Individual Projects A–G

Using Breath Analysis to Identify Aspergillosis in the Exhaled Breath of Pediatric Cystic Fibrosis Patients
Dina Abdo
*Mentor:* Donald Blake

Invasive Pulmonary Aspergillosis is a severe and detrimental fungal infection, where *Aspergillus* colonizes and damages lung tissue in Cystic Fibrosis patients. For these patients the high mortality rate associated with Invasive Pulmonary Aspergillosis is often due to a lack of efficient diagnostic techniques. Current techniques such as serological and radiological testing methods have been unsuccessful in accurately identifying *Aspergillus* in Cystic Fibrosis patients early enough to effectively treat.

This study examined exhaled breath samples from ten pediatric Cystic Fibrosis Patients infected with *Aspergillus*, in an effort to identify a unique volatile gas profile for the fungus *Aspergillus*. Preliminary results indicate that there is an unknown gas biomarker given off in higher concentrations by some Cystic Fibrosis patients, when compared to the healthy control. In addition, the exhaled breath results also indicate a potential case for albuterol propellant compliance among the patients. This study demonstrates that there is at least one potential breath biomarker for *Aspergillus*, which could later provide a non-invasive approach to diagnosing Invasive Pulmonary Aspergillosis. Additional results indicate the potential for a normalized standard to reinforce the compliance of propellant use among Cystic Fibrosis patients.

Representations of the Raced Body in Modern Egypt
Marwa Aboubaker
*Mentor:* Nasrin Rahimieh

Following the construction of the Aswan High Dam in 1964, 50,000 Nubians were dislocated from their deeply rooted genealogy, community, and agricultural economy. Although the government was able to resettle these populations and memorialize certain ancient artifacts, the strong ties to their homeland could not be preserved. Furthermore, the Nubian diaspora has yet to receive adequate compensation for their loss and trauma. Such sentiments are translated and reproduced in the works of contemporary Nubian writers and activists. This minority subjectivity is responding to the greater discourse of Egyptian film and literature which continuously chooses to erase or write over the existence of black people. Drawing on works of fiction by Nubian writers and cinematic representations of Nubians, my project traces the ways in which Egyptian modernity constructs the Nubians as racial others, marginal to the Arabized national identity. I have read the works of some contemporary Nubian writers such as Haggag Hassan Oddoul, Idris Ali, and Muhammed Khalil Qasim. In addition to watching *Africanu* (2002) and older films with the renowned actor Ali Al-Kassar, I have also turned to Viola Shafik’s *Popular Egyptian Cinema*, which specifically deals with the role of Egyptian Cinema in constructing the Self of the nation. My exploration of themes and motifs in these works helps advance a more complex analysis of the tension between anti-blackness in material production with the ongoing plea for a genuine incorporation into the national imaginary by Nubian writers, filmmakers, and activists.

Preclinical Safety and Efficacy Studies of Marizomib (NPI 0052) in Xenograft Glioma Models
Vivek Abraham
*Mentor:* Daniela Bota

The purpose of this study is to determine the efficacy of Marizomib (NPI 0052), a proteasome inhibitor, in treating glioblastoma multiforme (GBM) tumors in xenograft murine models. The proteasome is an essential component for the survival and proliferation of GBM; therefore, one method of treatment would be through proteasome inhibition. Marizomib, due to its lipophilic structure, is theorized to cross the blood brain barrier. Additionally, proteasome inhibition is higher in Marizomib as compared to other proteasome inhibitors such as bortezomib and carfilzomib. While these two other drugs are approved to treat multiple myeloma and have little to no effect on GBM, Marizomib may be the necessary agent to treat glioma. To assess the drug’s potential of crossing the blood brain barrier and treating GBM immunocompromised mice were implanted with human GBM and were treated with Marizomib in order to analyze the survival data. The mice that were treated with Marizomib had a significant increase in survival as compared to the control mice. As a result, the study proves that Marizomib is capable of crossing the blood brain barrier and can reduce, and even eradicate, malignant GBM in the xenograft murine models. Due to the results of this experiment, a Phase I clinical trial of Marizomib is now being performed on patients with recurring GBM.
Investigating Semantic Organization and Memory Impairment using Triadic Comparisons
Meline Abramyan
*Mentor: Michael Lee*

We study the effect of memory impairment on the structure of semantic representation, using triadic comparison and delayed free recall tasks for animal names coming from a large clinical data set. We define eight groups of patients in terms of their delayed free recall performance, and present standard analyses of the triadic comparison and free recall data that provide little insight into the effect of memory impairment on semantic structure. We then use Bayesian methods to infer multidimensional scaling (MDS) representation for each group based on their triadic comparisons. These representations reveal a successive decrease in semantic cluster structure and increase in uncertainty with increasing impairment. We propose a measure of spatial organization as a means of quantifying the visually evident changes in semantic organization, and demonstrate its usefulness for the eight groups. We conclude by discussing the potential for clinical application of our new models, measures, and methods.

After School Tutoring: Evaluating the Effectiveness of the K-12 Tutoring Program of Friendly Center, Inc.
Veronica Acosta
*Mentor: Doug Houston*

There is a persistent gap in test scores between ethnic minorities and their white counterparts known as the academic gap. The factors that contribute to the academic gap are generally based on environmental influences. Research shows that the interaction between a child and their environment influences them not only academically but also biologically, socially, and emotionally. The goal of the research conducted at the Friendly Center after school tutoring program is to determine factors that contribute to students’ academic struggles and achievements and in turn help students improve academically. The research analyzes over 40 assessments for students in grades first through sixth and their corresponding parent surveys. The anticipated results suggest that students in bilingual households, with more parental involvement and in a higher socioeconomic status perform better academically.

Tolkien and the Great Wars: The First World War and the War of the Ring
Arina Adourian
*Mentor: Giovanna Fogli*

*The Lord of the Rings,* by J.R.R Tolkien is a direct product of Tolkien’s careful transformation of his military service during WWI into a comprehensive commentary on man’s obsession with war and its burdens on the natural world. Instead of crafting a direct parallel to WWI, Tolkien creates the ultimate “meta-war” that describes how war imposes itself upon every aspect of life, from its belligerents, to civilians, and to the environment. He does this through his representations of war-torn landscapes serving as suffering characters, the ungodly and destructive nature of technology and industrialization, the encapsulating nature of war over all people, and the incapability of survivors of war to adjust to a post-conflict society. Through this reinterpretation of war, Tolkien offers a symbolic transformation of the First World War that argues against the destructive sentiments of war, stating that they only encourage violence against humanity and nature, leaving the welfare of the world in jeopardy. At its core, *The Lord of the Rings* is a work of truth, detailing the human experience of war despite its fantastical genre. Tolkien creates a different perspective of the harsh realities of the modern times in order to allow his readers the opportunity to digest and reflect upon the horrors and lessons that war spawns.

Circadian Dynamics of Immune Cells in the Skin
Yepraksia Agazaryan
*Mentor: Bogi Andersen*

The skin is an integral part of the immune system that serves as a biological protector and a physical barrier against pathogens. Biological processes are guided by a circadian clock, which operates using signals from the circadian pacemaker, the suprachiasmatic nucleus (SCN). Microarray and RNA sequencing data in mouse skin suggest that the skin’s immune cells are regulated in a circadian fashion. It is known that in other organs, such as spleen, bone marrow and muscle, these cells actively migrate in a diurnal fashion. The intent of this study is to determine the distribution of immune cells under homeostasis and under imiquimod treated skin. It was hypothesized that the presence of immune cell markers like CD45, MHCII, and F4/80 is stronger at night (6:30 P.M.) versus the day (6:30 A.M.) for both normal conditions and under imiquimod treated skin. To test this, immunofluorescence microscopy was used to identify the number of immune cells in the dermis area of mouse skin at light versus dark phases. Under homeostasis, a significant change was evident in both CD45+ and F/480+ cells at night; MHCII+ cells showed no significance. In addition, when comparing control skin with imiquimod treated skin at both ZT0 and ZT12 increase in cell count was detected for CD45+ and F4/80+ cells. This study provides important insight into the dynamics of immune cell activity in the skin under homeostasis as well as inflammation.
**McGurk Effect in Native vs. Non-Native German Speakers**

Maral Aghvinian  
*Mentor: Greg Hickok*

Öhström and Traunmüller’s (2007) study is an examination of the audiovisual phenomenon known as the McGurk Effect, a perceptual phenomenon that demonstrates an interaction occurring between hearing and vision in speech perception, in the Swedish language. This study shows that non-native speakers struggle immensely in distinguishing vowel sounds mismatched in roundedness. In the current study, we examine the effect of roundedness and openness in German speech sounds using native and non-native speakers through the McGurk Effect. The current data shows that subjects who are non-native, similar to the original Swedish study, struggle with the mismatched rounded vowel sounds. This experiment depicts the degree of confusion that can arise when different vowel sounds are dubbed over others, as well as distinguishing roundedness confusion from openness.

---

**Chavez and Maduro: A Comparison of their Economic Policies**

Arianna Aguero  
*Mentor: Caesar Serereses*

Venezuela’s current economic crisis is the consequent result of the state’s dependency on oil exports and a series of economic policies implemented by the Venezuelan government in the last ten years. This study, guided through the review of literature in both English and Spanish, examines the economic policies of the Hugo Chavez’s administration that preluded the current economic crisis in Venezuela and compares them to the economic policies that have so far been taken under the administration of Nicolas Maduro. It is noted that first Chavez and now Maduro have made economic policy decisions revolving around political goals, converting the Venezuelan economy into a statist economy. The fact that they both were elected on the basis of politics and not economics also contributes to the idea that as long as there is political stability for the ruling party in Venezuela, economic stability was not and continues not to be a priority. Thus the attitude and posture towards economic reform that characterized the Chavez administration is well resembled in the Maduro administration today. This research finds Nicolas Maduro as not failing to execute his predecessor’s economic policies to secure the survival of their socialist political ideology. Venezuela under Maduro continues to be the hybrid state—where democratic and autocratic features are present—that Chavez well-structured during his years in office. The only difference between the two regimes’ management of the state economy lies not in policy, but in leadership.

---

**Life, Liberty and the Pursuit of Bigger Calves: The Effects of Blood Flow Restriction**

Janelle Agustin  
*Mentor: Joshua Cotter*

Calf muscles experience atrophy in periods of disuse. Resistance exercise generally results in increased muscle mass and strength but there is evidence that the calf muscles are resistant to exercise stimuli. High intensity resistance training is commonly prescribed to positively impact the musculoskeletal system. Alternatively, studies reported similar adaptations from low intensity resistance training with blood flow restriction (BFR). BFR is a relatively new technique that incorporates low intensity exercise with partial restriction of the targeted limb’s blood flow. Over a five-week training period, human subjects were randomly assigned a leg with one of the three different training protocols: (1) high intensity (HIT), (2) low intensity (LIT), and (3) low intensity training with blood flow restriction (LIT-BFR). Strength levels were assessed by isokinetic dynamometry and on repetition max testing (IRM). Hemodynamic measurements were obtained by near-infrared spectroscopy. All training protocols increased isometric torque, max work and IRM. All training methods increased on repetition max with no difference between groups. HIT had a significantly lower number of repetitions per session greater total volume (repetitions x training load). There was no difference in repetitions or training load. There was no difference in repetitions or session RPE between LIT and LIT-BFR. The inability to detect differences in training stimuli may be due a short training period and prolonged rest intervals. Further research is recommended to determine optimal modifications to training protocols to elicit musculoskeletal changes in the calf muscle.

---

**Fabrication Y-branch Capillary for Saccular Aneurysm Simulation**

Tasnim Ahmed  
*Mentor: William Tang*

A saccular aneurysm is a pathological, blood-filled, dilatation of an artery. The saccular aneurysm is generally found at arterial bifurcations. A better understanding of such mechanisms is much needed in order to prevent the formation of aneurysms and the rupture of developed aneurysms. Most saccular aneurysms occur at the apices of arterial bifurcations. In previous work, our group has designed and made prototypes of molds to create a model of the artery in question. The goal of our project is to create a Y-branch capillary simulating arterial bifurcation using polydimethylsiloxane, and further study the formation of saccular aneurysm. Our progress this year has consisted of refining our design.
for the model in order to test it and choosing new materials to use to create the mold.

**Secularism in Iraq and its Geopolitical Future**  
Sahira Akram  
**Mentor:** Daniel Brunstetter

In the last decade, sectarian violence exploded in Iraq after the U.S. invasion in 2003. At the same time, questions about whether sectarian tension was rooted in the Iraqi society or was a result of the occupation became predominant in the political arena. To better understand the rise of sectarianism in Iraq, one must first understand the role of secularism in Iraq. To this end, I explore the following questions: what role has secularism played in Iraq since the creation of the Iraqi state in 1921 until our present day. Amid sectarian tensions today, what role could it have in the future of Iraq given the multiple geo-political changes that could occur? I argue that the Iraqi society was never as religious as other Arab societies in the region. Thus, the main factor that led to the rise of sectarian indent among Iraqis was the sense of losing the Iraqi national identity after the U.S. invasion. In the future, placing emphasis on buttressing a new cohesive national identity is key to securing a unified Iraqi state that avoids falling into civil war.

**The Role of HDAC3 in the Acquisition and Extinction of Cocaine-Cue Memories**  
Amni Al-Kachak  
**Mentor:** Marcelo Wood

Epigenetics has become central to the field of neurobiology, where researchers have discovered that regulation of chromatin modification has a pivotal role in drug addiction. After repeated pairings of an environmental context with the positive drug effects, a potent drug-cue memory is formed. Enzymes like histone acetyltransferases (HATs) and histone deacetylases (HDACs) facilitate and repress transcription, respectively, of genes necessary for long-term memory formation. We previously have shown that complete HDAC3 deletions have facilitated acquisition and extinction of drug-cue memories. However, little is known regarding the specific neural loci where HDAC3 plays these critical roles. To study the effect of HDAC3 in the dorsal hippocampus, one group of animals received infusions of a HDAC3 point mutant, blocking the enzymatic region of HDAC3. A second experimental group was used to investigate the effect of overexpressing wild type HDAC3 in the hippocampus on drug-cue memory acquisition and extinction. An empty vector infusion was used as a control. Using the conditioned-placed preference paradigm, we found that infusions of a point mutant of HDAC3 led to facilitated extinction learning compared to the control. HDAC3 overexpression had the same effect on the extinction of drug-seeking behavior as the control, neither group showing accelerated rates of extinction of drug-seeking behavior. Neither infusion of the HDAC3 point mutant nor HDAC3 overexpression had any effect on the acquisition of drug-cue memories. Our results illustrate the importance of HDAC3 in the hippocampus in the extinction but not the acquisition of drug-cue memories and propose possible treatments for relapse through extinction therapy.

**Non-Conventional Methanethiol Photochemistry: Experiment and Simulation**  
Jonathan Alaniz  
**Mentor:** Craig Murray

Velocity-map imaging has been used to detect sulfur products following photodissociation of methanethiol in the first absorption band. It is unclear whether sulfur atoms are primary photoproducts produced via an unconventional extrusion mechanism:

\[ \text{CH}_3\text{SH} + \ h\nu \rightarrow \text{CH}_4 + \ S \quad (1) \]

or result from secondary dissociation of a sulfur containing intermediate, most probably the \( \text{CH}_3\text{S} \) radical:

\[ \text{CH}_3\text{SH} + \ h\nu \rightarrow \text{CH}_3\text{S} + \ H \quad (2) \]
\[ \text{CH}_3\text{S} + \ h\nu \rightarrow \text{CH}_3 + \ S \quad (3) \]

To elucidate the mechanism of dissociation, we have simulated the images that would result from the sequential secondary dissociation process \[(2) + (3)\] using previously measured data on speed and angular distribution resulting from pathways (1) and (3). Comparison between the simulated and experimental images suggests that the experimentally observed sulfur atoms arising from photodissociation of methanethiol are not the result of secondary dissociation and can be attributed to a novel extrusion mechanism.

**Fundamental Differences in Oxygenation Levels in the Brain of Children with and without ASD**  
Sharina Dyan Alejo  
**Mentor:** Jean Gehricke

Autism Spectrum Disorder (ASD) is a range of neurobiological disorders that have steadily gained public attention over the past decade. The root cause is unknown, but there have been studies that suggest lowered oxygenation levels in the brain may be correlated to the symptoms associated with the disorder. In this study, near-infrared spectroscopy (NIRS) is utilized to investigate the spontaneous hemodynamic changes in the left prefrontal cortex compared to the right prefrontal cortex of children with ASD (n=10) and typically developing (TD) children (n=11). Participants were asked to sit still for 2 minutes while the NIRS
recorded changes in oxygenated [O2Hb] and deoxygenated [HHb] hemoglobin. It was hypothesized that children with ASD would generally have lower [O2Hb] and higher [HHb] overall. Results showed that there is a general trend in increased [HHb] in the left prefrontal cortex and decreased [O2Hb] in the right prefrontal cortex for children with ASD. Also, there is a correlation between high [O2Hb] and lower [HHb] when compared to lowered Social Communication Questionnaire (SCQ) scores. This may implicate that oxygenation levels can be used as a biomarker for ASD, potentially assisting in the earlier diagnosis of the disorder and providing the best plan of action for treatment.

