. Here we report a detailed purification protocol to isolate active
full length kinesin from Drosophila Embryos, thus allowing the combination of Drosophila genetics with single-molecule biophysical studies. Starting with approximately 50 laying cups, an overnight collection was performed. The embryos were bleach dechorionated, and then homogenized with ice cold homogenization buffer. After disruption the homogenate was clarified using a low speed spin followed by a high speed centrifugation. The clarified supernatant was treated with GTP and taxol to polymerize microtubules. Kinesin binding to polymerized microtubules was achieved by adding the ATP analog 5'-adenyl imidodiphosphate at room temperature. After binding, microtubules were sedimented via high speed centrifugation through a sucrose cushion. The microtubule pellet was then resuspended, and ATP was added to release the kinesin from the MT. High speed centrifugation then pelleted the MTs, leaving the kinesin in the supernatant. This kinesin was aliquoted, snap frozen in liquid nitrogen, and stored at -80°C. SDS gel electrophoresis and western blotting was performed using the purified sample and the motor activity was evaluated by an in vitro single molecule microtubule binding assay. The kinesin fraction showed processivity of 1.3 μm. Further experiments are underway to evaluate the interaction between kinesin and other transport related proteins.

**Imaging α4β2 Receptors: An Evaluation of 18F-nifrolene**

Sanghamitra Sinha  
**Mentor:** Jogeshwar Mukherjee

Nicotinic acetylcholine alpha-4, beta-2 receptors (nAChR) have been implicated in various neurodegenerative diseases. Therefore, it is of use to acquire methods to measure these receptors. Specific radioligands have been developed to monitor the α4β2 nAChRs through non-invasive techniques, such as positron emission tomography (PET) and single-photon emission computed tomography (SPECT). Though previously developed radiotracers can measure these receptors they are not the optimum candidate for quantitative analysis because they require prolonged scanning time. In order to develop a more suitable date for quantitative analysis because they require prolonged scanning time. In order to develop a more suitable method, the antagonist, 5-(3'-fluoropropyl)-3-[3,4-dehydro-2-(S)-pyrrolidinemethoxy]pyridine (nifrolene) was synthesized as a new high affinity agent for nicotinic nAChRs. The fluorine-18 analog, 18F-nifrolene was synthesized optimized event selection to the data to discriminate heavy neutrino signal from SM background, we predicted 7.2 ± 2.4 SM background events. We observed five data events, which is consistent with the SM background prediction. In absence of any excess of events beyond the SM background prediction, we set a 95% confidence level upper limit on the ‘u d → W → l N → l 1 u d’ cross section as a function of the mass of a possible heavy Majorana neutrino.

**Amyloid β Oligomers Bind to Neurons to Induce Cytotoxicity in Alzheimer’s Disease**

Ann Song  
**Mentor:** Charles Glabe

Alzheimer’s disease (AD) is characterized by extracellular amyloid β (Aβ) deposits and intracellular neurofibrillary tangles composed of misfolding tau, a microtubule stabilizing protein. Genetic mutation in amyloid precursor protein induces production of Aβ, which leads to familial AD. According to substantial evidence, soluble intermediates formed during Aβ aggregation are implicated to be neurotoxic in AD. Aβ misfolding includes multiple steps that produce soluble oligomeric intermediates including fibrillar oligomers (FOs) and prefibrillar oligomers (PFOs). These intermediates have distinct conformations that recognize conformation-specific antibodies from our laboratory. We hypothesized that FOs are neurotoxic species in AD, and bind to neurons in vitro, inducing apoptosis. To test the neurotoxic effects of Aβ oligomers, FOs were prepared from Aβ monomer peptides and were detected by using ratio of 4.93. Finally, Nifrolene has a shorter scanning time reaching pseudoequilibrium at 100 minutes than other agents (e.g. F18-2FA and 1123-5IA). This study demonstrates that 18F-nifrolene is a suitable agent for future α4β2 nAChR studies.

**Heavy Majorana Neutrino Search and ATLAS Data Quality Monitoring Display**

Kevin Slagle  
**Mentor:** Anyes Taffard

The recent discovery of neutrino masses introduces a new problem beyond the Standard Model (SM) of particle physics: determining by what mechanism neutrinos attain their mass. The see-saw mechanism provides an attractive theoretical answer which justifies why neutrinos have small masses (~1 eV). The theory predicts lepton number violation and at least one right-handed heavy (up to GUT scale) Majorana neutrino (N). We have analyzed the recent 34/pb (sqrt(s) = 7 TeV) of 2010 ATLAS data to search for heavy neutrinos in the mass range accessible by the LHC. We focused on decays of the type ‘u d → W → l N → l 1 u d’ with same-sign leptons, which provides a clean two-jet signature to work with. After applying an optimized event selection to the data to discriminate heavy Majorana neutrino signal from SM background, we predicted 7.2 ± 2.4 SM background events. We observed five data events, which is consistent with the SM background prediction. In absence of any excess of events beyond the SM background prediction, we set a 95% confidence level upper limit on the ‘u d → W → l N → l 1 u d’ cross section as a function of the mass of a possible heavy Majorana neutrino.
OC (fibril specific) and A11 (prefibrillar specific) antibodies. The cultured neurons were treated with FOs and revealed that FOs bind to neurons and induce cytotoxicity in vitro. Conformation-dependent, oligomer specific antibodies are valuable tools in studies to understand the role of oligomers in pathogenesis. For future studies, monoclonal antibodies were harvested and purified from hybridoma cells.

**WordSleuth: Deducing Social Connotations from Syntactic Clues**
Shannon Stanton  
*Mentor: Lisa Pearl*

The realm of social and emotional connotation is often thought to be the purview of humans rather than machines. Namely, humans are generally capable of recognizing social connotations including emotions (such as embarrassment), intentions (deception and persuading), attitudes (confidence and disbelief), and tone (formality, politeness, rudeness), and recent work has suggested that machines may also be capable of this feat. This study extends the work done by Pearl and Steyvers, improving the data gathering methodology, feature extraction, and machine learning classification. Prior to the WordSleuth project, a major barrier to researching social cues transmitted through text has been a lack of annotated data. WordSleuth, an online Game-With-a-Purpose, solves this problem, creating an effective means of encouraging a wide variety of participants to generate and annotate data. Salient linguistic features can then be extracted from the data gathered and used to train and test machine learning algorithms, effectively teaching machines to identify social connotations in text. In particular, as machines still currently lag behind human capabilities, this study extends Pearl & Steyvers’ work by examining more complex linguistic features and exploring more sophisticated machine learning methods, with the aim of substantially improving machine recognition of social connotation.

**Passing Strangers: The Rhetorical Performance of Identity in a Moment of Gay Literature**
Steven Stimach  
*Mentor: Jonathan Alexander*

The period between the Stonewall Riots of 1968 and the official identification of AIDS in 1981 saw the politicization of gay identity as part of the New Left, bringing with it a host of questions surrounding identity and the organization of the gay community. In political manifestos such as *Dancing the Gay Lib Blues* and *The Gay Militants*, this organization of community would extend even into literary spaces, with them becoming another site in which identity could be performed and used. It is among these questions of identity and community that the year 1978 would see the simultaneous publication of three major gay novels, *Dancer from the Dance* by Andrew Holleran, *Faggots* by Larry Kramer, and *Nocturnes for the King of Naples* by Edmund White. While these three authors have today entered into a gay canon, their position within their historical moment is more complex. At the same time that they are distributed through commercial publishers and receive reviews in such papers as the *New York Times*, Holleran, Kramer, and White still retain an identification with the marginal in their writings. Using the tools of mainstream distribution, the three authors carve out spaces of rhetorical performance through which new counter-publics to the mainstream audience can be forged. In examining the questions that these authors’ novels raise when read as modes of rhetorical performance, this paper will attempt to not only show their significance within their historical moment, but their continuing significance to a contemporary queer discourse of identity and community.

**Articular Cartilage Ablation with Femtosecond and Pulsed Infrared Lasers: An Alternative to Microfracture Surgery**
Erica Su  
*Mentor: Brian Wong*

Microfracture surgery, a bone marrow stimulation technique, is an emerging clinical treatment option for the repair of articular cartilage injury. During the procedure, the surgeon penetrates the subchondral bone and creates microholes (1.5 mm diameter) to facilitate the flow of blood from the bone marrow. This triggers a spontaneous repair response that results in formation of fibrocartilaginous repair tissue from the stem cells. Pilot studies on articular cartilage ablation by Ti:Sapphire femtosecond ($\lambda=800\text{nm}$, repetition rate=$5\text{kHz}$) and Erbium:YAG ($\lambda=2.94\mu\text{m}$, repetition rate=$1.2\text{Hz}$) laser systems were examined previously. The objective of this study was to improve upon previous studies by evaluating the use of a commercial AMO Intralase femtosecond laser ($\lambda=1053\text{nm}$, repetition rate=$30\text{kHz}$) and Erbium:YAG laser with water enhancement as other alternatives. Tissue cubes (8mm) were extracted from bovine femoral condyles and ablated with various laser dosimetry parameters (fluence of $8\text{J}/\text{cm}^2$ for Er:YAG, laser power of $300\text{mW}$ for AMO femtosecond). Imaging and analysis with high power dissecting microscope and conventional histology (hematoxylin and eosin staining) was done to provide detailed information on crater depth and peripheral thermal damage. The computerized scanning system of the AMO femtosecond laser enabled more efficient use of laser pulses than the previous Ti:Sapphire femtosecond system and required only 25 seconds per micron depth. Er:YAG ablation with water enhancement was shown to cool the area of ablation and reduce carbonization of the surrounding tissues.
result further demonstrate the possibility of using femto-second and Er:YAG laser systems as alternatives to the surgical-skill dependent microfracture procedure.

The Exploration of Cell Co-Culture Methods in Tumor Angiogenesis
Philip Suh
Mentor: Elliot Hui

Angiogenesis, the creation of vasculature from pre-existing vasculature, is an essential part of tumor growth. Therefore, the investigation of the intercellular interactions between cell types involved in angiogenesis may lead to therapies for the suppression of tumor growth. To fully understand the cell to cell communications, paracrine and juxtacrine signaling present in a co-culture must be investigated for each cell type. Although most conventional cell co-culture techniques allow for the examination of paracrine or juxtacrine signaling, very few allow for the separation of cell types after a short range (~ 80 micrometers) paracrine signaling experiment. Therefore, the use of a microfabricated micromechanical reconfigurable culture (MRC) developed by Elliot Hui can elucidate short range paracrine signaling of each cell type in co-culture. My work involves the investigation of the comparative differences between four cell co-culture techniques (monolayer, media transfer, Transwell inserts, and MRC) in the gene expression of co-cultured fibrosarcoma tumor cells (HT1080) and normal human lung fibroblasts (NHFL). Quantitative data gathered through the use of quantitative PCR (qPCR) shows, for example, the upregulation of the DNA-binding protein inhibitor ID-1 in NHFL during short range paracrine signaling facilitated by the MRC. Such specific knowledge of cell type roles in tumor angiogenesis may allow for the development of targeted drug therapies.

The Most Important Bilateral Relationship: How the American Perception of Japan is Fluctuating over TIME
Digo Takahashi
Mentor: Robert Garfias

In any society, the name of a country triggers certain images. These images can be used as a powerful tool at the micro level to analyze the alliances and relationships that exist at the national or state level. Since America’s “discovery” of Japan in the 19th Century, there has been a spurt of popular literature written on the nature of the Japanese people. However, with careful analysis, one finds that much of what is written about the Japanese is contradictory, depending on the author or the time in which it was written. Indeed, the American attitudes toward Japan have fluctuated greatly—with fear and hatred at the troughs and admiration and curiosity at the crests. Yet, today, the US-Japan alliance continues to be one of the most robust partnerships in the world at the social, cultural, political, economic, and military levels. A dynamic history of interactions and changes makes the US-Japan partnership one of a kind. This thesis explores the changes that took place in the American popular literature written on Japan from the “discovery” of Japan in the mid-19th Century to the present. The fluctuations that the partners have overcome make the US-Japan alliance “the most important bilateral partnership” of the world.