**Isolation of Helicobacter pylori Urease**

Nujhat Ali  
*Mentor: Hartmut Luecke*

*Helicobacter pylori* is a Gram-negative bacterium linked to the development of peptic ulcer disease and gastritis. Furthermore, chronic *H. pylori* infection can lead to gastric cancer, the second leading cause of cancer-related deaths worldwide. The pathogen *H. pylori* requires both urease and the urea channel UreI for survival in the acidic environment of the stomach. These proteins work together to help the bacterium maintain a nearly neutral periplasmic pH, perhaps by forming a complex with each other. Therefore, both urease and UreI are prime targets for combating *H. pylori* infection. To help with the development of urease inhibitors, the structure of urease will be determined at a higher resolution than previously available (3.00 Å) through X-ray crystallography. Moreover, a high-resolution structure of any potential urease-UreI complex will be determined by cryo-electron microscopy. The current focus of this project is to optimize urease expression and purification in preparation for these experiments. Recombinant urease was expressed in *Escherichia coli* BL21DE3, a well-known optimized protein-expression bacterial strain. Urease was then purified using a series of chromatographic techniques, including hydrophobic interaction, size exclusion, and ion exchange. An assay for testing urease activity has also been optimized and will be useful in a high-throughput screen for urease inhibitors. Ultimately, this information may help with structure-based drug discovery, leading to more targeted treatments for eradication of *H. pylori*.

**Effective Absorption Cross Sections and Photolysis Rates of Model Secondary Organic Aerosol**

Nujhat Ali  
*Mentor: Sergey Nizkorodov*

Secondary organic aerosols (SOAs) are produced by oxidation of atmospheric volatile organic compounds (VOCs). Major biogenic sources of VOCs include isoprene, α-pinene, β-pinene, and limonene, as well as anthropogenic processes like fossil fuel combustion. In the atmosphere, SOA particles undergo chemical changes resulting from interactions of particle components with atmospheric oxidants and sunlight. Understanding these changes will help better predict health and climate impacts of atmospheric aerosols. Prevalent mechanisms for SOA aging involve heterogeneous oxidation and fog photochemical processes with the OH radical and other oxidants. SOAs can also age in the atmosphere upon exposure to radiation. To estimate the time scales of these photochemical processes, this study focuses on optical properties of SOAs produced by flow-tube ozonolysis and smog chamber photo-oxidation, during low- and high-NOx oxidation. VOC precursors for these SOA samples include linalool, isoprene, α-pinene, d-limonene, p-xylene, 1-methylpyrrole, and others. Mass absorption coefficient values were measured for SOA samples and converted into effective molecular absorption cross sections. Photolysis rates of SOAs were calculated by assuming SOA compounds have photolysis quantum yields of H2O2, providing an upper limit for photochemical rates, or acetone, providing a more realistic estimate, and convoluting absorption cross section data with time-dependent solar flux density. The results of this study suggest condensed-phase photolysis of SOAs can occur with lifetimes ranging from minutes to hours, potentially representing an important aging mechanism for SOAs.

**Examining Psychological Practices among College Students**

Yara Altaheber  
*Mentor: Miryha Runnerstrom*

The transition into college is often associated with academic, social, and financial responsibilities that can lead to stress and mental fatigue. Psychological restoration is one strategy that allows for the recovery of mental resources that can enhance cognitive performance. Much of the existing literature focuses on experiences in natural environments [e.g., Attention Restoration Theory (ART) and Psychoevolutionary Theory (PET)] as a means to achieve psychological restoration. This study aims to bridge the gap in the literature by addressing the question of what undergraduate students actually choose to do to deal with stress and mental fatigue. More people live in cities than ever before in human history, thus it is important to recognize that undergraduates may not seek psychological restoration through scenic views of nature. Rather, students may perform activities that correspond with Self-Actualization Restoration theory (SART). Through an anonymous online survey, UC Irvine students were asked to describe the type of activity they
seek for stress relief, as well as the environment in which they perform this activity. Out of 405 participants, 84.8% usually perform their activity in a built environment, 12.1% perform their activity in a natural environment, and 3.0% did not have a preferential environment. Activities were grouped into 21 categories. The most common activities performed were exercise/physical activity (24.9%) and hanging out with friends (32.3%). This study suggests that UC Irvine undergraduate students primarily carry out restoration activities that parallel SART. Future studies that go beyond natural environments for psychological restoration are needed.

**Synthesis of Organometallic Rare Earth and Alkaline Earth Complexes**

**Natalie Ambriz**  
**Mentor: William Evans**

Recently, the Evans lab has discovered the first examples of the +2 oxidation states of the rare earth metals (Ln) including yttrium and all of the lanthanides (except radioactive promethium) with the general formula of [K(2.2.2-cryptand)][Cp′Ln] where Cp′ = C5H4SiMe3. Previously, it was thought that addition of an electron to a 4f Ln3+ ion of these metals to make a 4f5+1 Ln2+ was not possible for many of the rare earth metals. It now appears that the new Ln2+ ions have a different electron configuration than the 4f5+1 configuration previously found for the traditionally known Ln2+ ions of europium, ytterbium, samarium, and thulium. In the new ions, the additional electron goes into a d orbital, which affords the electron configuration is 4f5d1. The objective of this project is to make alkaline earth analogs of the new Ln2+ ions to compare their structure, reactivity, and spectroscopy with the rare earth complexes. Strontium and barium are the two alkaline earth metals that will be examined since they have stable +2 oxidation states and are closest in size to the rare earths. In order to determine whether these syntheses are successful, we will characterize the reaction products by X-ray diffraction and UV-Vis spectroscopy.

**Effects of Restoration on Soil Characteristics and Microbial Abundance at Nachusa Grasslands**

**Rene Amel Peralta**  
**Mentors: Nick Barber, Wesley Swingley**

The objective of this project was to elucidate the impact of restoration on soil physical composition and microbial diversity to understand restoration processes at Nachusa Grasslands tallgrass prairie. Moisture content, pH, and microbial abundance were the main geochemical parameters studied. In addition, microbial diversity was examined in a simultaneous collaborative study. It was hypothesized that moisture levels, pH, and microbial abundance would return to a state similar to remnant prairies; however, the results showed variation. Moisture levels varied depending on vegetation density. Sites with higher density had higher moisture content and vice versa. Soil pH increased and decreased irregularly and may have been influenced by nitrogen fertilizers applied to unrestored cornfields. Microbial abundance, though not statistically significant, showed an increase in restored fields. The phylum Verrucomicrobia, an important prairie bacterium, was the most affected, increasing in numbers after restoration. Understanding the effects of restoration on soil geochemical factors potentially can allow us to better understand soil microbe recovery, which can inform restoration efforts in other ecosystems.

**CD Microfluidic Device for Capture and Isolation of Cancer Stem Cells**

**Lydia Ameri**  
**Mentors: Lawrence Kulinsky, William Tang**

Despite all the accomplishments and advances in the medical field, cancer persists as one of the leading causes of death globally. Recently, there has been a surging interest in cells known as cancer stem cells (CSCs). These cells are said to behave very similarly to normal stem cells in that they have the capability to self-renew and differentiate into more specialized cell types; however, they are the main culprits in creating tumors. This project aims to create a CD microfluidic device that will capture and isolate the CSCs from non-tumorigenic cells, and will be used as a research tool to study CSCs to make it easier for researchers to develop more effective cancer treatments. The device will use differences in polarizability between different cell types to separate the cell types. Two prototypes made from different materials were considered for the device, one by using CNC machined plastic as the material for the channels and the other with polydimethylsiloxane (PDMS). Through dielectrophoresis (DEP), this microfluidic device will separate the CSCs from the cancer cells by creating a non-uniform electric field within a network of interdigitated electrodes. A high efficiency of separation between the CSCs and the non-tumorigenic cells will allow researchers studying cancer or pharmaceutical companies to develop treatments that will specifically target CSCs to prevent the spread of tumors and ultimately overcome cancer.

**Infectivity Assay of Coevolved Cyanophages**

**Neiki Amiri-Razavian**  
**Mentor: Jennifer Martiny**

A previous study in our lab found that coevolution between cyanobacteria and viruses that infect them is directional. Specifically, over the course of a six-month experiment, viruses evolved broader host ranges (viruses increased their ability to infect host strains from the
same experiment). In this study, we asked: does viral host range also increase on other host strains that were not coevolved with the virus? S-CAM1 was coevolved with *Synechococcus* sp. WH7803 for 19 weeks. I tested if the host range of S-CAM 1 on six different *Synechococcus* strains increased over the course of the experiment. Alternatively, directional evolution would not be applicable to hosts that have not coevolved with the S-CAM1. The six host strains were infected with phages that were isolated at weeks 0, 8, and 19. After three weeks, lysis was recorded, as indicated by a clearing of the host culture. Generally, the ability of the virus to infect a host did not depend on the time it was isolated from the coevolution experiment. However, the exception was WH8018, which over time had a lower rate of infection, showing a decrease in host range by the evolved viruses. Understanding the antagonistic coevolution of *Synechococcus* and its phages provides a better understanding of their potential interactions in the marine environment.

**The Gentrification of Contemporary Los Angeles: A Comparison of Echo Park and Boyle Heights**

Christabel Andrade  
**Mentor:** Ana Rosas

Previous research on gentrification has focused on the way in which large and diverse cities have affected the socioeconomic status of its residents. For my research, I have examined gentrification in two predominantly Latin@ neighborhoods—Boyle Heights and Echo Park—that are currently undergoing different stages of gentrification. Boyle Heights provides a contrast to Echo Park because it is still in an early stage of gentrification. Due to Echo Park’s vast gentrification, I focused on searching for the telling signs of gentrification in order to compare and contrast the ways in which the neighborhoods were affected. I approached the topic through two different methods. I conducted ethnographic fieldwork for both neighborhoods as well as textual analysis of several newspaper articles and books. The books provide an overview of gentrification and the newspaper articles provide some contextualization on the neighborhoods. Echo Park and Boyle Heights have retained their predominantly Latin@ status, but have showed a stark change in the socioeconomic class of the Latin@ population.

**Ion Coupled-Self-Exchange Electron Transfer between Metal-Polypyridyl Dyes Anchored to Titanium Oxide Mesoporous Thin Films**

Jacqueline Angsono  
**Mentor:** Shane Ardo

One of the top crises that humanity will face in the next 50 years is the shortage of clean energy. Using sunlight as an alternative energy source has been an active subject of interest. However, for large-scale implementation, storage is important and thus solar fuels technologies, such as water splitting and CO₂ reduction, make logical sense. A major challenge to drive these reactions is engineering a system to deliver multiple charges to the multiple-electron-transfer catalysts and to minimize wasted energy. One way to accomplish this is by accumulating charges at the catalyst through self-exchange electron transfer (SEET) between molecular sensitizers. In our study, we aim to study the coupling of ions in the electrolyte solution to the SEET rate. SEET between the dye Os(dcb)₂(NCS)₂ (dcb is [2,2’-bipyridine]-4,4’-dicarboxylic acid) in electrolyte solutions containing various anions (hexafluorophosphate, tetrafluoroborate, perchlorate, and chloride ions) and cations (lithium, sodium, tetraethylammonium, and tetrabutylammonium ions) are compared via spectroelectrochemistry. A three-electrode electrochemical cell was used and consisted of a working electrode of dye-adsorbed TiO₂ thin film sintered on fluorine-doped tin oxide (FTO)-coated glass, a counter electrode of Platinum wire/mesh, and a reference electrode of saturated calomel. A fixed potential step was applied to the working electrode to oxidize the dye. The rate of oxidation was quantified using ultraviolet–visible absorption spectroscopy through the change in absorbance of the metal-to-ligand charge-transfer band of the dye with time. The self-exchange electron transfer rate constant was determined by fitting the absorbance versus time data to the Cottrell equation. We found that SEET is fastest when coupled to small ions, such as Li⁺ possibly due to their higher mobility. Results from the study are important not only for pushing the solar fuel technologies forward, but also for understanding the fundamentals of ion-coupled electron transfer.

**Assessing the Impact of Disease Risk Knowledge on Behavior in College Students**

Janna Arabikatbi  
**Mentor:** Miryha Runnerstrom

Chronic diseases, which include cardiovascular disease, diabetes, obesity, and cancer, kill more than 36 million people each year. These diseases have been linked to an individual’s behavior and/or genetic health history. Some college students engage in risky behaviors, such as smoking, drinking, physical inactivity, unhealthy eating, and stress. The purpose of this study is to determine the level of students’ awareness of their disease risks and if this knowledge affects their lifestyle behaviors. This study used an online survey that was administered to 277 undergraduate college students at UC Irvine. One question asked participants if they practiced healthy habits due to their own awareness of personal disease risks. Only 9 of the 273 who responded to this question said “never,” and thus the majority of participants stated...
that their disease risk awareness led them to practice at least some healthy habits. Perception of health risks appeared to be the key influence of students’ lifestyle behaviors. Specifically, the survey included questions about subjects’ personal and familial risks of developing disease. The mean number of reported disease risks was 5.02 (range = 0 to 14). In addition, the mean number of healthy behaviors that participants reported was 5.96 behaviors (range = 1 to 10). The results of this study suggest the need for further research into the influence that personal disease risk has on healthy behaviors.

Salvadorans and Type 2 Diabetes: Coping with an Incurable Disease
Rina Arce
*Mentor: Ana Rosas*

The Latino population’s increasing rates of diabetes diagnosis merits investigation pertaining to the knowledge the Latino population possesses on diabetes, their measures of self-care, physical and emotional struggles and whether they have a positive or negative physician relationship. Six informal conversations with Salvadoran type 2 diabetics between the ages of 35–76 were conducted using 14 questions to address the following points: (a) their knowledge of the disease prior to and after their diagnosis (b) their use of home remedies or herbal medication, (c) their physical and emotional stability, and (d) their interaction with their physician concerning their treatment process. Results revealed very little was known about diabetes before formal diagnosis, but after diagnosis of diabetes participants grasped the symptoms and consequences of living with diabetes. Alternative medication was commonly used among younger participants compared to older participants who did not use alternative medication. Physical symptoms experienced by all participants were body chills, migraines, and blurred vision. Emotional symptoms reported were depression and sadness. Positive physician interaction and understanding of the patients progress was reported by all participants. Previous research indicates Latinos with low levels of understanding and lack of support result in their use of alternate medication, and symptoms of depression. However, there is limited research on how the Salvadoran population experiences diabetes, how they use herbal medication, and experience physical and emotional challenges. My research further examines the experiences of the Salvadoran Latino sub-group and their different practices of self-care and diabetes knowledge across age groups.

Drones: The Expansion of Technological Uninhabited Vehicles
Jason Arceneaux
*Mentor: Caesar Sereseres*

The expansion of drones has far exceeded most other technological weapons on an international level. Beginning from the origins of drones on August 22, 1898, Austria was the first recorded country to use uninhabited aerial vehicles. There have been extensive reasons for the use of drones in the world. The Israeli military has a long history of using drones to gather intelligence, as decoys, and for targeted killings. Their use of drones dates back to the occupation of the Sinai in the 1970s, and was further developed in the 1982 war in Lebanon and the ongoing conflicts in the Palestinian territories. Colombia began using drones in 2006 for the fight against terrorism. Currently countries that use drones that have been listed are: China, Russia, Iran, Venezuela, U.S., Brazil, Colombia, Mexico, Korea, and Israel. It is undisputed that technological advances in warfare will permeate the world, pushing scientific knowledge and ushering in an era of advanced warfare. With the upcoming transition from older technologies to drones (uninhabited vehicles), how will the use of drones change, and how will foreign and domestic policies accommodate such changes?

N100 and P200 Activity Patterns in Bipolar I, Schizoaffective, and Paranoid Schizophrenia Patients in Response to Gaps-In-Noise
Michelle Armendariz
*Mentor: Julie Patterson*

The purpose of this study is to examine response activity patterns in participants with bipolar I, schizoaffective, and paranoid schizophrenia and compare them to the response activity patterns for controls using N100 and P200 auditory evoked potentials, as well as to each other. These psychiatric disorders share many overlapping clinical features. Therefore, procedures such as identifying biomarkers can be used to more objectively distinguish between these disorders, for example, by studying auditory temporal processing, which can be impaired in individuals with psychiatric disorders. However, there is a lack of evidence regarding temporal processing in psychiatric groups. Participant groups and controls were given a Gap-in-Noise (GIN) test to study auditory sensory processing of 2, 5, 10, 20, and 50 ms silent gaps in noise, using an electroencephalogram (EEG) to record evoked potentials to the gaps. Overall, significant main effects for gap durations for N100 and P200 latency and for N100-P200 amplitude were seen, and diagnosis by gap duration interaction showed differences between the groups for the gap durations 10ms, 20ms, and 50ms. Present findings can be
expanded upon to determine if further correlations may exist between auditory sensory processing and electrophysiological measures, and to better diagnose patients suffering from psychotic disorders.