A Qualitative Study: Persistence of Latina/o Seniors in a Continuation High School
Stephanie Takamatsu
Mentor: Jeanett Castellanos

Latina/os comprise a large percentage of elementary and secondary school-aged children. However, these numbers begin to drop as the years of education increase, leaving an underrepresentation of Latina/os in the advanced levels of the educational system. Further, their reported experiences in their completion of high school degrees have shown significant challenges, including limited social support and ultimate attrition. Consequently, alternative routes to complete an education have been pursued by Latina/o students but little research has focused on these subpopulations and their experiences. The purpose of this study is to investigate the unique educational barriers and coping strategies that affect Latina/os’ persistence in continuation high school. The study examined six seniors who primarily identified themselves as first-generation Mexican Americans. The psychosociocultural framework was used to obtain a holistic and individual understanding behind persistence in the educational system. Results revealed that motivation, social support from family, friends, and teachers, and cultural congruity within the school had the largest influence on persistence among this sample. The findings will provide for a more culturally competent approach in enhancing prevention and intervention efforts to increase the persistence of Latina/os in education.

Influences of Electronic Effects, Inductive Effects, Structural Effects, and Electron Releasing Substituents on the Mechanism of the Reactions of Ammonia and 3- and 4-Substituted Aromatic Aldehydes
Show Takenaka
Mentor: Fillmore Freeman

The mechanisms of the reactions of ammonia with 3- and 4-substituted aromatic aldehydes (benzaldehyde, methylbenzaldehyde, tert-butylbenzaldehyde, cyclopropylbenzaldehyde, cyclo-butylbenzaldehyde, ethenylbenzaldehyde, propadienylbenzaldehyde, trimethylsilylbenzaldehyde, hydroxybenzaldehyde, methoxybenzaldehyde, aminobenzaldehyde, and (dimethylamino)-benzaldehyde) have been
Investigated computationally using high levels of electronic theory. The theoretical levels used include B3LYP, B3PW91, PBE1PBE, CCSD(T) and QCISD(T) with the 6-311+G(d,p) and cc-pVDZ basis sets. The energy differences between the HOMO and LUMO frontier molecular orbitals of the aromatic aldehydes were calculated and showed no significant correlation with the Hammett substituent constants whereas there were significant correlations for the bond lengths and vibrational frequencies of the aldehydic carbon-hydrogen bonds and the carbonyl carbon-oxygen bonds. Excellent linear correlations were obtained when the respective atomic charges of the aldehydic hydrogen, the carbonyl carbon, and the carbonyl oxygen were plotted against both the Hammett and the Brown substituent constants. The first step in the mechanism of the reaction involves formation of 1:1 cyclic complexes between ammonia and the aromatic aldehyde with zero, one, or two water molecules.

Relationship Between Tumor Characteristics and Epidemiological Characteristics in Breast Cancer
Steven Tate
Mentor: Argyrios Ziogas

Tumor characteristics such as estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor-2 (HER-2) status determine the clinical outcomes of invasive and in situ breast cancer cases. The epidemiological characteristics that govern the expression of receptor subtypes are not completely understood. The objective of this project is to examine the relationship between invasive and in situ breast cancer subtypes (characterized by ER, PR, and HER-2 status) and epidemiological characteristics including family history of cancer, lifetime exposure to smoke, hormone therapy status and menopause status. Fisher’s exact or chi-squared tests and multivariate logistic regression were used to examine the relationship between breast cancer subtypes and epidemiological characteristics. Results showed that pre-menopausal women were more likely to have in situ and HER-2 positive breast cancer. Post-menopausal women on current estrogen and progesterone hormone therapy were more likely to have PR positive and ER positive breast cancer. Patients with a family history of ovarian cancer had decreased odds of having PR positive and ER positive breast cancer. Furthermore, the odds of having invasive breast cancer compared to in situ breast cancer was decreased if a women had a family history of breast cancer in at least one first-degree relative. These results suggest the need for further research into the roles of hormone therapy and other epidemiological risk factors in breast cancer subtypes.

Bovine vs. Human Fibrin Gels
Julie Taylor
Mentor: Steven George

The goal of this research is to compare and contrast the mechanical and biological properties of bovine and human fibrin gels, while varying the concentrations to determine the optimal matrix density for constructing 3-D perfused microtissues. It has been observed that there is a two amino acid difference in the acceptor peptide of the bovine fibrin sequences, and there is a large influx of anti-bovine fibrinogen antibodies when implanted into humans. Through this side-by-side comparison of human and bovine fibrin gels, any significant differences that can affect the formation of unperfused capillaries can be observed. The mechanical properties are tested using the spectrophotometer to determine gelation time, the rheometer to detect the liquid properties, and volume fraction to establish the porosity of each fibrin gel. The biological properties are observed through the making, imaging, and staining of tissues and spheroids of EPC, NHLF, and co-cultures to compare both vessel formation and the cells’ ability to invade. The most successful results have shown that human fibrin gel at a concentration of 10 mg/ml is ~2.3 times stiffer than bovine fibrin gel at both 10 mg/ml and 8.5 mg/ml, the invasion of the NHLF culture is greater in the human fibrin gel at 10 mg/ml, and the gelation rates are similar.

Eating Habits and the Role of Hardiness as a Mediator
Alfredo Tigerino
Mentor: Salvatore Maddi

Previous researchers who have analyzed health care practices have conceptualized hardiness as a mediator of stress and one’s behavior habits. Further research has found that those with a hardy personality practice healthful behaviors opposed to those who do not have hardiness. A sample of 124 college students was given a food habit eating questionnaire in which the participants were asked to rate how often they ate certain types of food. Study results did not support the previously hypothesized role of hardiness as a mediator of healthful eating habits. Those who ate a high fruit and vegetable diet were found to have a sense of control as they were more likely to feel they had control over their outcomes and performed healthful eating habits. There were no other correlations, which could be for various reasons. A lot of eating habits are learned and being high in hardiness does not test one's knowledge on nutritionally balanced foods. A limitation of the study is when one attempts to assess eating habits it is already biased by the person answering. It is hard for someone to remember what they ate within the last week and it is easy for people to underestimate “bad” foods and overestimate “good”
Testing the Immunogenicity of DC Based Vaccine Loaded with a Novel Cancer Testis Antigen, Boris
Tigran Tiraturyan
Mentor: Edward Nelson
The purpose of this study is to initiate a robust cellular immune response by using Dendritic Cells loaded with cancer-testis antigen, BORIS. There are numerous specific and non-specific anti-tumor therapeutic techniques; however, few have been found to be effective. The advances in understanding antigen presentation and processing have lead to new techniques of vaccine administration, such as Dendritic Cells. Vaccination of mice with DC/mBORIS resulted in significantly higher CD4+ T cell proliferation and activation of cytolytic CD8+ cells than vaccinations with mBORIS protein. In contrast, the anti-mBORIS antibody titers were much higher for mice vaccinated with mBORIS protein when compared to DC/mBORIS. The results suggest that DC/mBORIS induces a strong cellular immune response. Further investigation of DC/mBORIS through therapeutic studies could help develop an effective anti-tumor vaccine.

Normalizing Injustice: The Portrayal of Date Rape in Fictional Television
Christine Tomlinson
Mentor: Francesca Polletta
Does television reflect the success of a movement or merely try to present something that will sell? When social problems are depicted on television, are they shown in a way that encourages the audience to take action against the issue or in a way that reproduces stereotypes? This project investigates the dramatized portrayal of acquaintance rape on popular television shows. While many studies have investigated the appearance of rape myths in television dramatizations of rape, this study also explored the position of the dramatized rape within the storylines of each episode. I analyzed the presentation of date rapes in fourteen fictional television episodes that aired between 1990 and 2011. I assessed the evolution of these depictions during this time frame in terms of both the presence of rape myths and narrative structure. These contemporary presentations were also compared with those in the 1970s and 1980s. While earlier dramas did not always end with victims getting legal justice, the show’s focus on the victim made the lack of resolution seem shocking. In contemporary dramas, however, the fact that the victim’s perspective is not central and that the perpetrator is not prosecuted make the rape seem peripheral to the episode’s other storylines. The result, I argue, is a normalization of injustice. I conclude by suggesting that television producers’ orientation to profit leads them to treat social problems like plot devices. For victims and potential victims of date rape, these modern presentations provide few models for reporting the rape to authorities.

College Students’ Well-Being Following Child Abuse: An Empowerment Perspective
Kevin Tracy
Mentor: Jeanett Castellanos
Taking into account the high volume of abuse literature based on a deficiency model, where child abuse is often seen as invoking near-irreparable psychological damage on victims, this study advances an integrative framework examining the personal resources, environmental resources, and coping responses leading to a child abuse victim’s...

Are Black Women Allowed to Have Sex? A Black Feminist Analysis of Media Representations of Black Women
Samiyah Tillman
Mentor: Jared Sexton
In her landmark essay, “Mama’s Baby, Papa’s Maybe,” Hortense Spillers writes of Black women in the Western imagination: “The names by which I am called in the public space render an example of signifying property plus.” Self-possession or ownership of one’s body has been a fundamental conceptual question in mediations on Black existence in the modern world. Defined as property in and through the political, economic and legal matrix of chattel slavery, the idea of Black autonomy under an anti-Black state is rendered unthinkable. Black female sexuality provokes well the historic instance. To the extent that one is defined by the gaze of others, consent, much less choice becomes unviable. This project begins by examining select images of Sarah Baartman in the Atlantic world in the early nineteenth century and follows the formation of Black female representation in mainstream media well into the twentieth century and twenty-first centuries. Applying the work of Black feminist scholars such as Angela Davis, Hortense Spillers, Audre Loude, and June Jordan, this project attempts to examine and challenge the non-existence of Black female sexual autonomy within the prevailing paradigm of sexuality in feminist studies.

Testing the Immunogenicity of DC Based Vaccine Loaded with a Novel Cancer Testis Antigen, Boris
Tigran Tiraturyan
Mentor: Edward Nelson
The purpose of this study is to initiate a robust cellular immune response by using Dendritic Cells loaded with cancer-testis antigen, BORIS. There are numerous specific and non-specific anti-tumor therapeutic techniques; however, few have been found to be effective. The advances in understanding antigen presentation and processing have lead to new techniques of vaccine administration, such as Dendritic Cells. Vaccination of mice with DC/mBORIS resulted in significantly higher CD4+ T cell proliferation and activation of cytolytic CD8+ cells than vaccinations with mBORIS protein. In contrast, the anti-mBORIS antibody titers were much higher for mice vaccinated with mBORIS protein when compared to DC/mBORIS. The results suggest that DC/mBORIS induces a strong cellular immune response. Further investigation of DC/mBORIS through therapeutic studies could help develop an effective anti-tumor vaccine.

Normalizing Injustice: The Portrayal of Date Rape in Fictional Television
Christine Tomlinson
Mentor: Francesca Polletta
Does television reflect the success of a movement or merely try to present something that will sell? When social problems are depicted on television, are they shown in a way that encourages the audience to take action against the issue or in a way that reproduces stereotypes? This project investigates the dramatized portrayal of acquaintance rape on popular television shows. While many studies have investigated the appearance of rape myths in television dramatizations of rape, this study also explored the position of the dramatized rape within the storylines of each episode. I analyzed the presentation of date rapes in fourteen fictional television episodes that aired between 1990 and 2011. I assessed the evolution of these depictions during this time frame in terms of both the presence of rape myths and narrative structure. These contemporary presentations were also compared with those in the 1970s and 1980s. While earlier dramas did not always end with victims getting legal justice, the show’s focus on the victim made the lack of resolution seem shocking. In contemporary dramas, however, the fact that the victim’s perspective is not central and that the perpetrator is not prosecuted make the rape seem peripheral to the episode’s other storylines. The result, I argue, is a normalization of injustice. I conclude by suggesting that television producers’ orientation to profit leads them to treat social problems like plot devices. For victims and potential victims of date rape, these modern presentations provide few models for reporting the rape to authorities.

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foods. Humans do not innately know how to select a nutritious diet; it is essential to learn about health and wellness to live a fulfilling life. Future research should look at other eating questionnaires with more precise measures.
positive well-being. Using the integrative framework as a model, the researcher views past abuse as an obstacle that adult victims can overcome via support from friends, family, and coworkers; via the possession of social skills, problem-solving skills, and self-esteem; and via a trait known as environmental mastery. The research follows qualitative social science methodology and is based on interviews conducted via a snowball sampling method at a large undergraduate research institution on the west coast of the United States. The aim of the interviews was to examine factors contributing to the current well-being of college students from a diverse array of socioeconomic and racial/ethnic backgrounds who were abused emotionally, sexually, and/or physically by one or more parent figures before age 18. In order to be interviewed, the college students must have been between the ages of 18 and 24, and currently attending school.

Is NF-κB a Non-Histone Target of HDAC3 in Long Term Memory Formation?
Anthony Tran
Mentor: Marcelo Wood

Gene expression is necessary for long-term memory. One of the most well studied methods for regulation of gene expression occurs at the level of chromatin structure. This involves an elegant interplay between histone acetyltransferases (HATs) and histone deacetylases (HDACs) altering the chromatin structure to either up-regulate or down-regulate gene expression, respectively. However, arguably as important are the non-histone targets of HDACs and HATs in long term memory formation. Previous studies in cell culture showed that deacetylation of the transcription factor NF-κB at the RelA subunit allows its export from the nucleus by the Inhibitor of κB. Therefore, deacetylase activity provided by HDAC3 serves as a mechanism to down regulate the abundance of NF-κB in the nucleus. However, it is not yet known whether HDAC3 regulates RelA in vivo during the formation of long-term memory. Hdac3FLOX/FLOX mice with homozygous knockout of the Hdac3 gene, targeted by Cre Recombinase infusions to the dorsal hippocampus, showed enhancement of long-term memory compared to wild type mice. Western blot data showed that acetylated RelA is also more abundant in hippocampal cells from Hdac3FLOX/FLOX mice than wild type. Furthermore, in mice with a defective subunit of NCoR (nuclear receptor corepressor) necessary for HDAC3 activity, enhancement of long-term memory was observed. Western blot data also showed that acetylated RelA was more abundantly localized in the nucleus of hippocampal cells in these mutant mice. These data suggest that NF-κB, one of the non-histone targets of HDAC3, should be further investigated for its role in long-term memory formation.

Increasing Expression of 6-Methylsalicylic Acid in Saccharomyces cerevisiae by Increasing Precursor Availability
Christina Tran
Mentor: Nancy Da Silva

Microorganisms like bacteria and fungi produce small amounts of complex compounds called polyketides. This class of compounds includes valuable antibiotic, anti-fungal, anti-cancer, and cholesterol-lowering drugs. Increasing the amount of polyketides produced in their native organisms is often very difficult and, therefore, we are engineering the yeast Saccharomyces cerevisiae as a host organism to produce large quantities of polyketides. 6-Methylsalicylic acid (6-MSA) is a simple polyketide that can be produced in g/L quantities in S. cerevisiae. Since production of 6-MSA has been achieved, it will be used as a model to evaluate the effects of increasing precursor availability on polyketide production. Malonyl-CoA is a precursor compound for the production of 6-MSA and other polyketides. The availability of malonyl-CoA was increased by integrating various genes into the chromosomes of S. cerevisiae. The two genes that I examined were ACS1 and ACC1 which code for the enzymes Acetyl-CoA synthetase and Acetyl-CoA carboxylase. Both these enzymes are essential to producing malonyl-CoA. The production of 6-MSA was then measured using HPLC. The results can be applied to increase the production of more complex polyketides that are more difficult to synthesize.

Bacterial Diversity Associated with Toxic and Non-Toxic Pseudo-nitzschia Species
Kevin Tran
Mentors: Sunny Jiang & Marilou Sison-Mangus

Epibiotic bacterial populations are implicated in the toxin production of the toxic Pseudo-nitzschia species. To date, several bacteria from &Alpha-proteobacteria (Roseobacter, Pseudealteromonas, Sulfitobacter, Staleya and Paracoccus, Sphingomonas) & Gamma-proteobacteria (Pseudalteromonas, Nep- tunomonas) and Bacteroidetes (Winogradskyella) have been isolated from the toxin-producing Pseudo-nitzschia multiseries. In this study, we isolated and identified the epibiotic bacteria associated with the non-toxic P. pungens strain by culture isolation technique and metagenomic approach to determine if their epibiont bacteria is diverse as well. The 16s rDNA was amplified and sequenced from cultured bacteria and from clonal library made from P. pungens metagenomic sample. We found that P. pungens associate with only a few bacteria from &Alpha-proteobacteria group; their 16S sequence identities are similar to cultured and uncultured Thalasso bacter and Rosobacter. Our results suggest that bacterial diversity may be a characteristic of toxic Pseudo-nitzschia species.
Genetic Dissection of Signaling Pathways that Coordinate the Cellular Response to Cadmium Stress
Kim Tran
Mentor: Peter Kaiser

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

Analysis of these genes will bring the science community closer to an understanding of the molecular events regulating the cellular response to heavy metal exposure.

Effects of Electron Withdrawing Substituents on the Formation of Charge Transfer Complexes and Hemiaminals from the Reactions of Ammonia and Aliphatic Aldehydes
Tran Tran
Mentor: Fillmore Freeman

Nitrogen nucleophiles such as ammonia and primary amines add to the carbonyl carbons of aliphatic aldehydes to form relatively unstable hemiaminals (tetrahedral intermediates). These hemiaminals undergo 1,2-elimination reactions to form imines. The purpose of this computational chemistry study is to investigate the mechanisms and the influences of electron withdrawing substituents on the reactions of ammonia with aliphatic aldehydes such as methanal (formaldehyde), fluoromethanal, difluromethanal, dichloromethanal, ethanol, trifluoroethanal, and trichloroethanal (chloral). High level electronic theory calculations were performed using B3LYP, PBE1PBE, MP2, CBS-QB3, CCSD(T), and QCISD(T) with the 6-311G(d,p) and cc-pVDZ basis sets. In the first step of the reaction it was found that 1:1 ammonia-aldehydes complexes were formed. These complexes rearrange to four-center transition states that subsequently yield hemiaminals.

A Qualitative Analysis of Bioethical, Cultural, and Practical Issues Affecting Recruitment and Retention in the NCS
Tuyet Hong Tran
Mentor: Kimberley Lakes

The National Children’s Study (NCS) is a 21-year longitudinal study following children from pre-conception until the age of 21. The primary purpose of the NCS is to study environmental and genetic factors that affect children’s health and development in order to improve and promote health in children. Unfortunately, many eligible women who are or may become pregnant may choose not to enroll in the study. This research project was designed to understand participants’ decisions to participate, not participate, or withdraw from the NCS. Our goal was to identify issues that affect decision making and ultimately the recruitment and retention of diverse participants in the NCS. We identified participants who refused to consent or withdrew from the study in Orange County, California. These women were contacted by telephone and invited to enroll in an interview study to address their reasons for choosing not to participate. After reviewing the Study Information sheet and consent form, the participants completed a semi-structured interview with a research assistant. At the end of each interview, participants suggested recruitment and retention methods for participants who were similar to them. The interviews were recorded digitally, and transcribed verbatim. Transcripts were then analyzed and coded to identify themes. A majority of participants who refused consent for the NCS did so because of concerns related to trust for research studies. Participants who withdrew from the study had concerns related to information security and time commitment. The data collected suggest that recruitment and research education techniques could be improved to encourage higher enrollment and retention, which will result in a more representative sample for the NCS.

Fertility as a Predictor of Death in Male Drosophila melanogaster
Xuan Tran
Mentor: Laurence Mueller

In Drosophila melanogaster, females within 6–15 days of death have significantly lower fecundity than similarly aged females that do not die. This phenomenon is called the death spiral, and this study aimed to determine if there is a similar phenomenon in male D. melanogaster. Daily mortality and weekly virility, measured as the number of females fertilized in 24 hours, were examined individually for 1,000 males throughout their entire lifetime. Death-spiral males

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were categorized as individuals that were within one week of death. Non-spiral males were more than one week from their death. Our data confirmed the existence of a male virility death spiral: at younger ages, death spiral males fertilized 3–4 fewer females than non-spiral males. This study established the death spiral in male fruit flies, which is a starting point for further research concerning physiological declines in death spiral males.

**Impact on Fitness of Transgenes in the Malarial Vector Mosquito Anopheles stephensi**

Mikhail Tretiakov  
Mentor: Anthony James

Transgenic refractory mosquitoes capable of suppressing *Plasmodium* infection are currently being developed as a method to combat malaria infection. Unlike transposon-mediated transgenesis, site-specific recombination of effector molecules into docking site transgenes has been demonstrated to increase integration efficiency and minimize fitness cost. The m4b7/m2a10 transgene coding for two antimalarial antibody proteins has been inserted into a mosquito genome containing multiple docking sites. To assess the fitness burden of this transgene, experiments were performed to determine the copy number and location of docking sites, as well as confirm integration of the m4b7/m2a10 transgene. We used Southern blotting in conjunction with fluorescent in situ hybridization on polytene chromosomes to determine that three docking sites were present in the mosquito, and the m4b7/m2a10 transgene had integrated into one of them. We then used outcrossing and PCR screening to eliminate the two unnecessary docking sites, and performed fitness assessments on the single-copy lines to determine docking site and antimalarial transgene burden. Based on preliminary evidence, serious fitness impact is not caused by the presence of the docking site or integrated transgene.

**Attitudes on the Ideal Division of Household Labor among Second Generation Latina Undergraduate Students**

Gina Trujillo  
Mentor: Catherine Bolzendahl

Gender and racial/ethnic differences can combine in important ways that shape individual outcomes and perpetuate inequality. Here, I study experiences and views of the household division of labor among Mexican-Americans using a unique multi-method approach. Interviews with ten undergraduate second-generation Latinas allow me to examine their views and expectations regarding the gender division of household labor as reflected through their cultural norms and structural factors. These interviews are supplemented through an analysis of married couples using data from the National Survey of Families and Households that examines the performance of stereotypically male (e.g., yardwork) and female (e.g., cooking) chores, as well as one gender-neutral chore (i.e., bill paying). The results of the survey analysis show that in Mexican-American couples, women spend 6.08 more hours per week than men on male-type tasks. This gap was significantly larger than the gap between White men and women. Results also indicate that Mexican men perform 3.25 more hours of male-type tasks than Mexican women and that this gap is also significantly larger than for Whites. Bill-paying hours were the same across the groups. These findings show that while gender powerfully differentiates tasks within the home for all groups, gender more strongly shapes Mexican-American household organization. These findings suggest Mexican-Americans may be “doing gender” more strongly than Whites based on cultural or other structural forces. These implications are further explored through the analysis of the interviews with college Latinas.

**Mechanisms Mediating Synchronous Membrane Potential Oscillations in Projection Neurons in the Adult Drosophila Brain**

Adam Truong  
Mentor: Diane O’Dowd

Chemical synaptic transmission mediates information transfer between neurons in the insect antennal lobe, similar to the mammalian olfactory bulb, and is known to play an important role in processing olfactory information. In contrast, while electrical synapses (gap junctions) play a clear role in neuronal communication in the olfactory bulb, there is relatively little known about the role these play in the insect antennal lobe. A recent study reported that electrical synapses (gap junctions) play a clear role in neuronal communication in the olfactory bulb, there is relatively little known about the role these play in the insect antennal lobe. A recent study reported that electrical synapses form specifically between homotypic PNs that innervate the same antennal lobe glomerulus in the intact adult fly brain. These are mediated by *innexin8* encoded gap junction proteins. My preliminary recordings in brains isolated from adult flies showed correlated membrane potential oscillations between randomly selected PNs. This led me to hypothesize that in the absence of sensory input, gap junctions are important for synchronizing activity between heterotypic PNs, that innervate different glomeruli, as well as between homotypic PNs. To test this I recorded from pairs of heterotypic PNs and examined their morphology and electrical activity in the isolated whole brain preparation. All heterotypic PN pairs in wild-type brains, identified by localization of dendrites in different glomeruli, showed correlated electrical activity before and after blockade of chemical synaptic transmission. In addition, correlated activity was reduced in PN pairs in *innexin8* mutants compared to wildtype. These data support the hypothesis that *innexin8* encoded gap junction proteins are important in synchronizing activity between
heterotypic as well as homotypic PNs in the adult brain in the absence of coordinated sensory input.