**Studying Macrophage Response to Mechanical Stretch**

Hamza Atcha  
*Mentor:* Wendy Liu

Macrophages are immune cells that are derived from circulating monocytes and play a critical role in surveying tissue for infection or damage. These cells are recruited to tissues throughout the body, including those that experience significant mechanical stimulation. However, little is known about how mechanical forces, such as stretch, influence macrophage function. In this work, we examine the response of macrophages to a unidirectional stimulation *in vitro* through the use of a uniaxial cell stretcher. Commercial uniaxial stretchers are costly and have rigid capabilities limiting their use and effectiveness in studying the responses of load sensitive cells to mechanical stresses. We designed and fabricated a low cost device that will provide uniform and reproducible stresses that simulate the mechanical environment of load sensitive cells. The stretcher is used to study the response of macrophages to uniaxial mechanical stretch. Macrophages exhibited a morphological response to mechanical stimulation and are observed to elongate and align in the direction of stretch. However, the degree of elongation and orientation are not influenced by changes in the stretch amplitude. Continued work will focus on the effect of stretch on macrophage phenotype polarization. A greater understanding of how the mechanical environment influences macrophage behavior will provide further insight about the progression of diseases including cancer and atherosclerosis, in which macrophages and mechanics have independently been shown to play important roles.

**Analyzing Cell Sub-Populations in Glioma Tumors and their Signaling Pathways**

Naomi Atkin  
*Mentor:* Yi-Hong Zhou

Gliomas are the most common type of malignant brain tumors. Of these, glioblastoma multiforme (GBM) are the most malignant subtype. GBMs originate from astrocytes and are highly resistant to chemotherapy and radiation. Malignancy of these tumors is directly related to their ability to reproduce cells quickly and their connection to a large network of blood vessels. Recent research has found that GBMs and other brain tumors are made of heterogeneous cell populations. The three main cell subtypes are neural stem-like cells (NSLC), endothelial-like tumor cells (ELTCs), and tumor mass cells (TMC). This study’s goal is to better understand the heterogeneous nature of GBMs and the genetic causes of the different cell subtypes. In this study, primary cultures enriched with these cell subpopulations were established from five GBM clinical specimens. Western blotting was conducted in order verify the cell surface markers for each sub-population and to determine which signaling pathways were being used by them. We have found that the NSLC cultures show expression of the neural stem cell associated protein, NOTCH. Additionally, we have found that ELTCs show expression of VEGF and CD31, common cell-surface proteins on normal endothelial cells. These results suggest that the cell sub-populations being cultured from primary tissue samples are behaving like and are characteristically similar to the cell types we suggested they would be. Namely, these results suggest that ELTCs are involved with vascularization of the tumor environment and that NSLCs are involved with differentiation of cells within the tumor.

**Ideological Happiness Gap between Political Conservatives and Liberals**

Cheryl Au  
*Mentor:* Peter Ditto

Previous research in political psychology has found an ideological happiness gap between political conservatives and liberals, in which conservatives report higher happiness levels than liberals; however, recent research has found that this ideological happiness gap essentially reverses when using unobtrusive behavioral measures of subjective well-being (SWB). In the present study, we conducted linguistic analyses on over 118,000 Twitter status updates collected from United States Senators’, Representatives’, and Governors’ verified Twitter accounts to compare the negative and positive emotion word use of political liberals and conservatives. We conducted a two-part study, in which we compared the baseline emotionality of tweets between liberals and conservatives before the 2014 midterm elections, and also analyzed how emotionality changed before and after the elections. For the baseline study, our results were consistent with the findings from studies using unobtrusive behavioral measures of SWB; liberals used significantly more positive emotion words and had a 13% higher odds ratio of using positive emotions compared to conservatives. For the pre and post-election comparison, party did not predict emotion word use. These results support recent findings of the ideological happiness gap that liberals display more positive emotion behaviors than liberals, and future research may shed more insight on political ideology differences in election outcomes during a bigger election, like the 2016 presidential elections.
Sympathy for the Devil: Short Stories Exploring the Devil Figure of Lore
Emma Austin
Mentor: Ron Carlson

In a culture all but dominated by modern Christianity, many are familiar with the figure of Satan—to some, Lucifer—the devil that lurks in darkness and tempts people to sin; what most don’t know is that “Satan” is merely the Old Testament’s word for “adversary,” and was used originally as a title for the fallen angel who had risen against his maker. In fact, all devils of mythology are in some way adversaries of the cultures who feared them, their traits and appearance changing with the people’s superstitions. This piece focuses on the conflicting identities of six devilish figures: the trickster of tribal mythology, Set of Ancient Egypt, Loki of the Norse pantheon, Susano of Shinto lore, the classic Lucifer, and a new “monster” of a young man inspired by the perpetrator of the 2014 Isla Vista killings. The arrangement of these pieces, roughly chronological, is meant to demonstrate a shift from mankind’s fears of the animalistic to a more sophisticated fear of one another. Each short story was crafted after investigating traditional mythology surrounding the figures, as well as reviewing commentary about the development of devils in general. Though otherwise an unconventional research method, the abstract nature of creative writing provided adequate space to explore this controversial topic. Developing these stories gave way to new understanding of religion, morality, and cultural evolution, and while also providing insight into humanity’s inherent need for some sort of devil as a scapegoat for our failings.

Search for Dark Matter in Events with Z’ and Missing Transverse Energy
Marcelo Autran
Mentor: Daniel Whiteson

Dark matter, a massive substance that is responsible for phenomena such as gravitational lensing and the galaxy rotation problem, is one of the greatest mysteries of modern physics. Although the existence of this elusive matter has been verified, its fundamental makeup has yet to be discovered. As we still have no means of directly identifying dark matter particles, we must resort to searching for indirect signs of its presence, such as missing transverse energy. Previous research using the Large Hadron Collider has explored the possibility of the production of Standard Model particles alongside this missing energy; however, research that considers particles beyond the Standard Model is scarce. Therefore, we explored a new mechanism of dark matter detection involving the production of a new particle: the Z’ boson. To this end, we devised three models of Z’ and missing transverse energy production, each offering two distinct modes: decay into a pair of leptons, or decay into a pair of jets. These models draw on currently available LHC collision data, plotting out what signatures the dark matter would leave behind in an interaction with a Z’ boson. This provides a new method of dark matter detection that will add to the existing data and will open up new possibilities for dark matter searches that look beyond the Standard Model.

Latina College Students’ Perspectives on HIV/AIDS and their Associated Preventative Behaviors
Brenda Avalos
Mentor: Brandon Brown

HIV/AIDS preventive efforts seem to be having very little success in the Latina population. The present study took a cultural approach in examining barriers contributing to the lack of Latina undergraduates’ HIV related health protective behaviors. Specifically, the study assessed traditional gender role values, level of acculturation, and the effects of Latinas’ perceptions of HIV/AIDS on their sexual behaviors. The study measured the acculturation level and gender role values of 100 Latina UCI students in an online 65 item questionnaire. A regression analysis was used to estimate the effect of acculturation, gender roles and perspectives on HIV/AIDS preventive behavior. Statistical analysis was used to examine the sample’s descriptive statistics as well. Preliminary finding show that a majority of UCI Latina students do not have strong beliefs in the traditional gender roles associated with their culture. Overall, participants had relatively high levels of acculturation which supported the findings on their gender role views. Low perceived risk for acquiring HIV seems to be the biggest barrier to HIV preventive practices. Results provide a further insight into cultural influences that need to be addressed in order to create culturally specific HIV/AIDS prevention programs for college aged Latinas.

Santiago Oaks Petroglyphs: A Potential Enigmatic Native American Rock Art Style
Ricardo Avelar
Mentor: Christopher Drover

Recent archaeological survey of Santiago Oaks Regional Park in Orange County, California has resulted in the discovery of various patterned grooves on the surfaces of sandstone boulders. This find, along with historical data that suggests rock formation accessibility to Southern California Native American groups such as the Gabrielino, Luiseno and Cahuilla, has presented the question as to the origin of the irregular abrasions. While some grooves are shown to occur naturally as the result of laurel sumac branch incisions, the potential for a
different style of manmade petroglyphs exists. The scope of this research project lies in the creation of an objective grading scale that can serve in comparison analysis of various grooves. Using standard professional California Historical Research Archaeological Forms as the basis of our long-term recording efforts, our database has resulted in the creation of a comparable test for better understanding the nature of abrasions possible on rock surfaces.

**Stem Cell Viability and Function are Preserved after Encapsulation in Alginate Microcapsules**

Andrew Ayad  
**Mentor:** Jonathan Lakey

Human embryonic stem cells programmed to differentiate into insulin producing cells (hESC-IPCs) represent a potential source of tissue for islet transplantation. In collaboration with Novo Nordisk LLC, we are evaluating hESC-IPC's technologies for treatment of Type-1 diabetes. The aim of this study is to evaluate the effect of alginate encapsulation on hESC-IPC viability and function. hESC-IPCs generated at the research laboratory of Novo Nordisk LLC were shipped to the laboratory of Dr. Jonathan Lakey at the University of California Irvine after extensive quality control testing. Half of the shipment was encapsulated in 2.5% (w/v) UP LVM alginate using an air pressure driven electrostatic bead generator (Nisco Engineering AG) using standard settings. After encapsulation they were allowed to recover in culture overnight at 37 °C, 5%CO2 using standard fluorescent probes (Calcein AM/ Propidium Iodide) and evaluated for insulin release using a glucose stimulate insulin release assay (GSIR). All data is represented as mean±SEM. Statistical analysis was performed using a student t-test. hESC-IPCs showed no significant change in viability or insulin release after alginate encapsulation. This proves our hypothesis that alginate encapsulation does not impact hESC-IPC viability or insulin release adversely. Future studies will evaluate the efficacy of these cell clusters in reversing hyperglycemia in diabetic mice.

**Caloric Restriction before Cardiac Arrest and Resuscitation Improves Neurological Outcome**

Matine Azadian  
**Mentor:** Yama Akbari

We investigated the effects of caloric restriction and blood glucose on neurological recovery in a rodent model of cardiac arrest (CA). Male Wistar rats were implanted with electroencephalogram (EEG) electrodes. After one week, rats were separated into two groups: 75% calorie-restricted 12hrs prior to CA and non-calorie-restricted. Rats underwent intubation, mechanical ventilation, cannulation of femoral vessels, seven minutes of asphyxial CA, followed by cardiopulmonary resuscitation (CPR). Blood glucose was measured before CA and after resuscitation. We conducted quantitative EEG analysis for 4hrs post-CA and for 30-minutes at 24hrs, 48hrs, and 72hrs post-CA using an entropy-based approach called information quantity (EEG-IQ). Neurological behavioral scale (NDS) testing was also conducted at these times. Pre-CA blood glucose was inversely related to NDS scores at 48hrs and 72hrs; post-CA blood glucose showed similar correlation at 48hrs and 72hrs. Likewise, pre-CA glucose was inversely related to EEG-IQ values at 48hrs and 72hrs; post-CA glucose showed similar correlation at 48hrs and 72hrs. Calorie-restriction, in comparison to non-calorie-restriction, led to significantly higher mean NDS scores at 24hrs and 48hrs. Our results demonstrate that hyperglycemia before or after CA/CPR is associated with poor neurological outcome, and that 12hrs of 75% calorie-restriction before CA/CPR significantly improves neurological outcome. We conclude that caloric restriction before CA significantly improves neurological outcome in rodents and warrants investigation in humans.

**Synthesis of Silica-Coated Quantum Dots to Increase Adhesion of Targeting Cells**

Furzan Azam  
**Mentor:** Jered Haun

Synthesis of silica-coated quantum dots is a process that must be done with care so as not to create particles that are too large to use for physiological processes. Once synthesized successfully silica-coated quantum dots can be used with different cell lines to increase functionality. I went about coating the cores of CdSe by using a reverse micelle approach, which made it relatively easy to coat a thin shell around the core of the nanoparticle that can be controlled to under 100nm. Then the lifetimes of the particles were observed using TEM to see how they behaved. The particles will then be coated with organic molecules and subsequently antibodies to target cells and provide high levels of adhesion. The unique properties of silica-coated quantum dots and strong interest in using silica as a delivery vehicle due to excellent biocompatibility and ease of manipulation may provide useful information to improve design of nano-scale targeted drug delivery system for optimal targeting selectivity.
The Use of Noninvasive Diffuse Optical Spectroscopy in Monitoring Tissue Water Content during Dehydration and Subsequent Rehydration in vivo
Sarah Azer
Mentor: Matthew Brenner

Dehydration is characterized by excessive loss of bodily fluids without adequate compensation by water intake. Suffering a state of dehydration can have serious clinical implications and negatively impact a person’s health and well-being. Currently there is a lack of a convenient, non-invasive, and accurate method for monitoring hydration status that focuses on the intracellular compartment, the location of the majority of bodily fluids. Diffuse Optical Spectroscopy (DOS) has potential to fulfill this deficit because of its unique ability to monitor tissue water content of skeletal muscle non-invasively. This pilot study was conducted in order to test this potential by observing tissue water content changes through DOS measurements over dehydration and subsequent rehydration in vivo. New Zealand white rabbits were first dehydrated for either 36 or 24 hours. Each rabbit was then rehydrated with 60cc of 5% dextrose water under the monitoring of a DOS probe on the right leg muscle. 36-hour rabbits lost 13.19±1.10% of their body weight and 24-hour rabbits lost 8.92±0.58% of their body weight post-dehydration. Average water content changes of 3.2% and 4.3% were observed by DOS measurements for 36 and 24 hour dehydration animals post-rehydration, respectively; such results are likely due to different tissue prioritization during dehydration. Overall, data gathered has confirmed DOS sensitivity to tissue water content changes rendering it of high potential as a diagnostic tool for monitoring hydration status.

Study of the Mechanism of Protein Aggregation and Amyloid Fibril Formation of Gamma-S Crystallin and Cataract-Associated Variants
Diana Bandak
Mentor: Rachel Martin

There are various diseases associated with protein aggregation, including Alzheimer’s disease, Parkinson’s disease, prion diseases and eye lens cataracts. However, the mechanism of formation of protein aggregates in these diseases is not yet fully understood. One of the potential benefits of understanding these mechanisms includes possible non-invasive treatment for these diseases. In the eye lens, there exists a family of structural proteins called crystallins. Since there is minimal turnover of these proteins in the eye lens, the structural integrity of these proteins must be maintained for an entire lifetime. The accumulation of aggregated proteins results in eye lens opacity, forming a cataract. In this study, wild-type human gamma-S crystallin and the cataract-associated variants G18V and G106V were expressed, purified and subjected to different environmental conditions including varying pH (pH 2, 4, 7, 9) and temperatures (room temperature and 37 °C). Building on previous studies, we hypothesized that the protein aggregates may form amyloid fibril structures under certain conditions. The structures of the protein aggregates were characterized with Thioflavin T (ThT) fluorescence assays to help determine whether the aggregates formed have amyloid fibril structure. ThT fluorescence was also used to determine the rate of amyloid fibril formation. To confirm the presence of amyloid fibril structures, x-ray powder diffraction was also conducted on the aggregated samples. The data collected suggest that the wild-type structure is quite resistant to aggregation and amyloid fibril formation, while the G18V and G106V variants readily form these aggregates, with G18V being the most aggregation prone.

Reversal of Alzheimer’s Disease with the Transfusion of Young Blood Plasma that Contains Bone Morphogenetic Protein 11 (GDF-11)
Maria Bangash
Mentor: Michael Yassa

Alzheimer’s disease (AD) causes cognitive impairment in the brain as a person ages. Memory is affected when neurofibrillary tangles first start in the hippocampus, and eventually affect other regions of the brain. AD affects approximately 5.4 million Americans, and by the year 2050 could affect as much as 11 to 16 million Americans. This literature review was searched with the terms “young blood” and the protein that is contained in the young blood which has the potential to reverse cognitive impairment. The literature research was done to investigate the potential reversal or betterment of AD with the infusion of young blood. A protein in the blood of young adults, Growth Differentiation factor 11, also called Bone Morphogenetic Protein 11 (GDF-11) starts to decrease as young adults start to age. Researchers have found a way to increase the GDF-11 protein by transfusing young blood, containing the protein, into older mice. This protein is necessary for the healthy function of the brain and heart in mice and humans during development. In an experiment where the circulatory systems of young and old mice were joined, Stanford researchers were able to observe increased dendritic spine density in the hippocampus. The study demonstrates capability for the reversal of cognitive impairments that occur as individual’s age. In AD the transfusion of young blood plasma, which contains the GDF-11 protein, can potentially aid in the treatment of AD. The transfusion of blood is not easily feasible as a long term therapeutic option, but can aid in the...
development of new drug therapeutics once it is understood how proteins in young blood can rescue cognitive defects.

**Impacts of Green Tea Polyphenols on Drosophila melanogaster Development and Reproduction**

**Julia Barbour**  
**Mentor:** Mahtab Jafari

Green tea has been shown to increase the life span of the male fruit fly *Drosophila melanogaster* while reducing its fertility. The goal of this project was to determine if green tea polyphenols (GTPs) have detrimental effects on the reproductive organs of male fruit flies by examining their morphology after exposure. I fed the flies green tea, then removed their reproductive tracts and stained them with 4,6-diamidino-2-phenylindole dihydrochloride hydrate (DAPI) for visualization using a fluorescence microscope. The flies were exposed to GTPs throughout their development from embryos to adult flies. The reproductive organs appear to be mildly affected; however, many of the flies did not make it to adulthood because the higher doses of GTPs proved to be toxic. Upon discovering delayed development and larval mortality in the higher dose groups, my focus shifted to the impaired growth. The life cycle was monitored to determine when most of the flies were dying and if the flies that made it to the adult stage showed any impairments. My findings suggest that consumption of high doses of GTPs slows fly growth and results in less robust adult flies. The reproductive impacts are still being investigated.