**Adherence with Recommended Physician Follow Up after Diagnosis and Treatment for Cervical Cancer in a Randomized Clinical Trial**

Marie Truong  
*Mentor: Kathryn Osann*

Physician follow-up every three to four months for two years after diagnosis of cervical cancer is recommended to ensure prompt detection of recurrence. The benefit for patient quality of life (QOL) is unknown. This study examines general health, QOL, and adherence with recommended follow-up in a study of 50 cervical cancer survivors randomly assigned to psychosocial telephone counseling (PTC) or usual care (UC). Data were assessed at baseline and four months post-enrollment in 36 participants. Patients who adhered to recommended follow-up were compared to those who did not with respect to demographics, general health and quality of life using chi-square tests and t-tests. Nineteen percent of women did not see a physician for cancer follow-up. Women who received PTC were more likely to follow up. Those who reported poor or fair general health at baseline were less likely to return. Younger age, Hispanic ethnicity, less education, later stage and treatment with surgery only were associated with lower rates for follow-up although differences did not reach statistical significance. Women who received counseling and returned for cancer follow-up experienced improved QOL compared to those who did not return. In conclusion, women who received PTC were more likely to seek follow-up care for cancer compared to women receiving UC. Women with poor health at baseline were less likely to comply. Those in the PTC arm who complied with recommended follow-up reported improved QOL compared to those who did not return.

**Molecular Dynamics Simulations of the Fate of Nitrate Photolysis in Seasalt Aerosols**

Carol Tsai  
*Mentor: Douglas Tobias*

Understanding the chemical balance of the atmosphere has major implications for human health and global sustainability of the future. Sea salt aerosols play a significant role in the transport and dynamics of chemicals in the atmosphere. One ubiquitous component of sea salt aerosols is the nitrate ion, which can photolyze in the lower mid latitudes and arctic regions, thereby acting as a source of hydroxy radical, a key player in the balance of atmospheric chemicals. While the quantum yield, or efficiency, of the nitrate photolysis reaction is typically very low, previous studies have shown that increased proximity to the surface, or interface, of an aerosol particle may increase the rate of photolysis. This research project seeks to investigate and characterize the increased quantum yield seen in interfacial nitrate photolysis via molecular dynamics simulations. In this project, aerosol particles were modeled as aqueous halide salt slabs consisting of nitrates placed near the interface and within the bulk of solution. Three systems were studied to determine the effects of the chemical environment on photolysis rates: NaCl, NaBr, and KBr.

**The Role of GABA in the Nucleus Ambiguus during Electroacupuncture on Gastric Distention Induced Inhibitory Hemodynamic Responses**

Michael Tung  
*Mentor: Stephanie Tjen-A-Looi*

Gastric distention induces a cardiovascular response that involves both the sympathetic and parasympathetic pathways. Neural mechanisms of the gastric distention induced inhibitory cardiovascular reflexes are not well understood. We hypothesize that electroacupuncture applied at active cardiovascular acupoints reverses the inhibitory cardiovascular reflex responses through GABA_A receptors in the Nucleus Ambiguus. We used a rodent gastric distention model with consistent inhibitory hemodynamic responses during repeated gastric distention stimulation. Rats were anesthetized and artificially ventilated to maintain optimal physiological conditions. We monitored for baseline and inhibitory hemodynamic responses: heart rate and mean arterial blood pressure. During repeated gastric distention, decreased heart rate and mean arterial pressure were normalized with EA at P5-6 active cardiovascular acupoints. Blockade of GABA receptors with microinjection of gabazine into the Nucleus Ambiguus reversed the effects of electroacupuncture on the inhibitory chronotropic hemodynamic responses while mean arterial blood pressure was not affected. We thus conclude that the Nucleus Ambiguus plays a role in the normalizing effects of EA on bradycardia through a GABAergic mechanism.

**Fluorescent Muscimol Inhibits ARC Protein Activation in the Hippocampus**

Anthony Turk  
*Mentor: Norbert Fortin*

Fluorescently-conjugated muscimol (FCM) is a GABA_A agonist that causes rapid and reversible suppression of neural activity. FCM is similar in effect to muscimol but remains advantageous for our purposes because, unlike muscimol, its spread can be measured using fluorescence imaging. FCM was infused at four sites in the adult male rat hippocampus, two each in the dorsal and ventral hippocampus. The results suggest the spread of FCM is directly proportional to the amount of ARC (activity-regulated cytoskeleton-associated protein) inactivation. ARC is an immediate early gene and a common marker of coordinated sensory input.
neurological activity. The results show that FCM can be localized and contained in the hippocampus, allowing future studies to be conducted with high spatial resolution. Due to the large and lipophilic molecular structure of FCM, we can predict it will not diffuse across particular brain areas, specifically those composed of white matter or CSF-containing ventricles. After 24 hours, a normal amount of ARC is expressed, indicating a return to baseline for neurological activity, but the spread of FCM can still be viewed due to the effects of the fluorescence. By day 7, FCM can no longer be traced and is completely metabolized, while neurological activity is back to normal. We can now accurately quantify the relationship between FCM spread and neurological inactivation which will be of great interest to neuroscientists who aim to assess brain-behavior relationships in freely-behaving rats using advanced temporary inactivation techniques.

Transcending Small-Scale Industries in Mexico: The Co-Benefits of Controlling Global Warming and Aerosol Toxicity
Nduka Unaka
Mentor: Rufus Edwards

Kilns are thermally insulated ovens used for crafting and cooking. In Michoacán, Mexico the making and selling of kilns by small-scale industries have a significant impact on Mexico's economy. As a result of the kiln’s economic influence their market activity remains high despite the negative effects of its mechanism for combustion. Our research focused on addressing the co-benefits of climate and health that would result from improving the combustion efficiency of kilns. The process of determining the effects of the greenhouse gases emitted by kilns on humans and the environment encompasses collecting the particulate matter (PM) from the emissions, determining the level of concentration of the PM and exposing rat cells to these different concentrations. Alveolar macrophages are the lung cells responsible for conducting phagocytosis on pollutants that are inhaled. To ensure that the level of emission of particles from the different types of kilns (copper, pottery, charcoal, and brick) corresponds to the level of emission analyzed in the research laboratory, several methods were used to collect the particles in Mexico and to extract the particles for testing at the University of California, Irvine. Quartz filters, Teflon filters, and Tedlar bags are the different types of pollutant-collecting mediums that were used. Each medium of collection was evaluated to determine which best eliminates the discrepancy between the actual amount of particles emitted to the amount used for the exposure to alveolar macrophages and the concluding of concentration levels among each particular green gas produced.

Investigation for the Presence of *Staphylococcus aureus* in the Collegiate Dance Environment
Desiree Unsworth
Mentors: Adam Martiny & Jeffrey Russell

An increase in the prevalence of *Staphylococcus aureus* (*S. aureus*) skin infections has been noted in closely populated community settings. For example, existing literature documents the presence of *S. aureus* in the sports environment. However, it appears that no literature to date has addressed an examination for the presence of *S. aureus* in the dance environment. Therefore, the purpose of this study was to evaluate university dance facilities for the presence of *S. aureus*. The experiment examined the floors and barres of three dance studios at the University of California, Irvine (UCI). Samples were taken using a swab method and plated onto a selective medium for *Staphylococcus* bacteria. Species differentiation was determined via the coagulase tube test. The majority of the colonies tested gave positive coagulate test results, which confirmed the identity and presence of *S. aureus* in the collegiate dance environment. This suggests that the floors and barres of dance environments may act as reservoirs for pathogenic *S. aureus* and may play a role in community transmission of *Staphylococcal* skin infections among dancers. Further research is required to determine whether the level of *S. aureus* concentration in the dance environment might pose a health hazard.

Chemical Aging of Secondary Organic Aerosols by N-Containing Compounds
Katelyn Updyke
Mentor: Sergey Nizkorodov

Secondary Organic Aerosols (SOA) are important trace constituents of our atmosphere. Oxidation of volatile organic compounds (VOC), such as biogenically emitted terpenes and anthropogenically-emitted aromatics are the primary mechanism of SOA production. Most freshly prepared SOA particles do not absorb solar radiation, but they can become absorbing with time causing a warming climate effect. Several mechanisms by which SOA samples become colored have been previously reported. For example, d-Limonene SOA was shown to undergo browning in the presence of N-containing compounds (NOC). The goal of my study is to find out whether other types of SOA can similarly be browned by NOC. Different SOA precursors (sesquiterpenes, essential oils, 1,3,5-TMB, etc.) were chemically aged with NOC to determine if they share similar physical properties of d-Limonene. The SOA precursors were oxidized either with gaseous ozone or hydroxyl radical. The resulting samples were collected on Teflon filters or on impaction stages. The varying precursors were chemically aged in the presence of dissolved ammonium, urea, and selected amino acids, and then extracted for
analysis with UV-visible spectroscopy. Each type of SOA precursor exhibited different changes in optical properties and light absorption after exposure to the aging reagents. Selected aged SOA were analyzed with Raman spectroscopy to determine compositional changes. The results show that SOA browning is more common that it was previously thought and may account for significant fraction of atmospheric light-absorbing aerosols.

**Hepatitis Screening, Knowledge, and Awareness among Vietnamese-Americans in Southern California**

**Julie Van**

**Mentors:** David Imagawa & Alex Keleman

Hepatocellular Carcinoma (HCC) is the fourth most common cause of cancer-related deaths worldwide. The greatest risk factor associated with HCC and liver cirrhosis is chronic Hepatitis B (HBV) and/or Hepatitis C (HCV) viral infection. Although less than 1% of the total population in the United States is infected with chronic HBV, previous studies have shown Vietnamese-Americans affected at a rate as great as 15%. The purpose of the study is to determine the current knowledge and prevalence of hepatitis infection in a region with a dense Vietnamese-American population. In our preliminary study in 2007, we surveyed and serologically tested 38 Vietnamese-Americans aged 23-79 in Orange County, California. Of those, 61% were found to have antibodies against HBV (vaccination or acquired immunity), 18% were found negative for HBV antibodies (not protected, not infected), and 21% were found to be chronically infected with HBV. Despite the small sample size, the relatively high prevalence of individuals who are chronically infected with HBV is indicative that it is important to identify these individuals so that they can potentially seek antiviral treatment or employ additional means to prevent further disease progression. Our goal for 2011 was to recruit at least 350 subjects for our next screening and was successfully achieved through better advertisements, but the data still needs time to be fully analyzed.

**Analysis of Humoral Immunity in HIV Infected Viremic Nonprogressors and Progressors with a Multiclade HIV-1 Proteomic Chip**

**Joseph Van Dorn**

**Mentors:** David Camerini & Donald Forthal

The rise and spread of human immunodeficiency virus (HIV) infection has led to a worldwide pandemic of acquired immunodeficiency syndrome (AIDS). A thorough understanding of the anti-HIV immune response is critical to effective treatment of the disease. An elite group of HIV-1+ patients referred to as viremic nonprogressors (VNPs) do not develop AIDS despite containing viral loads similar to that of patients referred to as progressors, who would develop AIDS if left untreated. We used a proteomic chip that we developed printed with all HIV-1 antigens from the major clades to assay specific antibody reactivity in each type of infection. This was done by acquiring six samples of serum from HIV-1+ VNPs and comparing them to six sera from HIV+ progressors. By incubating the sera with the HIV proteomic chip, the presence and amount of HIV antibodies reactive with each HIV antigen in the patient’s sera was determined. We compared the reactivity of the antigens in VNP and progressor sera with each HIV-1 antigen in order to determine if any specific antigen was more reactive with sera from either group. After comparing the antigen reactivity to the reactivity of the negatives, we found 25 antigens that showed a large difference between VNP and progressor sera. These antigens with high variance are primarily from gp120, gp41, and V1-V5, which are all from the envelope gene (>50%). These results show that the HIV-1 multiclade proteomic chip is useful for discerning differences in the humoral responses between VNPs and progressors.

**Expression and Purification of Toxoplasma gondii P450**

**George Vela**

**Mentor:** Naomi Morrissette

Human infection with the protozoan parasite *Toxoplasma gondii* can cause serious disease in immunocompromised individuals and the developing fetus. Human infection is characterized by the tachyzoite (acute infection) and bradyzoite (encysted form, latent infection) stages. Current therapies are ineffective against the bradyzoite stage of infection because this form replicates very slowly. Cytochrome P450 enzymes perform an array of monooxygenation reactions in diverse pathways in many organisms. Recent literature indicates that P450 inhibitors decrease the number of bradyzoites in *T. gondii* infected mice. We identified the gene for a novel P450 protein in the *Toxoplasma* genome. In-frame fusion of the *Toxoplasma* P450 to yellow fluorescent protein (YFP) shows colocalization of the P450 with a mitochondrial marker. The goal of my study is to express large quantities of the *T. gondii* P450 protein in *Escherichia coli*. Using SDS PAGE gels, I have established the optimal conditions for expressing the P450: growth at 30°C in BL21-CodonPlus *E. coli* with isopropyl β-D-1-thiogalactopyranoside (IPTG) induction for 3 hours. The protein has a carboxy-terminal His tag that allows protein purification using a nickel column. I am currently working on purification of the protein. When assayed by absorbance spectroscopy, my purified protein should show a Soret peak at 450 nm, a characteristic of P450 cytochromes. The protein will be used for crystallography. Resolving the structure of the *Toxoplasma* P450 will be important to identify new P450 inhibitors.
Quantifying TGF-β Levels in Rodent Prostate via p-smad3 Immunoblotting
Anita Venkatesan
Mentors: John Krolewski & Kent Nastiuk

Prostate cancer is the second leading cause of cancer related death in men. Growth of prostate epithelial cells is regulated by androgens, and castration is one method to promote apoptosis. This is known as androgen withdrawal induced cell death. The growth hormone TGF-β is negatively regulated by androgen, and plays a key role in one of the many death signaling pathways. TGF-β induces the expression of FLICE-like inhibitory protein (FLIP), which is a caspase 8 inhibitor and a key regulator of androgen withdrawal induced cell death. The goal of this project is to measure the levels of TGF-β produced post castration and determine whether we can mimic the effect through TGF-β injections. In order to quantify the TGF-β levels, we are evaluating phosphorylated smad 3 (p-smad3) protein levels since TGF-β is a key factor in the smad 3 signaling pathway and causes the phosphorylation of smad-3 proteins. Before detecting p-smad protein, we first confirmed the presence of smad protein in mice positive and negative for exogenous TGF-β post castration. In the mice without exogenous TGF-β, we expect a greater amount of smad protein than in mice with exogenous TGF-β. We are currently in the process of optimizing the phospho-smad antibody by testing different dilutions on positive control samples. This is a necessary step so that we may receive the best signal.

Lolo
Teresa Villaruz
Mentor: Michelle Latiolais

In 1946, President Truman signed the Recession Act taking away the benefits promised to Filipinos who fought for the United States in World War II. In 2009, President Obama finally paid Filipino veterans for their services. Upon speaking to veteran Mrs. Heidi Delatorre, I realized that for many veterans, the lack of recognition is not an issue of money so much as an issue of honor for the sacrifices they made on behalf of the United States. My research soon branched from what it means to be a Filipino World War II veteran to what it means to be Filipino American, a journey which one could call a war in and of itself. My creative thesis explores the dynamic of a family upon the passing of the patriarch who was a World War II veteran. Initially, it was my intention to define this family according to how they were affected by having unrecognized World War II veterans in their family. However, as with any creative piece, I had to allow the characters to reveal themselves to me and so this series of stories became not so much the exploration of the injustices of war, but the exploration of a family in turmoil and love.

The Effects of Medical Websites on Doctor-Patient Relationships
Duc Peter Vo
Mentor: Sheila O’Rourke

The Internet has revolutionized the world we live in. A wealth of information is constantly at our fingertips. This is evident when we look at the healthcare system. On the Internet today, information pertaining to illnesses, prescription drugs and even personal information of physicians is easily accessible. This deluge of information has left both physicians and patients in a quandary and possibly has exacerbated an issue that every doctor faces, the doctor-patient relationship. The rapport between those two people, by necessity, needs to be one of significant trust. However, not only has technology transformed the way a person interacts with family, friends and even strangers, it also has changed how we view our connection with our physicians. What was once a realm exclusive to the doctor, the diseases, treatments and other medical facts, are now widely available to everyone. What will happen to this doctor-patient relationship as more and more people connect to the Internet and form second opinions on their own? Five doctors were interviewed to discover their points of view on this topic and journal articles and books were consulted to get a deep understanding of this complex issue. As America’s healthcare system gets a massive overhaul and as the Baby Boomer generation ages, the issues facing doctors and patients are becoming daunting. Medical websites have the potential to be either a blessing to medicine or a dilemma. It is hoped that this and similar research will aid in understanding the matter.

Absorbable Synthetic Mesh for Reinforcement of Laparoscopic Paraesophageal Hernia Repair
Thomas Vo
Mentor: Kevin Reavis

Biologic mesh has reduced the recurrence of paraesophageal hernia (PEH) following repair compared to primary repair. It minimizes the risk of esophageal erosion posed by permanent mesh; however, biologics are expensive and pose cultural conflicts regarding the use of human and animal byproducts. Most have suboptimal handling characteristics as well. We present a series of patients with PEHs which were laparoscopically repaired and reinforced with an absorbable synthetic mesh. From September 2008 to January 2010, 21 patients with PEHs of at least 5 cm in vertical or transverse dimension underwent primary PEH repair reinforced with absorbable synthetic mesh along with fundoplication. Three patients were being treated for recurrent PEHs. Outcome measures included recurrent hernia (> 2 cm) on esophagram as well as return of preoperative GERD symptoms. Patient BMI was 21–33kg/m2 (mean 27.5kg/m2). Maximal hernia dimension
was 5–10 cm (mean 7 cm). Follow-up was 3–18 months (mean 9.7 months). There were no intraoperative complications and no reoperations. Two patients developed recurrent hernias of 3 and 4 cm, respectively. One reported recurrent symptoms, specifically mild dyspnea with a 3 cm recurrent hernia after repair of her initial 10 cm PEH. One reported dysphagia 1 month following repair of a recurrent 8 cm PEH. This resolved following endoscopic dilation. There have been no long term complications. The use of absorbable synthetic mesh for reinforcement of PEH repair is effective and safe. It is relatively inexpensive, and the material is easy to handle. It carries no cultural concerns when compared to human and animal derived biologic reinforcements.

**Integrating Sensory Information with Cerebellar Learning and Impedance Control**

Grant Vousden-Dishington  
*Mentor:* Jeffrey Krichmar

The cerebellum plays an active role in motor learning, and one of its primary functions is believed to be the creation and modification of internal models of the environment and the plant, namely, the body of the organism. Two categories of internal models are possible: forward models, which yield predicted sensory outcomes of actions given a copy of a motor command, and inverse models, which take a desired sensory state as input and produce the motor commands that must be executed to achieve it. Recent research has suggested both models may be acquired by the cerebellum. However, this hypothesis remains to be tested using biologically plausible sensory input. This project implements a recently proposed coupling scheme of the cerebellar microcomplex with neuron population-based integration of proprioceptive and visual feedback to determine sensory states. The results are expected to augment the previously proposed scheme of the cerebellum’s function in internal model consolidation and provide a biomimetic neural encoding schema for sensory feedback and motor commands with emphasis on being able to perform impedance control tasks.

**The Use of Optical Motion and Scene Analysis in the Perception of Object Motion**

Amy Vu  
*Mentor:* Myron Braunstein

Despite the ease with which each of us as humans function in our daily lives, there are many factors that can change and affect how we behave in certain situations. In order to objectively determine the pieces of information most vital to our success in properly perceiving a scene, we must identify the various aspects of vision and combine, isolate, and manipulate them. We exposed subjects to either a checkerboard background and ball stimulus or perpendicular trajectories of a ball and asked them to determine the final height of the ball’s trajectory and degree of curvature, respectively. Trials consisted of changes in cue characteristics that would affect the perception of the ball’s motion across the screen. We found that in the checkerboard experiment, size and speed had minor effects while shadow was more useful. The second experiment allowed us to see that at closer distances, size information alone was sufficient; however, at farther distances, size and speed information together was needed to produce accurate judgments. Our visual system has the capacity to use variations in cue availability and produce unique experiences. Knowing when our senses may or may not fail us will aid in predicting future behavior and overcoming erroneous natural tendencies.

**Depositor’s Influence on the Banking Market during the Great Depression**

Kellie Vu  
*Mentor:* Gary Richardson

The Great Depression heavily affected the banking system in the United States. Before the depression, it was clear that depositors could drive the market of banks because if there was word that a bank was underperforming, hysteria might spread and everyone would withdraw their money from that bank, possibly causing it to liquidate. However, after the depression, regulations were put into play limiting the abilities of banks and restoring the faith of the people in the banking system. The goal of this study is to examine banking data in the state of Florida between the years of 1928 and 1937 to see if depositors drove the market. After the Great Depression, many reforms were enacted in 1933 which controlled speculation. Although it is unclear which part of the reform drove the result, it is safe to conclude that the reforms did cause a change in depositor’s actions.

**In Vitro Selection Yields Human RNAs that Bind ATP**

Michael Vu  
*Mentor:* Andrej Luptak

Riboswitches, RNA molecules that bind a signal and affect gene expression, have been observed widely in prokaryotes but only recently in eukaryotic plants. The presence of riboswitches in many plants stimulates curiosity about possible riboswitches in higher organisms, especially humans. By applying selective pressure to a pool of RNA for signal binding capabilities, signal-binding RNAs called aptamers can be found. Because signal binding is required for riboswitches like many other processes in biology, discovery of aptamers can either lead to the discovery of riboswitches or elucidate novel aptamer functionality. Human RNAs were selected for their ability to bind ATP, a small molecule chosen for its biological importance and...
ubiquity. Two distinct RNA motifs that bound ATP were discovered on chromosomes three and nine. Further work will be required to determine their possible function in human biology as parts of riboswitches or something else entirely.

**Awake-State Active Exploration Completely Protects Rodent Cortex from Ischemic Stroke**

Quynh Vu  
*Mentor: Ron Frostig*

Using a rodent model of cerebral ischemia (permanent middle cerebral artery occlusion; pMCAO), our laboratory previously demonstrated that mechanical whisker stimulation delivered under an anesthetized condition within two hours of ischemic onset confers complete protection from impending injury. Animals that received the identical stimulation three hours following ischemic onset lost neuronal function and sustained substantial infarct. As neural physiology is very different in anesthetized versus awake states, this study examined, using functional imaging and histological analysis, whether stimulation-induced protection from ischemic stroke could also be observed in awake, behaving subjects. In this awake-state stimulation group, animals were revived from anesthesia either immediately or three hours after pMCAO—at which point they were allowed to engage freely in whisker-guided, tactile exploration. Animals that could actively explore immediately after ischemic onset maintained normal neuronal function and were histologically equivalent to healthy controls; whereas those subject to a three-hour delay post-pMCAO exhibited substantially reduced or completely eliminated cortical activity and all sustained infarct. Thus, active exploration under the awake condition shortly after ischemic onset completely protects cortical function and structure. Even after a three-hour delay from stroke onset, awake-state stimulation could salvage neuronal function in some cases and resulted in significantly less structural damage than anesthetized-state stimulation. These findings further support the translational potential of stimulation-induced protection from ischemic stroke.