**Serotonin Affects Seizure Activity in DS and GEFS+ Knock-In Drosophila**

**Eden Barragan**  
**Mentor:** Diane O'Dowd

Mutations in the voltage-gated sodium channel gene *SCN1A* cause a wide spectrum of epilepsy disorders, from the mild form of genetic epilepsy with febrile seizures plus (GEFS+) to the severe form of Dravet Syndrome (DS). Both diseases are characterized by febrile seizures. We used two knock-in fly lines, one with a GEFS+ (K1270T) mutation and one with a DS (S1231R) mutation, as model systems to search for new therapies. Consistent with disease symptoms in humans, GEFS+ and DS flies exhibit heat-induced seizures and the seizure phenotype is more severe in DS compared to GEFS+ flies. Our initial studies focused on feeding adult flies with classic anticonvulsants used in humans, but none were found to alleviate seizure behavior in either mutant. Additional experiments focused on monoamine signaling since we found that seizure-sensitivity was altered in DS and GEFS+ flies in a genetic background (white eyes) that affects monoamine levels. Feeding adult flies for three days with the serotonin precursor, 5-hydroxytryptophan (5-HTP), significantly reduces seizure sensitivity in a dose-dependent manner in DS mutants, but increases seizures in GEFS+ mutants. Injecting serotonin, 5-hydroxytryptamine (5-HT), into the dorsal vein of adult flies also significantly reduces seizure sensitivity in DS mutants one hour post-injection although the magnitude of reduction is less than induced by feeding. These data demonstrate that manipulation of serotonin signaling can result in both acute and long-term suppression of heat-induced seizures in DS flies, suggesting this pathway as an alternative therapeutic target for treatment of DS.

**The Implications of the Catalan Independence Movement on Spain and Catalonia**

**Neda Bazofti**  
**Mentor:** Caesar Sereseres

There has been inner turmoil within Spain since before General Franco ruled as dictator of Spain. Catalonia, an Autonomous Community within Spain, has sought to gain its independence. Catalonia has a population of 7.6 million out of Spain’s total 47 million. They account for 19% of Spain’s total Gross Domestic Product (GDP). They held a non-binding referendum, in which the question of wanting independence gained 87% of the vote. Despite the refusal of the Spanish government to acknowledge the legitimacy of the vote, the symbolic importance of the vote has created tension between Catalonia and the rest of Spain. Many Catalans believe that their independence is around the corner, while many Spaniards deny its possibility. If Catalonia were to secede, this could have lasting effects on Catalonia, Spain, and the European Union. The goal of this research was to understand the effects of the Catalan independence movement on both Spain and Catalonia. This study helps demonstrate the reasons for Catalonia’s strife for independence, as well as the repercussions it will have on Spain and itself. To answer these questions, I analyzed the public opinion about the Catalan movement through interviews, newspapers, journals, and class discussions when I studied abroad in Spain this past fall. Additionally, I did a historical analysis of Spain and its regions through the effects of the Franco regime. My results have shown that if the Catalan movement succeeds, it will have deep-rooted repercussions on Spanish and Catalan societies, both economically and socially, as well as on the European Union.
African American and Latina Graduate Students’ Mentorship and Persistence: A Psychosociocultural Analysis
Monica Becerra
*Mentor:* Jeanett Castellanos

The proportion of women, particularly African American and Latina women, declines at each stage of the educational ladder. Research indicates that graduate students’ educational success has been largely attributed to the quality of faculty-graduate student mentoring relationship. Although substantial literature underscores graduate student processes, little research examines the role of race and ethnicity at the graduate level in the context of persistence. Moreover, research examining the coping of REM through their graduate process and the psychological impact of the processes on women of color is almost non-existent. This study examined the role of faculty mentorship on African American and Latina female graduate students’ persistence and well-being. Through the psychosociocultural (PSC) framework, this study analyzes the unique and collective attributes of psychological, social, and cultural dimensions that impact the mentorship experiences on REM female graduate students’ well-being. Participants of this qualitative study consist of four Latina females and four African American females (one self-identified as Jamaican). Participants completed a demographic sheet and one-on-one semi-structured interviews based on questions reflecting the PSC framework. Findings suggest a significant influence between the quality of mentorship and their desire to persist. Moreover, discrimination, racism, feeling out of place/alienation, mentor-student relationship, and depression, impacted participants’ well-being. Findings shed light on the role of mentorship for REM graduate students and provide directives for future practice and research.

Motivation and False Autobiographical Memory
Nilofar Becker
*Mentor:* Elizabeth Loftus

Research has shown that some types of motivation can increase the likelihood of false memory development. In therapy settings, patients might be presented with a theory that some negative event happened to them, and they might then be motivated to believe this event occurred because it would explain why they are experiencing current symptoms and shortcomings. This study was an analogy to this situation and sought to explore this particular type of motivation on the likelihood of developing false autobiographical memories. Three conditions were used in this study: in one condition, participants were told (falsely) that they were bullied in middle childhood, and given a motivating consequence for believing this (individuals bullied at this age later develop poor flirting ability, which can explain why they are experiencing romantic shortcomings now). In the second condition, participants were told they were bullied, but without the motivation information. Those in the third condition were told nothing about bullying/flirting. I hypothesized that those in the first condition would show more false memories than either of the other conditions. Results indicated that confidence of being bullied significantly increased over time for subjects in all three conditions. Those in the motivation plus suggestion condition developed more false memories/beliefs of being bullied compared to the other condition groups, and this was statistically significant. This suggests that this type of motivation does influence memory suggestibility. Understanding more about this relationship can help therapists reduce the chances of patients forming false memories.

An Affordance Based Approach to Large Data-Set Navigation
Nathaniel Benjamin
*Mentors:* Sergio Gago, Ian Harris, Kimberly Jameson

Relational databases are difficult to traverse without advanced knowledge and a fair amount of abstraction. Even for familiarized database users, the sheer volume of data can be overwhelming given the number of possible (and sometimes tenuous) linkages between objects. To address these difficulties we examine a large dataset, consisting of color categorizing data from a large number of participants responding in different languages (The Robert E. MacLaury Color Categorization Archive). Our aim is to make the archive’s data accessible to researchers from a wide variety of disciplines, including students who may not have the technical knowledge or time required to learn to navigate the database effectively. To address this need, we aim to design and implement an application that provides an intuitive interface to better access the database’s technical knowledge (i.e. Server Query Language). There are several interface tools that might be appropriate for this goal (buttons usually have an immediate action, radio buttons inform people to select only one option, whereas check-boxes imply the ability to make multiple selections). By tracking users’ responses, an interface can use contextual cues to exclude invalid user actions. It is also possible to optimize exploration of vast amounts of information by using those same contextual cues to refine the displayed information. We have employed this approach to implement an intuitive database navigation that avoids the typical user learning curve found in many existing systems. Our results may be generalizable beyond the current project.
False Memories in the Context of Body Image
Karishma Bhakta

**Mentor:** Elizabeth Loftus

Extant research shows that human memories are malleable, reconstructive, and susceptible to suggestion. The Deese–Roediger–McDermott (DRM) paradigm is one method used in psychology to elicit false memories. In a typical DRM study, participants read a number of word lists, each containing a series of semantically associated words related to the critical lure, a semantically associated but non-presented word. When participants’ memory is later tested, they tend to remember the non-presented critical lure when it had actually not been shown before. Therefore, the participants’ recall of this word is a false memory. Past research has looked at whether people in a certain state (e.g., happy) are more likely to falsely recall a critical lure associated with that state. The current research investigates this idea in the context of body weight to see whether individuals who are overweight are more likely to recall weight-related critical lures (such as “fat” or “thin”). With the dramatic social and health costs of unhealthy weight, understanding how individuals’ memories are distorted for these topics can help us understand their experiences and potentially help alleviate these negative societal consequences. Results of this study found low levels of false recall for the critical lures of interest. However, it was found that women were more likely to falsely recall the critical lure “thin” than men. The role of individual difference variables and implications of these findings are discussed.

Differentiating between Hue and Saturation

Ema Bidiwala

**Mentor:** Charles Wright

The ability to differentiate between different hues on opposite ends of a color axis when compared with different saturations can provide important insight into color perception. This ability requires an individual to selectively attend to the specific hues and saturations while ignoring others. Initial studies have suggested textures can be differentiated if they are made of the same colors but different in saturation. To measure the ability to perform hue and saturation differentiation, a centroid task was used. Subjects were presented with a cloud and were asked to determine the center of density by clicking on it. Four different tasks were performed with four different conditions. The conditions were variation in size, hue (red and green), saturation, and number of dots presented. Subject were asked to attend to either only red dots with green dots acting as distractors (ignoring saturation), only green dots with red dots as the distractors (ignoring saturation), saturated targets with desaturated distractors (ignoring hue), and desaturated targets with saturated targets (ignoring hue). The number of dots per item increased from 1–4; therefore, the target items increased from 2–8 as one progressed through the task. The tasks proved difficult as the number of distractors increased. Neither hue nor saturation were an advantageous cue to determine the center of the target dots. Subjects had difficulty when differentiating green and red dots against less saturated distractor dots.

Real-Time Projection Mapping for Dynamic Objects

Gio Carlo Borje

**Mentor:** Charless Fowlkes

Projection mapping, also known as spatially augmented reality, is a display paradigm that enables the projection of virtually constructed textures and objects onto real surfaces. There are many applications of projection mapping for static objects such as projecting videos onto buildings, furniture, and various non-planar objects; however, the feasibility of projection mapping onto dynamic objects in real-time is unclear. This project explores the feasibility of a real-time system for projecting a texture onto an object in-motion using cheap, commodity hardware. Given a 3D object such as a cube, our system obtains the 3D geometry using a Kinect, reconstructs the object model, and reprojects a different texture onto the object in-motion through a projector. We show that our system executes in real time.

Synthesis of 2,2,6,6-tetramethylthiacycloheptyne for the Development of Orthogonal Bioorthogonal Reactions

Jeffrey Briggs

**Mentor:** Jennifer Prescher

Chemical reporters and bioorthogonal chemistries are powerful tools for examining biomolecules in living systems. Chemical reporters are small, non-perturbing functional groups that can be metabolically introduced into target biomolecules via cellular biosynthesis. Bioorthogonal reactions are widely used to visualize discrete biomolecules in a variety of complex environments. However, only a handful of these reactions exist and most cannot be used concurrently to probe multiple biomolecules in tandem. Thus, there is enormous interest in developing collections of novel bioorthogonal chemical reactions that can be used simultaneously to visualize complex biological networks. We aim to design a high yielding synthetic route to 2,2,6,6-tetramethylthiacycloheptyne (TMTH) to evaluate its reactivity against a panel of functionalized triazine reagents in an unprecedented bioorthogonal inverse-electron-demand Diels–Alder (IED-DA) cycloaddition. We hypothesize the sterically-hindered strained alkyne
Better Nutrition for a Healthy GPA: Analyzing the Nutrition Related Knowledge, Attitudes, and Practices (KAP) of Undergraduate University Students and its Relationship to GPA
Janessa Brown
Mentor: Zuzana Bic
Recent evidence shows that lower nutrition knowledge correlates with poor nutrition practices and overall health status, and decrease the ability to recall cognitive resources necessary for optimal learning. The objective of this study is to better understand the relationship between the nutrition related knowledge, attitudes, and practices (KAP) of undergraduate university students and its relationship to their GPA. Due to insufficient evidence about how nutrition related KAP may affect university students performance in school, this study used a 40-question online survey to assess the nutrition related KAP of undergraduates at the University of California, Irvine who were 18 years or older. A total of 283 students from all different majors were sampled. Different from our predicted hypothesis, the study results indicate that GPA and nutrition related KAP are unrelated. Though our data shows no correlation between nutrition knowledge and GPA, there is a positive correlation between GPA and nutrition practices and a negative correlation between GPA and nutrition attitudes. These findings reveal that GPA may not be the best indicator of nutrition KAP and school performance. In order to better understand how nutrition related KAP may affect academic performance we need to examine other variables such as academic major.
allowing subsequent testing of the effect of the inflammatory microenvironment on mNSC lineage selection in vitro. I hypothesized that when responding to the inflammatory microenvironment, mNSC would yield differentiation profiles similarly to hNSC. Testing in X-VIVO-based and Temple growth and differentiation basal media yielded distinct mNSC proliferation and fate patterns, one of which was particularly similar to that of hNSC, allowing further comparison between mNSC and hNSC in response to the inflammatory microenvironment. In this regard, polymorphonuclear leukocyte-conditioned media (PMN-CM), macrophage-conditioned media (MAC-CM), and complement components C1q and C3a consistently and significantly decreased mNSC Olig2+ differentiation relative to the control, reflecting hNSC behavior. These data support my hypothesis that mNSC respond to the inflammatory microenvironment similarly to hNSC, validating mNSC as a model and permitting usage of genetic tools in future experiments.

American Eves: The Female Bildungsroman in America during the 20th Century
Ashley Burnett
Mentor: Amy Wilentz

The twentieth century was a time in which the concept of “youth” began to resemble the modern way we view adolescence today—this change in the way we view young women and men also reflects a change in the way coming-of-age was depicted in literature. This project takes a look at the female bildungsroman (novels focusing on the depiction of young people undergoing spiritual and moral educations) in particular to see how the events of the twentieth century—from World War II to Roe vs Wade—may have affected the depictions of young women in literature. In addition, the paper takes a look at how the iconography of American life has changed the bildungsroman in the United States from its roots in Germany and France—we see a move away from the disillusionment of these earlier novels, as well as a removal of irony and satire. This project supports the formation of a new archetype in American literature to contrast with R.W.B. Lewis’s archetype of the “American Adam”—the American Eve, the young women who must either give in to or resist the temptation of the rapidly changing political and cultural landscapes they find themselves in as the century progresses.

Determining the Safety and Efficacy for Combined Pulsed Laser and Topical Delivery of Rapamycin and Axitinib to Inhibit the Regeneration of Coagulated Blood Vessels
Maisie Cai
Mentor: Wangcun Jia

Port-wine stains (PWS) are vascular birthmarks caused by dilated post-capillary venules near the surface of the skin. The dilation might be induced by a lack of innervation from surrounding neurons, which regulate blood flow in blood vessels. If PWS are left untreated, they may become dark and thick with the potential development of vascular nodules. The increase in tissue mass can cause deformity, bleeding, or inhibit sight or speech if it is near the eyes or mouth. The current method to remove PWS is pulsed dye laser treatment; however, regeneration of blood vessels usually occurs within a month. Therefore, to improve on the treatment, antiangiogenic drugs, Rapamycin (RPM) and Axitinib (AXI), are used in conjunction with pulse dye laser to permanently inhibit regrowth of the blood vessels. To test RPM and AXI, topical formula of the drugs were applied onto the skin of Golden Syrian hamsters that were pretreated with pulse dye laser to remove certain blood vessels. The two study groups were: (1) 1% AXI, and (2) 1% AXI/1% RPM. To determine the efficacy of the drugs, color and laser speckle images were taken and analyzed to determine which vessels have been completely removed. Although neither of the groups presented complete removal of the vessels, the second group showed the most promising results. This led to the conclusion that a combination of drugs along with pulse dye laser treatment is more effective in treating PWS than one drug alone with pulse dye laser treatment.

Latino Male Undergraduates’ Persistence in Academia
Daniel Cano
Mentor: Jeanett Castellanos

There are fewer than one million Latino male undergraduates within the United States. Latino male undergraduates are also less likely than Latina undergraduates to graduate from college. Previous literature suggests that factors such as lack of mentorship, campus climate including racial discrimination, campus climate mentorship and sense of belonging impact Latino male educational processes. Guided by the psychosociocultural framework, this study examines psychological, social, and cultural factors that impact Latino undergraduate male academic persistence. A quantitative design, the sample will be composed of 120 participants. The process of data collection is currently occurring. Once data has been fully collected, a multiple regression will be done in

Undergraduate Research: Growth through Innovation
- 17 -
order to provide for analysis of academic persistence and the independent variables. Preliminary findings will shed light on the three dimensions and their influence on the criterion variable. Results will then provide insight for practical and research directives such as providing more culturally integrative programs and services to assist Latino male undergraduates in their persistence in higher education.

LaShonda Carter
Mentor: Tiffany Willoughby-Herard

This research seeks to understand how blackness and black revolutionary movements are represented as “violent.” The meanings and associations tied to the use of political violence are deeply shaped by language and anti-black racism. Black people are largely prohibited from being deemed legitimate users of political violence. Further, this paper seeks to distinguish the violence of racial liberalism, on the one hand, from the struggle for black liberation, which is usually animated by self-defense. The goal is to analyze the government and media rhetorical framing of the Black Panther Party for Self Defense and a history of anti-blackness that allows for the killing of black people and justifies the acts. I am concerned with the weight of the word “violence,” particularly when used in relation to political struggle. In addition, I seek to argue that the misnaming of self-defense as violence is a political tool deployed to destroy black movements; and that the United States government’s practices on the state and federal level have created space for and condoned a history of violence against black people that remains prevalent today, making self-defense a practical tool of survival for revolution and revolutionaries. Through a qualitative interrogation of other scholarship on black and revolutionary movements, government practices, and the dominant ideology that aligns black people with violence, I make a case for self-defense as an option for revolutionary movements.