**Probability of Bank Failure in the Great Depression**

Jimmy Vuong  
*Mentor: Gary Richardson*

The Great Depression is a paragon of how low an economy can decline. Along with the crash of the stock market and the contraction of the currency, the widespread failure of banks is considered to be the cause of the Great Depression. This project examines the factors that affect the probability of a failure of a bank. I hypothesize that the transition from relationship banking to transactional banking contributed to the widespread failure of the United States’ financial system. Using the balance sheets of banks in the state of New York from 1912–1938, I analyze any bank operations that prove to put the bank at higher risk of failure. My model can calculate the health or success of a bank. Banks can exist under very hostile operations but not fail. This project examines any external factors that may attribute to a bank’s non-failure. In my data set, I coded the bank failures with a binary variable. Then given this restriction, used it as my dependent variable while date of organization, loan ratio, trust company, deposit bank, and liquid asset ratio as my independent variables. In the Great Depression Era, the financial system was under very low regulation. Because banks had no restrictions on their operations, the bank leaders had a larger role in the success or failure of their bank. I analyze the data of organization of the bank as an indicator of the strength of the relationship bankers have with their community. Also, loan ratio is found to be positively correlated to the probability of failure.

**The Role of Mitochondrial Lon in Connecting Hypoxic Adaptation and Treatment Resistance in Malignant Gliomas**

Yen Vuong  
*Mentor: Daniela Bota*

Glioblastoma multiforme is a highly aggressive tumor characterized by innate resistance to chemotherapy and poor survival rates. Lon protease, which is responsible for maintaining mitochondrial homeostasis, is suspected of promoting malignancy, but unlike homologues in bacteria or yeast, the functions of mammalian Lon is less well described. That said, the relationship between Lon expression and metabolic adaptation could provide useful insight and lead to the development of novel drugs that target cancer cell bioenergetics. Lon levels in different cell lines were evaluated with Western blot, while gene expression was regulated with siRNA. XTT viability assays were used to quantify proliferation under normoxic and hypoxic conditions. Interestingly, increased D54-MG hypoxic survival, respectively. Interestingly, *lon* up-regulation also reduced attachment and enhanced invasion in both established glioma cell lines. These data show that the Lon protease is a principal mediator in tumor progression and support current research on Lon inhibition as a possible treatment for malignant gliomas.
Reduction of Degradation During Purification of Recombinant Human Collagen Synthesized in Saccharomyces cerevisiae
Weheb Waheb
Mentor: Nancy Da Silva

Collagen is a protein found in the extracellular matrix of cells. Proteins such as collagen are biochemically signaled to regulate cell behaviors such as differentiation and adhesion. A goal of the laboratory is to make collagen variants (using the yeast Saccharomyces cerevisiae) that are engineered with specific cell-responsive and mechanical properties. These variants hold great potential for regenerative medicine, cancer therapy, and tissue engineering in general. My research goal is to find protocols necessary to minimize collagen degradation during purification. The objectives were to find the necessary pepsin concentration to digest background proteins to purify the collagen, to evaluate the collagen degradation during purification. The objectives of the research goal is to find protocols necessary to minimize collagen degradation during purification. The objectives were to find the necessary pepsin concentration to digest background proteins to purify the collagen, to evaluate the length of time at increased pH to inactivate pepsin and thus prevent collagen degradation, and to determine the amount of inhibitor required to stop pepsin digestion. Pepsin is used to remove available proteins, but if left for too long it may degrade the collagen. Therefore I digested collagen using a pepsin concentration range of 0.5 mg/ml to 2.0 mg/ml to determine the amount needed to degrade background non-collagen proteins. After the ideal pepsin concentration was found, I determined if pepsin activity continues at a pH of ~7.5, by leaving it at this pH for varying lengths of time. Finally, after digesting several samples, I added the inhibitor pepstatin and determined the length of time required to inactivate all pepsin. These conditions all helped in idealizing the environment to prevent collagen degradation during purification.

Low Abundance in Myoviridae Exhibit during Specific Temporal Seasons
Philip Wan
Mentor: Jennifer Martiny

The marine virus, Myoviridae, belonging to a family of cyanophages, have been studied over the years and favors showing up in certain temporal seasons. Previous studies have shown that certain months are more likely to reach a high abundance in Myoviridae due to abiotic factors; however, these studies do not explain why there are certain months in which it is difficult to carry out the presence of Myoviridae. In my study, I hypothesized whether Podoviridae, a subfamily of cyanophages, are present in the colony of infected cyanobacteria, Synechococcus, during a specific temporal season where Myoviridae do not amplify or plaque as well relative to other months by: 1) running and analyzing PCR of the molecular marker, DNA Polymerase for the presence of Podoviridae, 2) regrowing sample lysates that did not PCR amplify Myoviridae, and 3) running PCR for the regrown sample Myoviridae to suggest that Myoviridae, during certain months, have a higher decay rate compared to other months, therefore making it more difficult to plaque.

PCR analysis patterns, varying temporally and spatially, suggest that months in which Myoviridae did not amplify were not due to Podoviridae. Additionally, samples that did not amplify the first time for Myoviridae were able to amplify after lysates were regrown. The pattern and sequencing analyzes supports the idea that regrown lysate samples belong to the Myoviridae family. This study explains why Myoviridae during specific temporal seasons are hard to account for and we suspect that the leading cause for this may be because of a high decay rate compared to the other months.

Irrational Decisions: An Exploration into Prospect Theory
Raymond Wan
Mentor: L. Robin Keller

Prospect Theory explains how individuals resolve decisions under risk, in the face of losses or gains—it accounts for apparently irrational behavior that systematically violates traditional models in decision-making, such as expected utility theory. This study investigated whether Prospect Theory remains a descriptive model of decision-making when applied to modern young adults making choices faced with new types of risks. We explored three primary propositions from Prospect Theory. First, Prospect Theory posits that framing in the gain domain induces risk-aversion and framing in the loss domain induces risk-seeking. Second, Prospect Theory suggests that individuals are generally loss averse; that is, losses hurt more than gains gratify. Third, Prospect Theory indicates that people systematically weigh probabilities inconsistently. Attempting to examine whether these propositions are truly robust in today’s era, we surveyed 190 undergraduate UCI students exploring their hypothetical reactions to risk scenarios (examples: on oil spills and gambling on money) via an online survey. Our results indicate that while framing of a risky situation in the gain domain does strongly produce risk-aversion within individuals, framing of the same situation in the loss domain does not produce the same amount of risk-seeking. Additionally, individuals inconsistently displayed feelings of loss-aversion. Lastly, our results corroborate that people tend to weigh probability situations unevenly; that is, they particularly tended to overweight small probabilities. It is concluded that while Prospect Theory remains an extremely reliable theory in understanding irrational choice behavior, a changing environment may be subtly affecting its descriptive power.
Hybrid versus Non-Hybrid Vehicle Choice Model and Willingness to Pay for Fuel Efficiency

Jennifer Wang  
**Mentor:** David Brownstone

Due to demands for higher fuel efficiency and lower operating costs per mile, the popularity of hybrid electric vehicles has increased significantly over the past decade. This study investigates the probability that a household will purchase a hybrid vehicle based on vehicle characteristics and household attributes. Modeling vehicle choice often encounters issues due to the fact that many vehicle characteristics, such as brand preference and style, are qualitative and cannot be accurately measured. By assuming households are faced with the decision between a hybrid vehicle and its identical non-hybrid counterpart, the discrete choice model focuses on key differences other than aesthetics and brand name. The results show an aversion toward hybrid vehicles and higher prices, but a preference toward higher fuel efficiency. A household’s willingness to pay for higher fuel efficiency is calculated to determine the dollar value of a unit increase in miles per gallon.

Critical Interpretation of Matsuo Basho’s Influence in Gary Young’s Poetry

Lynn Wang  
**Mentor:** Colette Atkinson

Contemporary poet Gary Young cites Japanese poet Matsuo Basho’s *haikai* as an influence on his own prose poetry. Both poets typify their writing with austerity and aphorism, qualities which are realized within the poems by the speaker’s deeply insightful meditations upon the complexities of the world. This address that Basho and Young make towards multiplicity of situations and circumstance, whether tragic or fortunate, was of particular interest to me. I explored this detail further in my critical analyses of Basho’s and Youngs’ poetry to determine how both poets construct this similar perspective. Eleanor Kerkham’s article “And Us Too Enclosed in Mori Atsushi’s *Ware Mo Mata, Oku No Hosomichi*” expounds upon critic Mori Atsushi’s idea that Basho’s work sought balance through antithetical components placed together within single poems. Mori’s finds *taio* (a term he describes as “intersections between two entities within which correspondences or oppositions appear”) taking precedence in Basho’s work. According to Mori, the inclusion of opposing forces within Basho’s *haikai* produces tension within the constructed paradox; the constant interplay within this tension creates transformation. I have analyzed poems from Gary Young based on this same element of transformation through the tension produced by *taio*. My research has focused on how Young and Basho’s works guide readers through these transformations to achieve a greater perspicacity.

Sequence Memory in Rats: An Animal Model of Episodic Memory

Min-Xuan Wang  
**Mentors:** Timothy Allen & Norbert Fortin

Episodic memory is memory for specific events and the contexts in which they occur. In order to study the neural basis of episodic memories, we have developed a behavioral protocol to demonstrate sequence memory in rats. Rats were trained to learn a sequence of four unique odors in a custom-built maze with an automated odor delivery system. They significantly demonstrated the ability to remember the sequence and distinguish between correct in- sequence odors and incorrect out-of-sequence odors in all four training phases. The successful training allows us to pursue future studies with reversible inactivation of hippocampal structures and single-unit electrophysiology recordings.

Presence of Endoplasmic Reticulum Stress in the Artery Wall and its Partial Amelioration with Vitamin B Supplementation in Diabetic Rats

Steven Wang  
**Mentor:** Nosratola Vaziri

Endoplasmic reticulum stress plays a crucial role in the pathogenesis of diabetic complications. By promoting oxidative and endoplasmic reticulum (ER) stress, hyperglycemia can potentially result in vascular disease. However, presence of ER stress and its role in the pathogenesis of diabetic vasculopathy has not been explored previously and was investigated here using rats with streptozotocin (STZ)-induced diabetes. Diabetes was induced in male Sprague-Dawley rats by IP injection of streptozotocin (50 mg/kg). Vehicle-treated rats served as controls. Diabetic rats were randomly assigned into untreated group or those treated with a combination of vitamin B6 200mg/kg, vitamin B12 1mg/kg and folic acid 10mg/kg. The animals were observed for eight weeks, at which point they were euthanized and thoracic aorta was harvested. Expression of the ER stress-associated proteins including C/EBP homologous (CHOP), glucose-regulated protein-78 (GRP78/BiP), phospho-eukaryotic initiation factor 2 alpha (eIF2-α), Bax, Bel-2 and oxidative stress markers were assessed by Western blot analysis. The diabetic rats showed marked hyperglycemia, proteinuria and elevated serum urea concentration, which were unaffected by vitamin B administration. This was associated with significant increase in the abundance of CHOP, phospho-eIF2-α, Bax, p47phox and antioxidant enzymes, Cu,zn-SOD and Gpx in the aorta. Vitamin B therapy attenuated the ER stress and partially reduced the p47phox expression of in the aorta tissue of diabetic rats. STZ-induced diabetes results in ER and oxidative stress in the artery wall. These abnormalities can contribute to development of atherosclerosis.
and arteriosclerosis and can be partially attenuated by high doses of vitamin B6, folic acid and vitamin B12.