Can Flipping the Classroom Work? Evidence from Undergraduate Chemistry
Timothy Casasola
Mentor: Mark Warschauer

This paper describes student outcomes resulting from participation in an undergraduate chemistry course that implemented a flipped format—a format that consists of students watching recorded video lectures outside of the classroom and using class time to engage in problem solving activities with help from peers, teaching assistants, or instructors. We investigated: (1) if interest, study skills, and attendance as measured by self report improved during the term as a result of course format (n=252), and (2) if students in a flipped chemistry course earned higher grades in the subsequent chemistry course compared with students who enrolled in the non-flipped course that same term (n=295). While we found no evidence of significant differences between students’ self-reported interest and study skills at the end of the term, we did find that students enrolled in the flipped course reported attending lecture more often than students in the non-flipped course. We also found that after controlling for student-level covariates associated with achievement such as SAT Math scores and previous grades, students enrolled in the flipped chemistry course experienced on average a statistically significant increase of half a standard deviation in their grade for the subsequent chemistry course. Implications for the study of flipped instruction are discussed.

Characteristics of a Romantic Partner and Friend in Three Cultural Groups
Julio Castillo
Mentor: Belinda Campos

What are the specific characteristics that come to mind when thinking about a romantic partner and a friend? This question is important to answer because having an understanding of the characteristics of these groups can help researchers conceptualize how people think about romantic partners and friend. This study examined the overlap in characteristics for a romantic partner and friend in three cultural groups (i.e. Asian Americans, European Americans, and Latino Americans). It was hypothesized that: (a) there would be less overlap between the characteristics of a romantic partner and friend for Asian Americans and Latino Americans, relative to European Americans, and (b) there would be high levels of overlap in all three cultural groups when compared to each other for each condition individually. The sample consisted of undergraduate students from the University of California, Irvine (N=419) who self-identified as Asian American (n=169, 40%), European American (n=140, 33%), or Latina/o American (n=110, 26%). Participants were randomly assigned into two conditions (i.e. romantic partner or friend) and asked to freelist as many characteristics as possible. The top TEN characteristics for each condition where selected and arranged by cultural group and analyzed using percentages and frequencies. As expected our findings supported both of our hypotheses, which are consistent with previous research. There was wide agreement across all three cultural groups on friend characteristics (80% overlap, eight shared characteristics). There was less agreement for romantic partners (60% overlap, six shared characteristics). The author discusses the implications for these findings.
The Latina Undergraduate Experience: Managing A Heavy Workload “Successfully”
Veronica Castillo  
Mentor: Ana Rosas  
Previous literature has shown that Latina college students are making gains in their educational attainments as they seek opportunities for improvement in their personal and professional life. The purpose of this research was to develop a better understanding of Latina college students’ lifestyle and the effects of their involvement in multiple responsibilities as they impact and inspire other Latina college students to develop adequate goals towards their college completion. Five junior and five senior Latina students at the University of California, Irvine who were balancing multiple responsibilities, such as work, school, extracurricular activities, and family took part in a semi-structured interview. According to this study, three main groups of Latinas in education have been found: (a) young Latinas leaving home to attend four-year colleges, (b) Latina college students seeking power through educational involvements, and (c) Latina college students in the workforce. Five films were also analyzed and incorporated into this study to provide context on how: (a) traditional families, (b) women’s empowerment, and (c) women’s initiative is portrayed in films and how these concepts impact Latinas in college. According to the semi-structured interviews, Latina college students are overworking themselves as they pursue university degrees in order to become more competitive in the workforce. This study revealed that Familismo, an important value in the Latino community, can be a big hurdle that many Latina college students come across throughout their undergraduate years, in addition to the lack of sleep and malnutrition negatively affecting their physical and mental health. Participants in this study have learned to value their families more and take advantage of opportunities offered through the education they have had at UC Irvine.

The Effect of Over the Counter Preventative Toothpastes on their Efficiency in Biofilm Removal via Innovative Imaging Approaches  
Carla Castro  
Mentor: Petra Wilder-Smith  
A study to quantify and compare oral biofilm microstructure in thickness and coverage after brushing with two over the counter (OTC) toothpastes has provided potential to reestablish the preventive measures used in current oral health care. This study is necessary, as it is characteristic of extensive aggregation of oral biofilm to cause a number of disease-inducing effects on oral and systemic health. Efficiency of biofilm removal was assayed using a water control and two OTC toothpastes that differed in functional and biochemical mechanisms for plaque removal on enamel inserts worn by human subjects. Enamel inserts were removed at different times throughout the study and imaged using 3-D Nonlinear Optical Microscopy (NLOM) combined with Optical Coherence microscopy (OCM). Images of biofilm microstructure post treatment confirm that mechanistic roles of plaque removal and re-accumulation are indeed different. Biofilm adhesion and proliferation is more pronounced in OTC toothpastes functioning as abrasives and detergents, which is contrary to non-traditional toothpastes that use and extend the natural in-mouth bacterial control processes via the incorporation of a triple enzyme system. Formulas have the potential to become biochemically urbanized to promote proliferation delays for stagnation regions in such ways that this triple enzyme system has modeled. This is an important application, as it will diminish the oral and systemic risk factors caused by biofilm aggregates in the organism.

Mexico’s Oil Reform  
Ervin Castro  
Mentor: Caesar Sereseres  
Mexico’s oil reform is aiming to transform Petróleos Mexicanos (Pemex) by removing the monopoly that the company had for more than seventy-five years. New legislation seeks to change the way Pemex conducts business in Mexico by inviting foreign investment to cooperate with Pemex, engage in individual offshore drilling projects, and to bring a much needed technology into the oil industry. Through its new legislation, the Mexican government is trying to accomplish several things such as departing from its past nationalization of all the oil companies in 1938. The government is also trying to maintain Pemex as a competitive company due to its sudden decline in oil production, and a lack of technology in offshore drillings. Trying to save Pemex from a catastrophe, the government seeks to invite foreign investment to compete, but at the same time to allow Pemex partnership with other companies for offshore drillings. Through this partnership, the legislation seeks to reap some benefits such as the creation of jobs, increase in GDP, and a reduction in energy prices. As some experts have point out, the oil reform will add thousands and millions of jobs by 2025, and increasing Mexico’s GDP by one percent. The reform will repeat another benefit for the Mexican population as prices in electricity are expected to drop once the reform is in progress. As a result, the oil reform seeks to change some aspects of the oil industry in Mexico, and at the same time it seeks to reap so benefits.
Stability across Placement Types: The Role of Behavioral Disposition
Elizabeth Cathcart
Mentor: Jodi Quas

The current study aimed to examine behavioral disposition and placement stability amongst children removed from home because of maltreatment and placed in foster care, group homes, or kinship care. The role of behavioral disposition as a predictor of placement instability in maltreated children has been studied previously and higher levels of problems are related to more instability. What remains undetermined is whether this relation differs across types of placement and the causal direction of the associations. We hypothesized more problems to predict more instability across placement types, and more problems and less stability in group and foster than in kinship settings. We tested our hypotheses on 265 maltreated 6-17-year-olds living in out-of-home placement due to substantiated maltreatment. Children completed in-person interviews while in a temporary residential facility. These included the Strengths and Difficulties Questionnaire, a standardized measure of behavioral adjustment and the Antisocial Process Screening Device. Six to twelve months later, data on placement history of each participant was collected. Results of multiple regressions supported hypotheses and suggest behavioral disposition may play an important role in predicting placement instability. Scores of antisocial tendencies were significantly associated with an increase in post-interview placement changes. As anticipated, total problem behavior was significantly correlated with type of longest placement. Analyses provide insight into problems that need to be addressed as children transition to out-of-home placement following maltreatment.

Computer Simulations of Cardiomyocyte Contraction on PDMS Microplatforms
Claudia Cetrola
Mentor: William Tang

Cardiomyocytes are muscle cells that make up the cardiac muscle. They are composed mainly of the atria, which is the chamber where blood enters the heart, and the ventricles, where blood is pumped out of the heart. Cardiomyocytes must be able to shorten and lengthen, which is critical for the heart to beat. In order to measure cell contraction force, microcantilever beams are fabricated and cardiomyocytes are seeded on them. When the cells contract it induces stress on the cantilever, making it bend. Cell contraction force can then be detected according to the microcantilever bending vertical displacement. With the use of Finite Element Analysis (FEA), microcantilever beams were modeled with different lengths and widths in order to compare their deflection when the appropriate cardiomyocyte stress was applied. According to the simulations, the change in width did not cause a significant change in bending displacement. On the other hand, the longer the cantilever was, the more it deflected. This proves that when more cardiomyocytes are aligned they exert greater force and contract more efficiently. Knowing this information, microcantilever beams will be fabricated in lab and experiments will be run to compare the results. Since cardiomyocytes are strongly related to the cardiovascular system, increased knowledge from studying these cells can be used to develop better diagnostic tools and treatments for cardiovascular diseases.

Development and Evaluation of an Algorithm to Enable Rapid Characterization of Alginate Microcapsules and Islet Encapsulated Microcapsules
Ka Hei Chan
Mentor: Jonathan Lakey

In order to achieve consistent success with encapsulated islet transplantation, microcapsule morphology needs standardization. Since hundreds of thousands of microcapsules are generated during the process, manual characterization of alginate microcapsules without automation is difficult, time-consuming and error-prone. The aim of this study was to develop an algorithm to analyze large numbers of microencapsulated islets and characterize their size, shape and circularity. Alginate microcapsules made using 2.5% (w/v) alginate solution of UP LVM (NovaMatrix® PRONOVA™ UP LVM) alginate in an air pressure-driven, electrostatic bead generator (Nisco Engineering AG) with standard settings (9kV; voltage, 80rpm; agitator speed, 4psi; air pressure, 40mm; needle height, 25G; needle gauge, 120mM CaCl2; gelling solution) were imaged using a digital inverted microscope (EVOS). Microcapsule images were then either analyzed by three independent observers using conventional techniques on ImageJ or, a batch processing image analysis algorithm that was developed for use with ImageJ was employed. All data is reported as Mean±SEM. Statistical analysis was performed using a one way ANOVA, p<0.05 was considered statistically significant. Using the conventional method, three independent observers required 11±1 minutes to measure the diameter of 50 microcapsules, producing results with significant variation: 393±8µm, 390±13µm, 392±10 µm. When the algorithm was used, the same results were obtained significantly faster (37±3 seconds, p<0.001, ANOVA), producing results with zero variation: 406±11µm. Using this algorithm, microcapsule quality analysis can be completed within a fraction of the time it would otherwise take. This innovation will find wide
applicability in the fields of islet and stem cell encapsulation processes.

**Determining the Mechanism of Par6α-Mediated Protein Transport to the Centrosome**  
Christopher Chander  
*Mentor: Christine Suetterlin*

The centrosome is a small non-membrane bound organelle that nucleates and anchors microtubules that are arranged in a radial array in interphase and bipolar spindle in mitosis. It is composed of two microtubule-based centrioles, surrounded by several hundred proteins that constitute the pericentriolar matrix (PCM). The mechanism by which proteins are trafficked to the centrosome and PCM has not been completely understood. The Suetterlin lab has identified Par6α as a novel regulator of centrosomal protein composition. They also reported that Par6α binds to the p150Glued subunit of dynactin, a multisubunit protein complex that links cargo to the minus end-directed microtubule motor dynein, and which controls normal centrosome organization. In this study, I examined the molecular interaction between p150Glued and Par6α, reconstituting it in an in vitro system, with the goal to identify the binding site for p150Glued in Par6α. I expressed maltose binding protein (MBP)-tagged Par6α in bacteria and purified it from bacteria lysate via binding to amylose beads. I then incubated recombinant MBP-Par6α with total cell lysate from RPE cells and re-isolated MBP-Par6α for Western blot analysis. This binding assay revealed that p150Glued bound selectively to MBP-Par6α, but not to MBP-Flag, which I used as a negative control. I am further characterizing the interaction of these two proteins by generating MBP-tagged Par6α truncations. I will describe my results with these fragments and possible implications for the assembly of the centrosome.

**The Intersection of Ceilings: Asian American Females Breaking Through**  
Shannon Chang  
*Mentor: Linda Vo*

In Forbes' 2014 list of “The World’s 100 Most Powerful Women”, only three women were Asian American. When picturing a leader, very rarely does a woman ever come to mind but even more rarely do Asian American women. This research seeks to understand the experiences and barriers of Asian American female leaders in the corporate world. It specifically attempts to uncover the ways in which Asian American females struggle in the for-profit world as well as how the community can move forward and empower each other. By conducting qualitative interviews of nine Asian American females in positions of leadership in both Northern and Southern California as well as using quotes from interviews done by former and current Fortune 500 CEOs, Andrea Jung and Indra Nooyi respectfully, I seek to uncover the way that being both female as well as an Asian American minority intersect to produce inequalities in the workplace for this group of individuals. The study has shown that the culture of corporations fundamentally inhibits Asian American females from climbing the ladder of leadership within organizations. It reveals that there is a dual struggle in being both an ethnic minority as well as a gendered one when it comes to gaining positions of leadership. Thus, it raises significant issues of workforce diversity that are still pervasive and suggest ways in which this community of women can learn to overcome barriers but also changes corporations can make towards a more inclusive and healthy workplace environment.

**Designing Crowdsourcing Methods for the Transcription of Handwritten Documents**  
Stephanie Chang  
*Mentors: Sergio Gago, Ian Harris, Kimberly Jameson*

Emerging approaches of online collaborative research permit novel methods that enlist the power of the Internet and human subject processing to rapidly convert handwritten forms of archival information into data-addressable file formats. This project develops and tests crowdsourcing methods for transcribing a large corpus of natural categorization phenomena from a large number of ethnolinguistic cultures. We designed and implemented a flexible and scalable Web application to determine the feasibility of using crowdsourcing as a method for transcribing handwritten documents. The gathered information will ultimately populate an online archive of color categorization data from over 116 indigenous languages. Efficient strategies are required for transcribing, digitizing, and verifying the data obtained from our task designs. Vital features of the Web application include provisions for creating task modules appropriate for the documents needing transcription, permitting data gathering in efficient and accurate manners, and devising methods of optimally organizing, exporting, and storing the collected data for future use (e.g., integration into a relational database). The application might generally serve as a software tool for transcribing various types of handwritten data. With this form of crowdsourced data collection, we aim to develop an automatic, accurate, and efficient tool for transcribing documents for public dissemination and use by the research community.
**In vivo Study to Evaluate Test Dental Gel**

Tiffany Chao  
*Mentor: Petra Wilder-Smith*

The salivary pellicle is a significant factor in the homeostasis of oral hard tissue health; it provides physical protection as well as a reservoir for calcium and fluoride that is essential to mediating enamel remineralization after acid attack. The goal of this study was to identify the effects of Livionex toothpaste (an over the counter FDA approved dental gel) on enamel microstructure during de- and re-mineralization cycling. Subjects recruited for this study wore a palatal appliance which held enamel chips that were exposed to the test toothpaste or a control dentifrice. The samples were imaged using Optical Coherence Tomography (OCT), Light microscopy, and Scanning Electron Microscopy (SEM) to identify surface microstructural changes. Using OCT and light microscopy images, no differences were detected between the two toothpastes. However, in SEM images, the samples exposed to the test formulation appeared smoother than the samples treated with the control. It was concluded that the experimental toothpaste performed comparably to the control toothpaste through using advanced imaging techniques.

**Home Energy Management as a Service over Networking Platforms**

Quan Chau  
*Mentor: Mohammad Al Faruque*

About 40% of U.S. primary energy is consumed in buildings. Therefore, to manage energy consumption and its usages pattern, for instance, the U.S. state of California mandated Zero Net Energy buildings by 2020 for the residential sector (22% of the U.S. primary energy). Moreover, towards this goal, U.S. Department of Energy, Building Technologies Office is trying to develop techniques to improve the efficiency of buildings. Home Energy Management (HEM) may be used to improve the energy consumption in the residential buildings. However, the cost, scalability, and flexibility of the software and hardware architectures available have increased the time to market and have made it difficult for HEMs to penetrate the consumer market. To solve these limitations, in this paper, we have presented a novel HEM platform, which uses a low power IEEE 802.15.4 standard to monitor and control all the appliances in a house. Moreover, it uses Service-Oriented Architecture and Devices Profile for Web Services to implement the monitoring and controlling algorithms and therefore may significantly improve the scalability and flexibility of the platform. Also, some other features like: plug-n-play capability, remote access feature, and open source architecture are implemented in this platform. Finally, a table-top prototype of the HEM platform is demonstrated in the paper.

**How do Expression Levels of IncRNAs Differ in Males and Females?**

Jinal Chaudhari  
*Mentor: Sha Sun*

Long non-coding RNAs are part of the non-coding region of the genome. Studies have shown evidence of long non-coding RNAs (IncRNAs) activities in the development of cancerous diseases. When most of the eukaryotic genes are transcribed, there are thousands of long non-coding RNAs yielded with very little to no protein-coding capacity. Ample research in this field has indicated that it is possible for non-coding RNAs to positively or negatively affect the expression of neighboring genes. The expression levels of IncRNAs differ significantly in both males and females. This will allow us to study and to understand the expression levels of IncRNAs in cancer progression in males relative to females. I hypothesize that there is a distinguishable difference in IncRNA expression levels of HOTAIR, H19, MEG-3 and p21 in an embryonic stem cells of males and females. Expression levels of IncRNAs H19, HOTAIR, MEG3, and lincRNA-p21 were assessed in both 16.7 WT female and J1 WT male mES cells collected at differentiation days 0, 4, 8, and 12 by Leukemia inhibitory factor (LIF) withdrawal. In the presence of LIF, J1male and 16.7 female remains pluripotent and thus LIF withdrawal induces differentiation of J1 male and 16.7 female and cells are collected over the course of 12 days. The expression levels of IncRNAs are determined by analyzing RNA extraction and qRT-PCR results.

**Tracing the Shadow of Slavery in The Location of Culture: A Critical Reading of Homi Bhabha and Fanon**

Austin Chen  
*Mentors: Jared Sexton, Tiffany Willoughby-Herard*

This presentation offers a close reading of Homi Bhabha’s *The Location of Culture* (1994), in conjunction with Frantz Fanon’s *Black Skins White Masks* (1952), *Wretched of the Earth* (1961), and *Toward the African Revolution* (1964) in order to explore the ways in which Bhabha overlooks Fanon’s thinking on the particular nature of anti-blackness. While Fanon’s body of work spans a vast array of topics, from an epistemological study of colonial space and time to an ontological study of being and it’s bodily relationship with racial blackness, Bhabha’s inquiry curtails Fanon’s far-reaching ontological inquiries on being and appropriates it to support his epistemological deconstructive analysis of the differences between beings in colonial spaces and times. In this rhetorical move, Bhabha not only
undermines Fanon’s potentially radical challenges to the order of society, but also contributes to anti-black structures of disavowal, appropriation and consumption of theories of blackness within the academy and society at large. This is not to say that Bhabha’s inquiry into colonial space and time should be abandoned. Rather, his questions of space and time should be refocused to understand their relationship to being and non-being. To this end, I suggest that Bhabha revisit Fanon’s works as well as the works of Black feminist spatial theorists in order to more fully explore the interrelated nature of space, time, and being.

Interaction between Zfp819 and Brcal
Dylan Chen
Mentor: Eva Lee

ZBRC1 is a zinc finger protein involved in transcription repression. It forms a nuclear protein complex with BRCA1, a tumor suppressor, and CtIP to inhibit expression of GADD45, ANG1, and HMJ2. The nuclear protein complex allows ZBRC1 to repress transcription by binding to the consensus region on intron 3 of GADD45, a stress sensor implicated in DNA damage response. We have searched for a mouse homolog of ZBRC1 and identified Zfp819 as a putative homolog to ZBRC1. Zfp819 is structurally similar to ZBRC1, as both contain multiple zinc fingers on the C-terminal and a KRAB domain on the N-terminal. Although the binding between ZBRC1 and BRCA1 is already known, it has not been established whether Zfp819 is also able to bind to Brca1. Therefore, I attempted to identify the motif of Zfp819 responsible for binding to Brca1. Multiple Zfp819 and Brca1 constructs were generated, protein purified, and used for protein-protein interaction assays. I identified that amino acids 341-748 of Brca1 are responsible for binding with Zfp819, which corresponds to same region that human ZBRC1 binds to BRCA1. The motif in Zfp819 responsible for binding to mouse Brca1 is yet to be identified.

Methionine Induced Animal Model of Schizophrenia
Frances Chen
Mentors: Olivier Civelli, Lien Wang

Schizophrenia is a chronic debilitating neuropsychiatric disorder that elicits three major classes of symptoms: positive symptoms (delusions, hallucinations, and bizarre speech); negative symptoms (anhedonia and social withdrawal); and cognitive deficits (impairments in attention, learning, and memory). In addition to antipsychotic drug for treatment of schizophrenia, L-methionine was designed as a therapy for schizophrenic patients in the 1960s but exacerbation of the symptoms in patients was reported. Studies involving mice that received L-methionine treatment demonstrate social interaction disruption (a negative schizophrenic symptom) due to DNA methylation. However, it is unclear whether other schizophrenic-like symptoms are caused by the same mechanism and the time course in which these symptoms arise. To address this question, I administered several tests to Swiss Webster mice that were injected with L-methionine to evaluate the three classes of symptoms of schizophrenia. We report that repeated administration of L-methionine for seven days led to behavioral changes that reflect all three types of schizophrenia-like symptoms including hyperactivity, stereotypy, social withdrawal, emotional flattening, and object recognition deficit.

Relationship between Mitochondrial Haplogroups and Age-Related Macular Degeneration Severity
George Chen
Mentor: M. Cristina Kenney

Age-related macular degeneration is a condition which damages the macula, the central part of the retina responsible for sharp central vision. AMD is caused by fatty deposits, called drusen, on the macula and previous studies have identified multiple nuclear genes which increase the risk factors for late stage AMD. However, despite controlling for nuclear genes, certain individuals have shown higher risk for late stage AMD. Recent studies have indicated that different types of mtDNA, known as haplogroups, affects the risk of severe age-related macular degeneration (AMD). To determine which haplogroups affect AMD risk genes, I have identified the mitochondrial haplogroups of 83 individuals with known levels of AMD. Each individual’s AMD stage was classified from a scale from 1 (no prevalence) to 4 (late-stage AMD) by the Minnesota Grading System and correlated with their haplogroup and nuclear risk genes. I found haplogroups H and U to be protective from AMD even when factoring in the nuclear risk genes CFH and ARMS2. These mitochondrial haplogroups have different snips which may explain why different individuals may be at a decreased risk for AMD despite having nuclear risk genes.

Air-Stable Borane Initiators for C1 Polymerization
Gerald Chen
Mentor: Kenneth Shea

In this paper, we found an air-stable borane initiator for C1 polyhomologation with control of MW and low polydispersity. A variety of commercially available amine- and phosphine-borane complexes were examined due to their air-stability, such as BH₃·NMe₃, BH₃·NEt₃, BH₃·BnNH₃, BH₃·PPh₃, BH₃·Morpholine and BH₃·4-methylmorpholine. Polymerization conditions were screened with different solvents and temperatures. The performances of the initiators were evaluated based on
how well controlled of the polymer MW and PDI. Most of the polymers can be obtained from these initiators with a high yield% and a low PDI. We found that the borane with a bulkier ligand has a faster decomplexation rate and thus results in the polymer MW closer to the expected values.

Kinetic Study of DNA Hybridization using a Novel Coarse-Grained Model
Darrell Cheng
Mentor: Hung Nguyen
Undergraduate Research: Growth through Innovation

Understanding the kinetics of DNA hybridization might provide new guidelines for engineering novel DNA based nanotechnology. Using coarse-grained molecular dynamics simulations, a method for elucidating the kinetics of DNA aggregation is developed. Self-assembly simulations on 100 strands of DNA (50 sense strands and 50 antisense strands) of either a randomized or tetrablock sequence containing 32 nucleotides are performed. By applying least squares regression to simulation aggregate concentration data, the kinetics of these two systems are investigated. From this least squares regression, rate constants for the formation of DNA dimers and trimers are determined at varying temperatures. Then, the activation energies of aggregate formation in each system is calculated. It is shown that the formation of dimers occurs at a much faster rate than trimers and the stability of trimer aggregates is much lower than dimer aggregates. The results of this study agree well with trends observed by experimentalists. It is confirmed a detailed kinetics study on coarse-grained simulations can yield realistic results and explain important trends in aggregation. The method developed to analyze these two systems may be expanded to explore the kinetics of more complex sequences and structures. The findings of these kinetics studies will aid experimentalists in optimizing nanostructure formation.

Structural Studies of the Complex of two Periplasmic Domains, D1 and D2, from the Essential Mycobacterium tuberculosis protein, MmpL3
Hui Ling Cheong
Mentor: Celia Goulding
Undergraduate Research: Growth through Innovation

The Mycobacterium tuberculosis heme-uptake pathway involves a secreted heme-scavenger protein RV0203 that sequesters heme from its host and transfers it to one of two integral membrane proteins, MmpL3 and MmpL11. Based on topology prediction, both MmpL3 and MmpL11 have twelve transmembrane helices and three soluble domains, D1, D2, and D3. Furthermore, D1 and D2 domains, which share structural homology, are localized in the periplasm and hence, are proposed to interact. I investigated interaction between MmpL3 periplasmic domains, 3D1 and 3D2. This was done by cross-linking studies using the homobifunctional cross-linker, BS3. I then further purified the cross-linked heterodimer, 3D1-D2, for crystallization trials. The eventual goal is to obtain the X-ray crystal structure of the 3D1-D2 heterodimer, which will reveal atomic details of the domain interactions as well as possibly provide insights into heme binding and transfer.

Investigation of Marine Bacterial Resistance to Chlorine during Desalination Pretreatment
Lynze Cheung
Mentor: Sunny Jiang
Undergraduate Research: Growth through Innovation

Severe drought and increasing population has pushed the Western U.S. to seek new sources of drinking water to supplement existing supplies. The advancement of reverse osmosis (RO) membrane technology has made desalination of seawater a viable source of drinking water in the coastal region. During membrane desalination, chlorination of seawater is a common pretreatment process to reduce bacteria loads in the intake in order to prevent membrane biofouling by the formation of bacterial biofilm. However, little is known about the efficiency of chlorine treatment and desalination plants have reported biofouling following dechlorination, indicating the inadequacy of chlorination to inactive all marine bacteria. This study investigated the marine bacterial resistance to chlorine in order to improve membrane desalination efficiency by reducing biofouling. Seawater from coastal Pacific Ocean was collected and treated with 3, 5, and 10 mg/L of chlorine for 10 min. The bacterial resistance to chlorine was examined by adding essential nutrients after dechlorination to observe the possible growth of surviving bacteria. The results showed that a fraction of the marine bacteria were resistant to all chlorine concentrations tested, which was further confirmed by a second chlorine treatment. An extracellular polymeric substance (EPS) assay was performed on the bacterial community and isolates to identify if the production of EPS is a possible mechanism for chlorine resistance. However, EPS assay results were inconclusive indicating the complexity of the resistance mechanism. Identification of resistant bacteria using 16S rDNA sequencing is current underway and will provide further insight.

Optical Control of Muscle Differentiation using the Optogenetic-Cryptochrome/CRE System
Tiffany Chien
Mentor: Elliot Hui
Undergraduate Research: Growth through Innovation
rejection. However current methods to control stem cell differentiation are limited by the spatial precision of cell patterning techniques, preventing the construction of small intricate tissue structures like muscle. We propose to use “optogenetics” in order to spatially control the muscle formation (myogenesis) and allow for the formation of finely patterned muscle tissue solely by projecting light onto optogenetically engineered stem cells. Optogenetics is a technique that uses light sensitive protein derived from plants to control gene expression. We will adapt the cryptochrome optogenetic system in order to optically control differentiation and induce myogenesis. Currently we are introducing the cryptochrome optogenetic system to the mammalian cells by utilizing the piggybac transposon system.

**Narrative + the Commodification of Storytelling through the Video Game Medium**

Anastasia Chin  
**Mentor:** Braxton Soderman

The ease of communication between the producer and the consumer within the video game industry has a direct impact upon the inclusion of more complex stories within the medium. Central to this argument is the new game + (new game plus) mechanic, which is a gameplay mode that unlocks after a player completes a game for the first time. This mechanic was introduced in the 1990s and traditionally alters the gameplay by strengthening enemies or allowing the player to retain the previous playthrough’s equipment. The recent trend has been to include never-before heard narrative content in line with consumer demands for storytelling in a medium which has been traditionally viewed by academics as antithetical to the linear narrative. In this paper, I examine the engagement between game developers and gamers as an explanation for this trajectory. Borrowing from Henry Jenkin’s idea of “evocative spaces,” I underscore the labor and attention that goes into crafting a cohesive and recognizable narrative on the behalf of consumers. My research draws upon the established schools of thought: ludology and narratology, emergent discussions via Internet blogs, as well as social media interactions between producer and consumer. I intend to bridge these two theoretical approaches in contrast to choosing one or the other. From this work comes the idea of the “narrative mechanic,” wherein the story functions as both reward and an aspect of gameplay. Narrative as a mechanic encourages exploration and seeking out the non-linear fragments of an overarching plot and becomes the player’s imperative.

**Correlation of Flow Field and Clinical Parameters in Patients with Repaired Tetralogy of Fallot**

Avinash Chinchali  
**Mentor:** Arash Kheradvar

Tetralogy of Fallot (TOF) is a common form of congenital heart disease which requires surgical intervention within the first year of life. Studying the blood flow dynamics (hemodynamics) in TOF and surgically repaired TOF patients is essential in improving understanding of cardiac remodeling mechanisms, ventricular function, and TOF patient care. The purpose of this study is to use MRI imaging data to compute the dissipation of kinetic energy in blood flow of patients with repaired TOF and correlate the result to clinical parameters of the right ventricle. The central hypothesis of this study is that the dissipation of the kinetic energy of blood flow is correlated to the reduced efficiency of the right ventricle. Patient MRI data from both repaired TOF and healthy volunteer groups will be used to calculate clinical parameters and compared. MATLAB codes reconstruct right ventricular geometries and blood velocity flood fields, which then allows for the calculation of dissipation of kinetic energy and clinical parameters such as ejection fraction, stroke volume, etc. Trends in repaired TOF patient data provided by medical collaborators show a correlation between dissipation of kinetic energy and reduced cardiac efficiency. Currently, healthy volunteers are being recruited by the UCI Medical Center for imaging to serve as the control group in this study. The results from this pilot study will allow us to define a hypothesis to test later on through a more comprehensive study in addition to providing insights on the previously mentioned fields.

**Police-Citizens’ Reciprocal Relationship: Enforcement Discrepancies and Strategies**

Hei Chio  
**Mentor:** John Dombrink

Several police reforms and policy changes attempt to reduce tensions between public expectations and police action. This paper examines classic and current journal articles; media coverage; governmental studies, interventions and legal action; expert and citizen opinions; and citizen attitudes to link current strategies with relevant concepts. The paper looks specifically at two suggested interventions—police body cameras and enhanced citizen review boards. The goal of this research is to explore possible suggestions and reasons for current and future strategy effectiveness. By extracting details from current cases of police misconduct and their resolutions, the paper explores the intervention strategies with relevant studies and theories from journal articles. This paper discusses three
discrepancies that enhance police misconduct: (1) police’s broad discretion and isolated culture, (2) the lack of understandable reasons for differences in punishment of misconducts, and (3) differences between citizens’ and police’s expectation of overall police duty. Due to the decentralization of the U.S. police enforcement, the application of technology, such as body cameras, and oversight, such as citizen review boards, provides mixed results in minimizing police misconduct or increasing citizen’s trust in police legitimacy. In result, the effectiveness of these strategies does not imply the need for further restriction on overall police discretion. However, oversights shall be applicable to the police culture rather than the policy. This paper suggests that the use of technology for minimizing enforcement discrepancies shall be further studied for improvement.

Thermoelectric Power Generation (TEG)
HyunJin Cho
Mentor: Yun Wang

Globally, the power stations in the factory consume roughly two thirds of energy by heat loss. A heat engine is used to convert heat to generate power. However, when heat enters the generator, almost half of the energy is wasted. As such, an opportunity exists to harvest this energy stream and convert some of it to useful power. One approach involves thermoelectric power generation (TEG), which operates on a fundamental principle termed the Seebeck effect that states when a temperature gradient is established within a material, a corresponding voltage gradient is induced. The purpose of this research is to understand how different materials will provide higher efficiency under different temperatures or pressure when thermoelectric module is attached to the material. For different materials under different temperature, TEG will generate different amount of work. This process of performing thermoelectric material under different temperatures or pressure requires a stationary holder (TEG Mounting) to be designed so that it provides enough pressure between materials and TEG. In addition, the TEG Mounting is designed to collect data under different temperature difference. TEG research is basically for understanding of heat and mass transfer. Heat transfer processes, conduction, convection and thermal radiation, is thermal energy in transit due to a spatial temperature difference. Once the TEG used to harvest waste heat, more understanding of TEG will provide green energy. This research will collect energy more convenient and simple way. Simply using two different temperatures that provide work will only appear in TEG.

China Threat of China Misperceived?
An Na Choi
Mentor: Caesar Sereseres

In 2011, President Obama initiated a new foreign policy strategy known as the “pivot” with the aim to redirect America’s interests and resources from the Middle East to the Asia-Pacific region. While U.S allies welcomed America’s presence into the region, China, on the other hand, was not too thrilled; President Xi condemned President Obama’s foreign policy as a method to contain China’s rising military and economic power. We must, therefore, ask ourselves: is the threat of China real or misperceived? Indeed, as many scholars have stated, China’s rising military is not sufficient to surpass America’s military greatness; nonetheless, it must not be overlooked. Throughout the years, China has increased its military aggression in the South and East China Sea by expanding its territorial ownership through the construction of artificial islands. Furthermore, China has constantly devalued its Yuan, allowing them to gain economic leverage, while simultaneously buying up enormous amounts of U.S foreign reserves. The United States has been the sole hegemonic power since the end of the Second World War. For decades, America stood on top; but what if it’s time for “China to rule the world,” as Martin Jacques states. What must America do to remain, or possibly even regain, its sole hegemonic power? Through scholarly articles, library archives, and emerging everyday current events, I learned that China is a power that should not be overlooked. Yet, if I were to choose what motivated China’s military and economic strive, America would be at fault. Hence, is Obama’s “pivot” worth it?