**The Study of Opera: An Italian Perspective**

**Heather Wells**

**Mentor:** Darryl Taylor

As a student of classical voice, I am constantly immersed in training and research to help better the quality of my instrument as well as my performance abilities and understanding of the art as a whole. Participating in the Amalfi Coast Music Festival in Italy over the summer was a great opportunity to learn and put into practice many aspects of the performing art of opera. I was able to study role preparation and vocal technique, and the vast array of performance opportunities provided me with incalculable experience. Being immersed in the culture of Italy was another benefit of this research activity. Italy has often been proclaimed the home of opera, and my research in this country helped me to better identify with the culture that gave birth to this art form. Immersion in the Italian language also benefited my training because it allowed me the chance to hear the language as spoken by natives. As students of classical voice are expected to sing in an array of languages, including Italian, this was an invaluable experience. Since the end of the program, I have been working hard to employ the knowledge and experience gained in my everyday research and training.

**A Microfluidic Trap System for C. elegans Egg Counting**

**Yuang Wen**

**Mentor:** Elliot Hui

Assays that measure egg-laying assess the well-being of *Caenorhabditis elegans* in specific environments. If a worm’s egg count during the course of an experiment varies significantly from a wild type worm growing on an *E. coli* seeded agar plate, then that worm cannot be considered as thriving. The previous *C. elegans* counting technique, done by light microscopy, is inefficient, for it takes days to collect an accurate egg-count. The goal of this research project is to develop a system that sequentially traps eggs as they are laid by worms in microfluidic devices, which allows for accurate and efficient counting for worms cultured in liquid media. A prototype of the microfluidic trap was fabricated with poly(dimethylsiloxane) (PDMS) using standard photolithography and soft lithography methods, and was tested with poly(methyl methacrylate) (PMMA) beads. Data obtained from optical profilometer showed that the fabricated device has rough surfaces, which hinders performance of the device. Furthermore, some small, critical features of the trap device were not successfully molded into the device due to the high aspect ratios that the features required. Testing with PMMA beads did not yield the desired outcome, due to loss of critical features from fabrication. These results suggest that alternative photolithography and soft lithography methods are required to produce the desired features.

**Lysis of the Toxic Algal Bloom Forming Marine Diatom *Pseudo-nitzschia***

**Juliana West**

**Mentors:** Sunny Jiang & Marilou Sison-Mangus

*Pseudo-nitzschia* is a domoic acid producing marine diatom responsible for numerous toxic algal blooms all over the world. Domoic acid is a water-soluble excitatory neurotoxin that poses health risk to humans and mortality in marine mammals and birds. Toxic blooms also cause huge monetary losses to aquatic and tourism industries. Although it is known that viruses and bacteria are found in elevated quantities during bloom events, the role of these microbes on the mitigation of phytoplankton bloom is not well understood. One hypothesis is that viruses present during the bloom may be responsible for the termination of the bloom. If the biological agents responsible for the termination of harmful algal blooms could be isolated it may be possible to use them to mitigate future bloom events. To this end, a viral concentrate obtained from Santa Cruz, California seawater was used to inoculate healthy cultures of *Pseudo-nitzschia*. A lytic agent present in the concentrate successfully caused lysis in *Pseudo-nitzschia*. The culture medium of the lysed algae were isolated and used to induce lysis in a second round of healthy cultures. Lysis was successfully replicated in several strains of *Pseudo-nitzschia* however visualization of the lytic agent responsible for the lysis of the marine diatom is still underway.

**Cartels’ Effects on Tourism**

**Erica White**

**Mentor:** Ricardo Chavira

Tourism in Mexico is one of the top three contributors to the Mexican economy behind oil revenues and remittances sent by migrants working in the United States. With depleting oil reserves and tighter border security and U.S. immigration policies, Mexico has been forced to rely heavily on revenues from the Mexican tourist industry. This industry has, however been in decline in recent years. The purpose of this research was to discover by what and how the industry had been impacted. Originally it was hypothesized that the violence from Mexico’s ongoing drug war with cartels had been the cause of the decline. Through analysis of statistics from the Bank of Mexico, hotel occupancy statistics from the Mexican hotel chain Pueblo Bonito, and articles from the Journal of Travel Research, it has been concluded that the impact of the cartel violence is less significant then the impact of the United States’ economic recession. Although the decline of the Mexican tourism...
industry is from a combination of factors including cartel violence and natural disasters, the most detrimental factor to the Mexican tourism industry has been the economic recession in the United States.

In Vivo Imaging of a Stem Cell Niche
Brandon Wong
Mentor: Elliot Hui
Since assays of large vertebrate animals are time-consuming and costly, many biologists have turned to *C. elegans* for genetic experimentation. As a model organism, many genetic interactions have been well documented but not understood. To understand how or why these processes occur, further experimentation is necessary; however, due to the micro-scaled nature of *C. elegans*, there are difficulties immobilizing the worm while leaving it unharmed. Recent microfluidic device have found methods to immobilize *C. elegans* in chemical free manner. We report the use of a previously engineered microfluidic device constructed from PDMS to immobilize *C. elegans* and keep the worms in device to image the development of the *C. elegans* germline.

Presidential Rhetoric and its Effectiveness Between Presidents
Danielle Wong
Mentor: Mark Petracca
Presidential rhetoric has become increasingly important in the role of the American presidency. Presidents have constantly used their rhetoric to push policy, pass legislation, and comfort the American public. There are several key similarities, differences, and criteria in presidential speeches that determine the success or failure of a speech. This thesis uses public reaction to determine the success or failure of speech. It focuses on presidential speeches from the mid twentieth to the twenty-first century and analyzes the criteria of each speech. Evidence from literature written by scholars has shown that there are key similarities that presidential speeches employ. This suggests that these similarities have either a positive or negative effect on presidential rhetoric.

Trading Up: Patterns of Social Exchange in Interracial Romantic Relationships
Jaelyn Wong
Mentor: Andrew Penner
Existing literature on interracial marriage suggests that intermarriage often follows patterns of status exchange, where racial minorities “trade” achieved social capital (e.g., income, occupational prestige) for a romantic partner of a high-status race. While many studies note the exchange of physical attractiveness or income in Black-White marriages, very few studies address race differences in status exchange. Using the National Longitudinal Study of Adolescents and Young Adults (NLSY79), this project examines the role of race and gender on patterns of status exchange in married Black-White romantic relationships. Using multivariate analysis, this project determines the influence of race and gender on status exchange in Black-White marriages.

Oxidative DNA Damage in the Gclm/Nnt Knockout Mouse Ovary
Jeren Wong
Mentor: Ulrike Luderer
This study was performed to test whether the ovaries of *Gclm-/-* mice have increased oxidative DNA damage compared to *Gclm+/+* ovaries and further, that the presence of the *Nnt* mutation will enhance oxidative damage caused by lack of *Gclm*. The *Gclm* gene codes for the modifier subunit in the glutamate cysteine ligase enzyme. Glutamate cysteine ligase is important for the synthesis of glutathione, an important antioxidant. While, the *Nnt* gene codes for NADP transhydrogenase which is important in restoring glutathione levels in the cell. Female mice from each of four groups, *Gclm+/+ Nnt* wild type; *Gclm-/- Nnt* wild type, *Gclm+/+ Nnt* mutant, and *Gclm-/- Nnt* mutant, were mated with a wild type C57BL/6J males while number and size of litters were recorded. Immunostaining using antibodies against 8-hydroxy-2'-deoxyguanosine, 8-OHdG, was used to locate oxidative DNA damage within the ovaries. The *Nnt* mutation has had no significant effect on fertility, but rather it is the *Gclm* knockout alone that is producing decreased fertility in these mice. No conclusions can be drawn about the effect of either mutation on ovarian oxidative DNA damage pending additional immunostaining experiments.

Global Risk Evaluation and Risk Factor Control in U.S. Adults with Asymptomatic Peripheral Arterial Disease
Kalina Wong
Mentor: Nathan Wong
Peripheral Arterial Disease (PAD) has been vastly prevalent in the elderly population and has been shown to be highly correlated to cardiovascular disease morbidity, mortality, coronary heart disease, and other associated risk factors. We examined adults between the ages of 18 to 85
years from the National Health and Nutrition Examination Survey (NHANES) 1999 to 2004 without any previous history of cardiovascular disease (stroke, myocardial infarction, angina pectoris, heart failure, coronary heart disease) and with ABI measurements by gender, age groups, ethnicity, risk factors controls, and treatment (anti-platelets, lipid-lowering agents, and ACE inhibitors or angiotension receptor blockers (ACE/ARB)). The overall prevalence of ABI risk groups (<1.5 and ≥ 1.0, < 1.0 and ≥ 0.9, and < 0.9) was 87.3%, 9.3%, and 3.5%, respectively. The overall prevalence of FRS risk groups (<10%, ≥10% and <20%, and ≥20%) was 54.9%, 24.8%, and 20.3%, respectively. Women had a higher proportion (12.3% and 4.5%) of having a low or intermediate ABI than men. There are a significant number of individuals considered to be at intermediate or high risk for PAD, bases on an ABI <0.9, who would be considered to be at a low or intermediate risk for CVD. Also, a very small proportion of individuals with PAD are on treatment. Improvements of classifying individuals to a proper risk for PAD and CVD and a more aggressive approach to addressing individuals with PAD on recommended treatment(s) are highly suggested.

Role of Nucleus Ambiguus Inhibitory Cardiovascular Effects during Electroacupuncture Response
Megan Wu
Mentor: Stephanie Tjen-A-Looi

Complementary and alternative medicine modalities have become popular in place of contemporary Western medicine. Acupuncture has been used for ages to treat many different ailments including cardiovascular diseases. Past studies have shown the normalizing effect of electroacupuncture (EA) on the excitatory cardiovascular responses. This study focused on the Bezold-Jarisch reflex, which causes a drop in blood pressure and heart rate (bradycardia). We examined the effects of EA in normalizing the PBG induced cardiovascular responses. We also investigated the role of nucleus ambiguus (NA), the regulator of heart rate, and neurotransmitter γ-aminobutyric acid (GABA) during the effects of EA. I hypothesized that GABA in the NA plays a role during acupuncture’s normalizing effects on inhibitory chronotropic hemodynamic responses. Adult cats were anesthetized and ventilated while their blood pressure and heart rate were monitored. EA was applied at P5-P6 acupoints during repeated stimulation of the Bezold-Jarisch reflex with PBG. EA normalized both the blood pressure and the heart rate for a prolonged period of time. Microinjection of gabazine into the NA reversed the effect of EA on bradycardiac responses. Saline microinjections did not influence the EA effect. The results of this study suggest that EA normalizes cardiovascular responses. We also have shown that EA normalizes bradycardia through a GABAergic mechanism in the NA.

Amalfi Coast Music Festival
Celeste Wychopen
Mentor: Frances Bennett

In the summer of 2010 I attended the week-long Amalfi Music Festival in Italy, where I performed the role of Drittel Knabe (Third Spirit) in Mozart’s opera Die Zauberflöte (The Magic Flute) in addition to performances in various opera scenes and art song concerts. My goal was to expand my academic knowledge of musical literature and form while improving technical aspects of my diction and voice. In the months leading up to the festival I spent 10–14 hours per week researching and practicing music for performance. My research included creating literal and idiomatic translations of German and Italian texts, consulting Urtext editions (original musical scores) of songs and arias and constructing a historical and literary context for each of the works I performed. While in residence at the Amalfi Festival the intensive training schedule included private and group music rehearsals, master classes in technique, lectures on industry success and classes in dramatic interpretation and movement. I participated in five performances at venues including an outdoor community amphitheater, a concert hall at the Royal Palace of Caserta, and a seventeenth-century church in the village of Vietri Sul Mare. Studying opera in the country where the art form originated deepened my understanding of the musical works I performed, while singing and conversing with native speakers of Italian and German improved my language skills and musical acuity.