Reevaluation of “Red China’s” Involvement in Cambodia through the Indochina Wars
Adrien Chorn
Mentor: Dorothy Solinger

This paper takes a look at the People’s Republic of China (PRC)’s relationship with Cambodia and the PRC’s participation in the Indochina Wars. More specifically, it will answer the question of why China began and maintained such a strong relationship with Cambodia during the Cold War and thereafter. It will analyze highlights of the Sino-Cambodian relationship through its beginnings at the Bandung Conference in 1955 through the present day, alongside Cambodia’s stages in history as newly independent Cambodia, the Khmer Republic, the Democratic Kampuchea, and the present day Kingdom of Cambodia. Orthodox perceptions would oversimplify the PRC’s international aims as using aggression to spread the ideology of “communist agenda”. Contrary to these views, this paper argues that China’s goals were much more nuanced than
Evaluation of Laminin Expression and Basement Membrane Integrity in Isolated Human and Porcine Islets

Sherman Chu

Mentors: Rahul Krishnan, Jonathan Lakey

The lack of suitable and sufficient human organ donors for human islet allotransplantation in type 1 diabetes has encouraged researchers to evaluate porcine islets as a possible alternative source due to the physiological similarities between human and porcine insulin. Juvenile porcine islets have been extensively evaluated for use in xenotransplantation trials. Unlike human islets, it is purported that islets isolated from juvenile pigs possess an intact basement membrane. Laminin is an important component of the islet basement membrane, which provides structural support to islets. Using a moderate enzymatic digestion, high islet laminin content isolation can be obtained, improving islet survival and function. The aim of this study is to assess islet laminin content and evaluate islet basement membrane integrity in islets isolated from juvenile and adult pigs and human cadaver donors and evaluate changes in basement membrane integrity and laminin expression in juvenile porcine islets during the in vitro culture period. Hematoxylin and Eosin staining was performed to evaluate islet morphology, and immunohistochemistry was performed to evaluate islet laminin content. We found that compared to human islets and adult porcine islets, juvenile porcine islets cultured in vitro for seven days demonstrated similar levels of laminin; laminin levels were marginally lower in juvenile porcine islets cultured in vitro for three days and 14 days. However, these differences were found to be insignificant following an ANOVA test. Ultimately, we aim to correlate islet basement membrane integrity and laminin expression to better survival after transplantation.

Modeling the Molecular Weight and Age Distribution of Marine Dissolved Organic Carbon

Jeannesse Cochran

Mentor: Francois Primeau

With 662 GtC, the dissolved organic carbon (DOC) pool in the ocean is an important carbon reservoir for the Earth system, but the processes that control its cycling rate are poorly understood. Recent measurements have reported a possible relationship between the molecular size and radiocarbon age of the material. As a step towards exploring this relationship, we combine a random scission model and the Smoluchowski mean-field coagulation equations to derive a mathematical model for the molecular size distribution and radiocarbon content of DOC. We simulate the time-evolution of the size and age distribution numerically using an Euler-forward time-stepping method, which we have implemented in Matlab. The model allows us to predict the transient and equilibrium joint distribution for molecular size and age of DOC. We use the model to explore the sensitivity of the equilibrium distribution to changes in the size dependent random scission and coagulation rates. The results will give us a more concrete understanding of the processes that control the cycling of DOC in the ocean. The longer term goal of the project is to quantify rates of DOC cycling in the ocean by combining our new model with a small but growing database of radiocarbon measurements of DOC material filtered to separate different molecular sizes.

Role of Media in Perpetuating Fear of Ebola Outbreak

Idda Coleol

Mentor: Leo Chavez

News media is like metastatic cancer, it generates in one region and then spreads to neighboring regions and then eventually all around, perpetuating a pre-disposed public response. Society today relies more on the information communicated by news media than that given by health care providers. This paper critiques how the media communicates disease outbreaks to the United States public with the most current Ebola crisis. First, a media analysis of several notoriously biased news broadcasts was conducted to quantify the volume of articles by month in the past year; and second; several undergraduate students at UC Irvine were anonymously interviewed on their awareness and attitude of Ebola. The results show that a dominating presence of media is a significant perpetrator of irrational fear across the public. The health and well-being of a population is affected by a media-induced fear. As a society, our well-being and mental health are easily manipulated because of the amount of technological activity we engage in daily. Our brains respond to what the media feeds us
more than we are aware of. One interesting aspect to note is that the U.S. population recently only became interested in Ebola matters when it came to the United States, as perpetuated by the increased volume in media sources. It is a valuable call to attention the need for a re-evaluation of whether we should have as much coverage as projected during the height of the scare in Fall 2014.

**Destabilization of Cell Adhesion in Human Monocytes Induced by *Toxoplasma gondii* Parasites**
Joshua Cook
Mentor: Melissa Lodoen

*Toxoplasma gondii* is an extremely successful obligate, intracellular parasite that is estimated to infect one-third of the human population. It is capable of infecting any warm-blooded organism, and chronic infection can lead to life-threatening diseases in immunocompromised individuals. Parasite dissemination throughout the host is facilitated by a Trojan horse mechanism: the parasite invades human monocytes, and the infected cells are trafficked, via the bloodstream, to various tissues, such as the heart or brain. Our lab has previously reported that *T. gondii* induces “hypermotility” in infected monocytes, which may facilitate their migration from the blood to tissue. We hypothesize that cells undergo hypermotility due to disruption of the host cell adhesion by the parasite. To test this, we investigated: (1) integrins, transmembrane adhesion molecules, and (2) an integrin mediated pathway, namely that involving focal adhesion kinase (FAK), a protein kinase involved in the formation and disassembly of adhesions to the extracellular matrix. Our preliminary data show that *T. gondii* dysregulates the localization of activated β1 integrins, cell spreading, and the downstream activation of FAK. These results suggest that the parasite may modify host cell motility to its advantage by acting upon these components of the host’s adhesion machinery.

**Quantitative Analysis of Nuclei Imperfection in the LMNA Mutation**
Jason Core
Mentor: Anna Grosberg

Genomic mutations have been associated with characteristic structural defects as well as particular cardiac diseases. Quantitatively measuring the structure and functioning of cells, as well as the relationship between them, will afford researchers greater insight into disease pathology. To achieve this, I developed MATLAB code which analyzes DAPI stained images of nuclei, quantifying nuclei imperfection as well identifying notable and recurring structural defects by measuring the mean negative curvature (MNC) of cell nuclei. Nuclei from human dermal fibroblasts of a patient expressing the phenotype of the LMNA gene mutation were analyzed, with the patient’s unaffected sister serving as a control. MNC, as well as other parameters such as area, eccentricity, and orientation, were calculated for each nucleus. The MATLAB code’s speed was maintained despite additional shape-fitting and MNC calculations. While no significant differences were found in cell morphology, patient cells did possess a greater average MNC value compared to control cells. This study suggests that patients possessing the LMNA mutation may exhibit measurable differences in nuclei shape, but additional experiments are needed to determine whether these differences are significant. Analysis of additional individuals possessing the LMNA mutation is needed to increase the sample size, as only one affected and unaffected individual’s cells have been studied at this time. Artificially inducing structural irregularities in nuclei and then comparing their MNC values to controls is another possible means of assessing the parameter’s effectiveness in quantifying abnormality of nuclei shape.

**Crystallographic Studies of Familial Aβ**
Kelsey Corro
Mentor: James Nowick

Alzheimer’s disease (AD) affects 5.2 million Americans and is the sixth leading cause of death in the United States. A small percentage of Alzheimer’s patients are affected by a familial mutation causing the effects of AD to occur faster and earlier in life—dementia-like symptoms will occur before the age of 65 (also known as early onset AD). These patients are affected by familial Alzheimer’s disease (FAD). Unfortunately, there is no cure or effective way to treat AD. One of the biological distinctions of AD is the insoluble fibril of the peptide Amyloid Beta (Aβ). Before aggregating and becoming insoluble fibrils, the Aβ peptide forms soluble oligomers which are believed to be the toxic species of interest. Unfortunately, these oligomers are a transient species in solution which make it difficult to study in traditional experimental approaches. My aim is to understand the structural effects of familial mutations on Aβ oligomerization using a chemical model. Since patients affected by FAD have a property of Aβ that accelerates aggregation, I wanted to understand why these familial mutations were more toxic than the wild type. In order to carry out this study, I designed β-sheet macrocyclic peptides that contained sequences found in Aβ1-42 and incorporated familial mutations within the design. These macrocyclic peptides were synthesized through solid phase peptide synthesis, then purified and analyzed through the use of preparatory and analytical HPLC as well as ESI-MS. These peptides were then subjected to x-ray crystallography for structural determination.
Forever Swept (Excerpt from Senior Thesis Concert)
Cierra Crowley
Mentor: Loretta Livingston
For my Concert I have explored the universal and widespread associations people have with regard to the sky, sea, and earth and how those associations can be sought out, paralleled and portrayed through human relationships and emotions. These three huge locational platforms are places that people have an intuitive regard for, and similar feelings for, that you can reflect upon through human relationships and those human relationships through movement. The tides, more specifically, are the underlying factor that ties the three places together, as it is affected by the earth’s gravitational pull. The moon, an object of the sky, causes the rising and lowering of the tides of the ocean on the earth’s surface. In each piece I have also worked with the idea of life, and all things that go along with that, being fleeting. From this I have divided my concert into three sections, the sky, the sea, and ending with the earth. This piece is an excerpt from the section that pertains to the sea and in particular deals with erosion; thus, the idea of the ocean breaking down rocks to create sand. I have paralleled this to the idea of the someone coming into your life who has the ability to change it completely. Once they leave, whether from death or simply moving on, you cannot erase the affect they have had on your life.

The Influence of Racial/Ethnic Discrimination and Racial/Ethnic Socialization on the Academic Outcomes of African American Youth
Melissa Mae Cruz
Mentors: Meeta Banerjee, Jacquelynne Eccles, Samuel Gilmore
Personal experiences of racial discrimination are linked to negative effects on African American youths’ educational outcomes. However, racial socialization has positive effects on educational outcomes and may moderate the relationship between racial discrimination and educational outcomes. Using data from a longitudinal study known as the Maryland Adolescent Development in Contexts Study (MADICS), students’ reports of racial discrimination and two dimensions of ethnic/racial socialization (cultural socialization and preparation for bias) were used to examine their effects on grades and academic self-concept, attitudes toward academic importance and attitudes toward educational utility. The sample included 600 African American youth who were in their junior year of high school. Results show that increased peer and teacher discrimination resulted in lower educational outcomes. Cultural socialization and preparation for bias had significant positive effects on educational outcomes. In addition, we found a significant interaction between teacher discrimination and both dimensions of ethnic/racial socialization on the adolescent’s attitudes toward educational utility. Implications from this study with regards to the links between racial discrimination and racial socialization on educational outcomes will be discussed.

Humanism in the Perioperative Environment
Timothy Cuyegkeng
Mentor: Maxime Cannesson
Humanism can be defined as the combination of scientific knowledge and skills with respectful, compassionate care. This care is meant to make the patient feel as comfortable as possible and is critical in the perioperative setting, where patient stress and anxiety levels are often the highest. Unfortunately, humanism in this environment tends to be neglected, where technologically-oriented specialties, such as anesthesiology, lack formal training of humanistic care in their residency programs. At the UCI Medical Center, the Department of Anesthesiology & Perioperative Care has created the “Humanism in the Perioperative Environment” curriculum, which will train Anesthesiology residents in patient-centered care. The intent of this study is to determine the impact of the “Humanism” curriculum for residents, specifically assessing the added benefit (if any) on patient-centered skills, such as empathy, communication, professionalism, and assessment of patient pain and anxiety. The residents were asked to write a reflection following completion of the Immersion Session, an interactive part of the “Humanism” curriculum. The reflections were analyzed for common themes across the responses. The most frequently mentioned themes indicate an increased sensitivity to the patient’s perioperative perspective. Due to the integral role of humanism in the perioperative environment, the concept should be included in the curriculum of anesthesia residents nationwide.

Synthesis of Nanoparticle Polymer and Testing Affinity with IgG
Rishad Dalal
Mentor: Kenneth Shea
IgG (Immunoglobulin G) is a workhorse protein that can be used for research, diagnostics, and therapeutic applications. IgG is the most abundant antibody isotype found in circulation, which represents approximately 75% of serum immunoglobulins in humans. Although IgG is productive and active, the protein denatures at ~60 °C. To address the problem, I am proposing the use of polymer nanoparticle (NP) hydrogels to use as a heat shock protein for IgG. If achieved it could be directly used for drug transportation and storage. These N-
ispropyl acrylamide (NiPAm) based NPs use catch and release techniques based on the LCST (lower critical solution temperature) to protect the protein from thermal stress. A NP library has been synthesized with a range of compositions of NiPAm, N-tert-butylacrylamide (tBAm), acrylic acid (AAc), and \( N,N' \)-methylen-bis-acrylamide (Bis). The NPs were then characterized and are now being tested for affinity to IgG.

Hardiness and Social Conformity
Jasmin Dalili
Mentor: Salvatore Maddi

Incidents of social conformity are prevalent in all groups and societies. Hardiness is a particular combination of motivations and skills that several studies have shown to improve performance and health. Hardiness is composed of a combination of three attitudes including commitment, control, and challenge. Together these hardi-attitudes provide the courage and motivation needed to turn stressful circumstances into opportunities for personal growth. Commitment refers to inferred interest and curiosity about the surrounding world, activities, and people, thus one should be deeply engaged in whatever one is doing. Control is the belief that one can influence the outcome of events and direction of one’s life through effort. Finally, a hardy person continues to seek challenge as a normal part of their life and growth. This characteristic further motivates individuals to seek opportunities that provide wisdom and knowledge. The current study sought to evaluate the relationship between the personality construct of hardiness and attitudes of social conformity. Social conformity can be described as the tendency to correspond ones actions and/or beliefs with the attitudes of a small group or society. The participants of the study consisted of 226 undergraduates from the University of California, Irvine who participated in a survey that evaluated their level of hardiness and their attitudes of social conformity. Social conformity and social conformity with share a strong positive correlation. However, results of the Spearman’s rho suggested a strong statistically significant negative correlation between social conformity and hardiness. Thus, individuals who have high levels of hardiness are likely to have lower levels of social conformity affiliation.

Evaluation of Compact Projectors for a Handheld Quantitative Skin Imaging Instrument
An Dang
Mentors: Anthony Durkin, Rolf Saager

Spatially Modulated Quantitative Spectroscopy (SMoQS), developed at Beckman Laser Institute, is an optical technique capable of quantitatively characterizing the composition of structured in-vivo tissue in depth; a critical need for both non-invasive melanoma screening and staging. The current SMoQS instrument, however, is a benchtop system that is cumbersome to use and transport, thereby limiting its access to clinical study populations. To that end, a handheld implementation of SMoQS will be fabricated. A SMoQS instrument requires two main components: (1) a means of projecting spatially varying patterns of light on tissue, and (2) a means of spectrally resolving the light remitted back from tissue. This presentation will focus on item #1, evaluation of the performance of two potentially viable projector systems. We have evaluated two compact, low-cost, commercially-available digital projectors: (1) LightCrafter (Texas Instruments), and (2) Pico-Projector (Optoma Inc.). While these projectors provide form factors amenable to a handheld instrument, it is critical to determine whether they will match or exceed the optical performance of the current benchtop instrument. Testing included the evaluation of: (1) coupling efficiency, (2) spatial and spectral light distribution, (3) projector stability, and (4) measurement reproducibility. The results show that both projectors are comparable to the benchtop system, but each system displayed distinct strengths and weaknesses. The LightCrafter perform at higher refresh rates (240Hz) and can be hardware triggered; making it better suited for high light throughput detection schemes and/or fast data acquisition. The Pico-Projector maintains greater software and projection stability at slower acquisition rates (<30Hz).

Visualization of Interdigital Ectoderm Proliferation during Embryonic Digit Separation
Ani Darakchyan
Mentor: Bogi Andersen

Syndactyly is the failure of separation in embryonic digit development, which is generally thought to be caused by impaired apoptosis of cells in the interdigital mesenchyme. The Andersen lab has generated grainy head like-3 (Grhl3) -deficient mice that have a fused digit phenotype. When the amount of apoptosis in the interdigital mesenchymal tissue was tested, both mutant and wild type mice had the same amount of apoptosis. Yet, the two layers of the interdigital ectoderm in Grhl3-deficient mice were adhered together and unable to be separated, while the same region of the wild type mice is briefly adhered together between E14 to E15, but are able to separate later on. This raised the notion that a mechanism unique to the ectoderm is required for complete and sufficient digit separation. We thus aim to investigate this novel mechanism mediated by the ectoderm. In this study, E13.5 and E14.5 murine limbs are used to map and show the degree of proliferation in
Lost Grrrls: Riot Grrrl in Los Angeles
Darby Darling  
Mentor: Fatimah Tobing-Rony

Riot grrrl is a political, social, and musical movement that began in 1991 simultaneously in the cities of Olympia, Washington and Washington, D.C. by a small group of young women who wanted to bring feminism to punk rock. In the early to mid-1990s the media was enamored with riot grrrl but continually misrepresented the messages of the movement through misquotes and fabricated stories which caused a large schism between riot grrrl and the media. Riot grrrl became synonymous with white middle class college educated rebellious girls. Contrary to this image, Los Angeles riot grrrl culture has presented a longstanding idealistic vision of intersectional feminism by connecting various marginalized and unlikely partners in overlapping social, political, economic, and environmental issues. More than twenty years later, riot grrrl in Los Angeles is characterized by an ethnically and economically diverse population of mostly women rich with music, literature, cultural festivals and consciousness raising meetings. In making this short film, I directed a small crew including producers, editors, and camera operators to document through video the unique culture of riot grrrl in Los Angeles since the early nineteen nineties. Members of local bands, writers, and riot grrrl chapters were interviewed and represent a wide variety of experiences. This short documentary traces the roots and evolution of a local feminist culture that has defied the stereotypes and has remained vibrant.