Evaluation of Recombinant Human Collagen III Stability with Trypsin
Dongyoung Yang
Mentor: Szu-Wen Wang

The stability of recombinant human collagen III (rhC III) can be studied by evaluating the trypsin resistance of the protein’s triple helical conformation. Recombinant human collagen III is cleaved by trypsin when it is unfolded, but is resistant to proteolysis when in its triple helical conformation. This transition can be induced by the temperature, and investigating the transition temperature will help to identify the optimum process temperature for rhC III purification. In this study, rhC III, produced by engineered Saccharomyces cerevisiae, are incubated with trypsin and incubate within the temperature range from 4 °C to 45 °C. To analyze digesting rhC III, SDS-PAGE protein gels are used for separating with the other background proteins.
Discovering and Developing New Tuberculosis Therapeutics: Crystallizing AccA3/AccD4
Kimberline Yang
Mentor: Sheryl Tsai

*Mycobacterium tuberculosis* thick cell wall consists of long, highly-branched fatty acids, called mycolic acids. This unique cell wall contributes to the latency and pathogenicity of the Tuberculosis infection. The enzyme involved in the biosynthesis of these fatty acids is acyl-CoA carboxylase (ACCase). Within this large ACC protein complex are three subunits; two of these—the di-domain α subunit, consisting of biotin carboxylase and biotin carboxylase carrier protein domains, and the carboxyltransferase consisting of biotin carboxylase and biotin carboxylase carrier protein domains, and the carboxyltransferase β subunit—are my areas of focus. *M. Tuberculosis* has six β subunits (accD1-6), each providing a different biological role and different extender units for the biosynthesis of fatty acids. From the experimental results of the Tsai Lab, AccD4, AccD5 and AccD6 have distinct affinities for long chain 24C-CoA, propionyl-CoA and acetyl-CoA, respectively. However, how AccD4-6, three highly homologous proteins, developed such different substrate specificities, and their interactions with the α subunit is still unknown. New results from the Tsai lab have shown that one of the alpha subunits, AccA3, and one of the β subunits, AccD4, together plays an essential role in fatty acid synthesis in tuberculosis cells. In addition, it was found that AccD4 needs to be associated with AccA3 in order to be enzymatically active. This is the first time that an α and β complex has ever been studied through protein crystallography. Therefore, the two proteins are being researched in hopes of understanding how the two subunits interact with each other and affect substrate specificity. These novel findings will help understand the mechanism of bacterial fatty acid biosynthesis and moreover, advance the developments of anti-tuberculosis drugs through structure-based drug design.

In Vitro Selection of DNA-RNA Fusions in Water-in-Oil Emulsions
Stephanie Yang
Mentor: Andrej Luptak

Display technologies are procedures that fuse genotypic data, DNA, with its phenotypic product, such as RNA. Current display technologies, however, each have their own disadvantages. In an attempt to overcome the disadvantages of other display technologies, in *vitro* compartmentalization (IVC), a technique using emulsions to create molecular compartments, was used to co-localize the DNA with its RNA for binding to occur. In order to begin this process, the DNA was optimized, specifically designing DNA for stability, which was crucial for transcription reactions of transforming DNA into RNA in emulsions. With carefully constructed DNA, chemical modifications were made on the 5’ and 3’ ends of the DNA sequence to test for specific binding activity. With IVC, selecting for DNA fused with its RNA would then allow for greater evolution of macromolecules, leading to advancements in designing drugs.

Dynamic Out-of-Order Java (DOJ)
Stephen Yang
Mentor: Brian Demsky

With the advent of multicore and manycore computers comes the need for better parallel programming practices. Traditional ways of software parallelization required that the programmer carefully reason out race conditions and where to use locks in order to ensure data coherency between the many cores on a computer. While this task may be manageable in small projects, it quickly becomes a daunting task as the complexity and size of the project grows. In an attempt to ameliorate the situation, Brian Demsky and James Jenista came up with Out-of-Order Java. It allows the programmer to mark parts of Java source code that he/she thinks can be parallelized. The computer would then analyze the code for dependences and generate the necessary code to facilitate the parallelism. However, since this analysis is done before runtime, it would increase the compile time and conservatively mark blocks it was unsure about as unparallelizable. This is where DOJ comes into play. We replace the heavy-duty static analysis with a light-weight analysis that identifies potential conflicts and generates heap traversers to rule out dependences at runtime. This leads to faster compile times and more precise decisions. Testing with ten benchmarks, DOJ consistently had a lower compile time and mostly comparable runtimes. Additionally, there were two programs that DOJ could parallelize where OoO had failed. Overall, we consider DOJ a step in the right direction. With a few heuristic features, it could potentially achieve even greater speedups.

Modified UPy H-bonding Units to Direct Peptoid Folding
Max Yen
Mentor: Zhibin Guan

Peptides and their mimics present a vast range of desirable properties, including molecular catalysis, which mankind has long sought to mimic through new proteins and enzymes. However, the path between construction of a primary sequence and folding in media to form a functional higher-order structure has been difficult to elucidate and navigate. Molecular folding in water, dictated by hydrophobic interactions and the nucleation of secondary structure elements that eventually leads to specific
tertiary and quaternary structures, has inspired many engineered systems encoding key hydrophobic residues. However, the attenuation of hydrophobic collapse in organic media means that in such environments, one or more other impetuses must be engineered into systems to incept the path between sequence and structure and function. We proposed strong and specific hydrogen bonding units, introduced in the primary sequence of peptides, to replace the hydrophobic collapse in chloroform. Pairing of these strong hydrogen bonding units in an organic environment were envisioned to lead the folding process by locking the structure in a local energy minimum, thus limiting the backbone to a narrower conformational space. We devised unnatural amino acid derivatives of 2-ureido-4-pyrimidone (UPy) as the strong and specific hydrogen bonding unit to direct peptide folding. However, the insolvibility of these UPy-incorporated peptides due to unquenched backbone H-bonding in our organic system, chloroform, now leads us to peptoid (N-substituted glycines) backbones. Herein, we discuss the effect of incorporating UPy-modified peptoid backbones in promoting alpha-helical formation for a peptoid (Nspe) sequence known to form alpha-helices.

The Flying Cranes and Other Stories
Helen Yoshida
*Mentor:* Ron Carlson

During the spring of 1942 and during World War II, all persons of Japanese descent were evacuated from their homes by the United States government. These American citizens and aliens were given ten days to pack their belongings and take only what they could carry to Assembly Centers and finally internment camps built in rural spaces of California, Wyoming, Idaho, Utah, Colorado, Arkansas and Arizona. Most of the research done on this topic has been the content of history books or some historical fiction as well as autobiographies, and these works contain the “outer story” which is the activities and politics that take place within the camps and that surround the internment of the Japanese. My creative thesis emerges as a novel idea because the lens through which each story is told changes, yet they are bound together because the short stories are centered on the Heart Mountain camp in Wyoming. My stories still include that “outer story” that establishes setting and has each protagonist working towards a goal and encountering obstacles, but strongly emphasize the “inner story,” their anger, joy, and determination that they encounter during internment and how they handle those emotions. By including both the inner and outer stories within these four short stories, the reader experiences the events in the protagonists’ lives and how each protagonist impacts the lives of others and how they function in this microcosmic desert community.

Breast Tissue Decomposition Using CdZnTe Detectors
Frances Yu
*Mentor:* Sabee Molloi

Currently, the primary technique for diagnosing breast cancer is mammography, which often decreases in sensitivity with dense breasts or structure superposition. Research in breast computed tomography (CT) with photon counting and energy resolved detectors is beginning to develop more accurate techniques for breast cancer detection. CdZnTe, or CZT, detectors are in use in conjunction with a CT system to count photons and sort them into energy bins. This energy resolution is used to determine the concentrations of water, lipid, and protein within the sample, which are then used to identify the presence of tumors within a tissue. High water concentrations are expected within cancerous tissue, since tumors promote angiogenesis, the growth of new blood vessels. In order to verify the image results, a physical chemical decomposition is also performed on the sample. The chemical decomposition consists of documenting the mass of a sample between the baking of water from the sample, filtering the protein from the oils, and distilling the fat from the ether. Development of this breast CT technique will not only decrease the amount of radiation exposure and discomfort to the patient but also provide a more accurate method for cancer detection.

Prolonged Intrathecal Infusion of Novel Amino Acid BMAA Induces Astrocytic Effects in Wild-Type Rat Spinal Cord, Resembling Disease Progression in Transgenic Rat Model of ALS
Stephen Yu
*Mentor:* John Weiss

Thousands of people each year are diagnosed with Amyotrophic Lateral Sclerosis (ALS), a devastating progressive neurodegenerative disease. The unusual amino β-methylamino-L-alanine (BMAA) has been proposed to be responsible for the high incidence of Amyotrophic Lateral Sclerosis-Parkinsonism Dementia Complex (ALS-PDC) in Guam. BMAA, an active compound resembling the neurotransmitter glutamate, was found in cycad seeds consumed by the Chamorro people of Guam, induced selective injury to motor neurons (MNs) with minimal effects on other spinal neurons at low concentrations in previous *in vitro* studies. Recent reports suggest novel routes of BMAA ex-
Exposure, which include biomagnification, protein incorporation, and the global presence of cyanobacteria responsible for producing BMAA, implicating BMAA as a possible contributor of widespread sporadic ALS pathogenesis. After four week intrathecal infusion of BMAA in vivo in SOD1 G93A rats (a model for ALS) and their wild-type littermates, this study found that BMAA significantly decreased the expression of astrocytic glutamate transporter (GLT-1) and significantly increased astrocyte activation in wild-type animals. These findings suggest a disruption of glutamate regulation and perturbation of delicate motor neuron (MN) homeostasis. Results suggest a possible common mechanism for pathogenesis between BMAA exposure and sporadic ALS.

The Effects of Human Embryonic Stem Cell-Derived NPC Transplants on Endogenous Neuronal Sparing/Sprouting in Spinal Cord Injured Rats

Mina Zadeh

Mentor: Hans Keirstead

Spinal cord injury (SCI) is a debilitating disease caused by damage to the spinal cord that often results in paralysis and loss of sensation below the injury site. At this time no cure exists for SCI; however, stem cell-based therapies using human neural progenitor cells (NPCs) have been shown to enhance remyelination of axons, tissue sparing, and in some cases, locomotion. Yet it remains unclear whether the mechanism by which these NPCs cause locomotor enhancement is due to remyelination or sparing. To investigate this, we transplanted human embryonic stem cell-derived NPCs that had limited remyelination capability into spinal cord injured rats. Two months after transplant we assessed the effects of our transplants on endogenous sparing. Endogenous sparing was assessed by injecting all animals with an anterogradal neuronal tracer (BDA), which labels all descending neurons. These neurons were then quantified in all transplanted and non-transplanted control animals. Although our data has not yet been thoroughly analyzed, we hypothesize that the human embryonic stem cell derived NPC animal will have more BDA label than controls.

The Effects of Community Affluence on Community Gardens

Jorge Zavala

Mentor: Victoria Basolo

A community garden is a garden in an urban locale that gives the neighboring community the opportunity to plant food in a public setting, is harvested for the benefit of the community, and elicits community activism. Although community gardens can add to a community in terms of health and community development, they are difficult to maintain due to their often uncertain sustainability. A qualitative study was conducted that looked at five community gardens in Orange County in order to understand the role that community affluence plays in the success of community gardens. The current literature has yet to focus on community affluence as a predictor to garden success; hence this study will add relevant information to the existing literature. Garden success was measured by the frequency and importance given to social interaction and by each garden’s sustainability. Unstructured and Semi-Structured interviews were conducted with prominent garden administration, garden leaders, and garden users. Additionally, participant observation was used in order to achieve a maximum understanding of community relations within the gardens. The hypothesis that community gardens in wealthier neighborhoods are more successful in terms of community activism and garden sustainability than comparable gardens in low-income neighborhoods was explored. Data was analyzed by triangulating between garden location and emergent topics which include garden design, administration, funding, land tenure and community activism. Findings demonstrate that gardens in low-income neighborhoods are more successful in terms of community activism. However, there were no significant differences between the gardens regarding sustainability; in fact, each garden’s sustainability was threatened in some way.