Does Music Enhance Memory in Children with Autism? Assessing the Potential of Music-Related Interventions
Soraya Davia  
Mentors: Wendy Goldberg, Angela Lukowski

Autism spectrum disorder (ASD) is a neurodevelopmental condition that impairs social and cognitive abilities. Although there are many therapies available for children with ASD, there is no consensus as to which interventions are ideal in terms of fostering significant growth in the cognitive and social-emotional domains. Several studies indicate that musical interventions might promote positive outcomes in multiple domains of functioning, but additional research is needed to determine whether exposure to music enhances cognitive functioning in children with ASD over the short term. The present study was conducted to determine whether exposure to solo classical music, orchestral classic music, or no music was associated with performance on measures of executive functioning from the Cambridge Automated Neuropsychological Test Assessment Battery (CANTAB). Because of the small sample size, a statistical analysis has not yet been completed. However, visual inspection of the data suggests that exposure to music might slightly improve children’s performance on the working memory tasks relative to conditions in which children were not exposed to music. Furthermore, the difference in complexity of the music being listened to (solo vs. orchestral music) does not seem to have any differential effect on performance. A larger sample size (and thus a stronger conclusion) is forthcoming and will be presented at the Symposium.

Characterization of the Cleavage and Polyadenylation Specificity Factor 4-Like Protein
Ryan Davis  
Mentor: Yongsheng Shi

A greater appreciation for the role of 3’ end processing of the pre-mRNA molecule has developed with regard to its function in the regulation of cell processes and the development of human disease, including cancer. One aspect of this processing occurs through cleavage and polyadenylation of the pre-mRNA, controlled by a number of proteins, including CPSF4. CPSF4 is vital to the recognition of the cleavage site. In an attempt to gain a greater understanding of this molecular process, we wanted to explore the possibility of homologous proteins that had the potential to function in a similar capacity. A novel protein known as the cleavage and polyadenylation specificity factor 4-like (CPSF4L) was selected due to its sequence similarities to CPSF4. Initial results include successful generation of cDNA for CPSF4L using a mouse embryonic stem cell line and successive cloning/sub cloning procedures to generate a mammalian expression vector to analyze its function in a HeLa cell line. This project is still ongoing, which includes expression of the vector in mammalian culture and additional assays to determine the interactions of CPSF4L in situ.

Spectral Domain Optical Coherence Tomography Analysis of the Retina in a Rat Model: A Comparison of Transgenic Immunodeficient

-mounting ectoderm. Embryonic limbs were isolated, fixed, sectioned and immunostained for proliferation markers, specifically S and M-phase cells. The results indicated that proliferation is happening ubiquitously and evenly outlining the distal epithelium over the tip of the digit, but gradually diminishes as you go deeper into the interdigital groove, and finally ends in the interdigit epithelium tongue. Future experiments will be performed to test whether the embryonic ectodermal digit separation is due to more apoptosis or adhesion molecule breaking in the most center interdigital ectoderms.
Retinal Degenerate Rat and Rats with Normal Retina
Alexander De Guzman
Mentor: Brian Cummings

Retinal degeneration (RD) affects millions of people worldwide, and in vivo monitoring of the progression of this disorder is needed to aid the development of treatments for it, such as retinal sheet transplants. This study demonstrated that spectral-domain optical coherence tomography (SD-OCT) can track RD in a rat model by evaluating changes in the retina over time. Cross-sectional SD-OCT scans were obtained from rats (n=40) between P17-P77, using SD-Foxn1 Tg(S334ter)3Lav rats (=RD rats) as a model for RD, and rats expressing human placental alkaline phosphatase (hPAP) as a normal retina group. Using post-scan analysis software, changes in the thickness of the total retina (TR), the outer retina (OR), and the inner nuclear layer (INL) were determined with respect to age group and rat strain. At P17, there was already a noticeable difference in TR and OR thickness between strains. In hPAP rats, TR decreased between P17-P77 by 10.4% (260µm to 233µm) whereas TR of RD rats decreased by 32.6% (133µm to 95µm). hPAP OR decreased by 6.5% (141µm to 132µm) whereas RD rat OR decreased by 28.8% (26µm to 20µm). hPAP INL decreased between the ages of P17-P77 by 32.6% (38µm to 25µm) whereas RD rat INL decreased by 38.8% (34µm to 21µm). The results suggest that SD-OCT is a viable method of detecting and analyzing RD; and consequently, the status of the retina and any occurring changes can be monitored and analyzed over time in vivo. SD-OCT may be useful in the evaluation of RD treatments in rats.

Understanding the Acquisition Phase of Tobacco Dependence using Animal Models
Juanne Deguzman
Mentor: Frances Leslie

The acquisition phase of tobacco dependence model is crucial considering that most humans initiate tobacco use as a teenager. The intravenous self-administration paradigm is used to compare male rats exposed to cigarette smoke extract (CSE) or nicotine alone. Previous studies in our lab show that adult rats will not only self-administer CSE but that it is more reinforcing than nicotine alone at a dose of 7.5µg/kg per infusion nicotine content. Here we test the hypothesis that CSE will be even more reinforcing than nicotine alone in adolescent rats. Rats aged postnatal day (P) 25 and P85 were trained to work for food pellets on an FR1TO20 schedule (1 pellet per lever press with a 20 second timeout). After rats reached the reinforced lever press threshold (35 for adolescents, 50 for adults), the rats were surgically implanted with catheters that allow them to intravenously infuse drugs into their right jugular vein. Starting at P37 and P97, adolescents and adults respectively, began self-administration on testing schedules that gradually became more difficult (FR1TO20, FR2TO20, and FR5TO20). The results show that both adolescent and adult rats will self-administer CSE and nicotine at all schedules and doses. Adolescents show an increase in drug intake at all test doses on an FR1TO20 schedule compared to their adult counterparts. When rats were tested on an FR5TO20 schedule, adolescents took more drug than their adult counterparts at the 30µg/kg/infusion dose of nicotine. These findings suggest that age and dose are important factors in tobacco dependence animal models.

Biochemical and Structural Characterization of the Pterin Cofactor in Bacterial Nitric Oxide Synthase
Dillon Dejam
Mentor: Thomas Poulos

Nitric oxide (NO) produced from bacterial nitric oxide synthase (bNOS) has been implicated in a variety of mechanisms that protect gram-positive bacteria from reactive oxygen species and antibiotics. Development of bNOS inhibitors for the gram-positive pathogens Staphylococcus aureus and Bacillus anthracis could improve the therapeutic efficacy of antimicrobials for infected individuals. However, the design of inhibitors for bNOS is complicated by the fact that humans also contain NOS proteins. One possible target for bNOS drug design is the pterin binding pocket, a site where there are stark differences between the bacterial and mammalian isoforms. Here we investigated the ability of pterin analogues to facilitate NO production over time in a Bacillus subtilis native redox system. The Griess reaction was used to indirectly quantify NO production at time points of 0, 2, 4, 6, 10, 15, 20, and 30 minutes in the presence of each pterin analogue. In conjunction with X-ray diffraction studies, we determined several suitable candidates for future inhibitor studies based on their ability to bind to but not facilitate NO production in B. subtilis NOS.

Investigating the Effect of Heterozygosity in the Gclc Gene on Protein Levels of GCLC using Immunoblotting
Angelica Del Rosario
Mentor: Ulrike Luderer

Glutathione (GSH) is an antioxidant that prevents cellular damage from reactive oxygen species (ROS). It is synthesized by the holoenzyme Glutamate Cysteine Ligase, which has a modifier subunit, GLCL, and a catalytic subunit, GCLC. GSH protects against ROS damage that can disrupt folliculogenesis, which is important for normal ovarian function. For instance, previous work in the Luderer laboratory showed that
mice with GSH deficiency due to Gclm deletion have an accelerated decline in ovarian follicles and poor oocyte quality. This project aims to investigate the possible gene-dosage dependent effect on GSH synthesis by the Gclc gene using immunoblotting to measure GCLC protein levels in kidney and liver tissue generated from Gclc heterozygous and wild type mice. Gclc(+/+del) and Gclc(+/+) mice were generated using Cre-Lox recombination, and liver and kidney tissues were collected from 5-month-old mice. Protein levels of GCLC were measured using immunoblotting with anti-GCLC primary antibody, and visualization was accomplished using LI-COR Odyssey Infrared Imaging. Optimization data showed that loading 12.5 μg of kidney protein and 10 μg of liver protein results in clear bands on the membrane. Although the study is still ongoing, current results show that, although not significant and not yet normalized to loading control, Gclc(+/+) mice tend to have higher GCLC protein concentration than Gclc(+/del) mice in kidney tissues. These results suggest that Gclc(+/del) mice exhibit a gene-dosage dependent deficiency is GSH. These results could contribute to the understanding of the protective role of GSH in ovarian function, and the pathophysiology of premature ovarian failure.

Microaggressions and Well-Being among Filipino American Undergraduates at UC Irvine
Patrick Del Rosario
Mentor: Jeanett Castellanos
The current study examined Filipina/o American undergraduates’ educational experiences in higher education. Using a heuristic model that explores the psychological, social, and cultural factors, students were interviewed one-on-one to describe their experiences with microaggressions, their coping behaviors and well-being. Results suggest that microaggressions impact Filipino/a American undergraduates’ well-being. Moreover, coping behaviors varied in response resulting in building a sense of motivation, self identity, looking towards others for social support, or building a sense of community and fitting into the campus climate. Findings provide insight for directives toward enhancing Filipina/o American experiences in higher education and means for higher educational professionals to better understand Filipina/o American undergraduates’ psychological processes of well-being.

Search and Rescue Reconnaissance Device
Aaron Dembla
Mentor: Syed Jafar
With outdoor activities increasing and many people wandering into wildlife extreme adventures, safety is becoming a crucial area to understand. In the U.S. alone, thousands of people become lost each year and require search and rescue assistance. A few unfortunately end up resulting in death. No one should have to go through such a situation because search and rescue operations could not locate the missing victim quickly enough. Thus Team ANSR has worked on and built a prototype for a cheap and efficiently tracking beacon that works with mobile devices to find the missing victim. The system consists of three parts: the handleless distress beacon, which transmits the distress signal, a handheld receiver, and the app, which tethers with the handheld receiver. Our developed app works with the phone’s GPS and, using the USB tether, is attached to the receiver, which works as a mini dish to pickup the signal of the distress beacon. The app then converts the readings into a percentage of signal strength and makes a representation of the path on the map on the phone. With testing and further research the beacon and receiver worked up to a range of 4,000 feet without obstruction and 2,000 feet with obstruction. This range can be boosted with the drone subsystem that can do aerial scans of the area. Overall, with ANSR’s search and rescue beacon people’s lives can be saved.

The Power of Homeownership and its Impact on the Racial Wealth Gap
Armand Demirchyan
Mentor: Tiffany Willoughby-Herard
This research compares the history of wealth accumulation through homeownership for black and white Americans. Homeownership is deemed the greatest source of wealth for most American families. However, as history shows, a great majority of Black people have been excluded from the access to wealth in homeownership and even investment in housing stock, thereby contributing significantly to the current racial wealth gap. Drawing from multiple texts, it is easy to dispel notions of meritocracy and individuality as a means of access to wealth by understanding the federal and social barriers that continuously excluded many African Americans from accumulating homeownership as a signature form of wealth. As can be seen by the U.S. Census Bureau, homeownership levels between black and white families reflect disproportionate access as many Black families are still dealing with the housing economic crisis of 2008. Through use of archival methods and participation research action methods, my research links this contemporary economic crisis which by no accident affected more black than white homeowners to a century-long history of economic policies that have distorted Black participation in homeownership as a form of shelter and wealth accumulation. Hence, this research shows how the economy has boosted wealth for white Americans and denied this access to African Americans.
A Cultural Consensus Theory Analysis of Crowdsourced Transcription Data
Prutha Deshpande
Mentors: Sergio Gago, Ian Harris, Kimberly Jameson

Large-scale data management is prevalent in research and frequently involves handwritten archival records. Such datasets require efficient and accurate transcription into data addressable formats to enable the application of modern computational analysis techniques. The transcription of documents by individual human effort however can involve time-consuming, tedious and potentially error prone processes. Two promising technological approaches may permit the development of a method to tackle this general problem of data conversion. Methods involving Optical Character Recognition (OCR) software can be used to automate portions of data transcription, but OCR results for handwritten data are typically not completely effective or error-free. Another approach is to use human judgments obtained through Internet-based crowdsourcing to complement the results obtained using OCR. In the present study, human participant responses were collected for tasks involving the direct transcription of digital images of handwritten data sheets, and the transcription and verification of OCR output. Several task designs were implemented to compare success rates of different judgment variations. A novel implementation of Cultural Consensus Theory was used to evaluate the transcriptions provided by the participant group. Such analyses provide model-based estimates of best possible solutions to resolve transcription ambiguity in the data. Our results provide potential insights regarding the development of general crowdsourcing procedures for the transcription of handwritten documents and build toward our research team’s larger aim of preserving a large and invaluable color categorization dataset composed of ~116 indigenous languages of Mesoamerica, and data from several other languages world-wide.

Color Categorization in Bilingual Populations: Korean-English Bilinguals
Prutha Deshpande
Mentors: Kimberly Jameson, Louis Narens

Empirical research on the influence of language on cognition often focuses on the domain of color categorization. With a global increase in bilingualism, investigating how the cognitive processing of non-linguistic information may be impacted by the knowledge of two languages is especially important. For example, it remains uncertain whether a bilingual’s sensory representation of color appearance similarity is affected by their linguistic representations of color semantics. The literature on this topic has primarily examined the color naming of bilingual participants in non-English language modes. To address this gap in the literature, the present study compares the color categorization and naming of bilinguals in both of their known languages. The study investigates Korean-English Bilinguals as the Korean color lexicon has interesting features that differentiate it from the English color lexicon. In particular, research suggests that Korean has two highly salient basic color terms for the region of color space that in the English language would be described with the single color term “green.” The methods used in the present study were modeled on the Mesoamerican Color Survey (MCS) conducted between 1978 and 1981 by late cognitive anthropologist, Dr. Robert E. MacLaury. Data obtained in the present study was compared with data from Korean monolingual and bilingual informants, and American English monolingual informants, collected as a part of the multinational component of Dr. MacLaury’s MCS in 1994. The direct comparisons made provide valuable insights for refining current theories on variations in the color naming patterns of bilingual speakers.

Timing of Iron Deficiency and Executive Functioning at Nine Months
Prutha Deshpande
Mentor: Angela Lukowski

Iron deficiency is a common nutrient insufficiency across the globe. Importantly, infants and young children are disproportionately affected, which is concerning given the documented effects of iron deficiency on brain development and behavioral functioning. For example, previous research has indicated that early iron deficiency impacts cognitive functioning both in infancy and in the elementary school years after iron repletion. The goal of the present study was to examine associations between early iron status and an infant precursor of later executive functioning. We predicted that early iron deficiency would be associated with reduced performance on a measure of working memory/inhibitory control at nine months and that the effects of iron deficiency on cognitive functioning would vary based on the timing of early iron deficiency. Families were recruited from a rural area near Beijing, China. Fetal-neonatal iron status was assessed at birth using cord blood and postnatal iron status was assessed at nine months using capillary blood. Infants completed a measure of working memory/inhibitory control at nine months. Results revealed that group differences were not found on a measure of short-term memory or object permanence. When considering working memory/inhibitory control in particular, infants with fetal-neonatal iron deficiency and postnatal iron deficiency performed less well relative to infants who were iron sufficient. These findings highlight the
importance of infant status during prenatal and postnatal development on later cognitive functioning.

**Recidivism Reduction of L.A. Sheriff’s Gang Divergence Program**

Kimberley Dinh  
*Mentor: Doug Houston*

The purpose of this research was to assess the effectiveness of program success rates of the Los Angeles Gang Diversion Team program in reducing recidivism. The primary outcome of interest was to provide insight regarding the individual factors of program participants and their success in diverging from criminal behavior and to identify factors that contributed to varying success rates. Literature review of various theories that sought to explain different criminal-genic phenomena were assessed in order to enhance understanding of factors that were found to contribute to overall program success. Various factors were identified based on intake records of more than 60 participants in the program that correlated with program completion or dropout, as well as relationships of factors to various client levels. An analysis of why different level participants had higher program completion success rates than others was conducted. An overwhelming majority of participants had both academic and behavioral issues. The next most common was drug abuse, particularly marijuana. Family issues were seen in the majority of the participants. The majority of participants entering the program were classified as Level 2. The most common theme of closed cases was “lost to follow,” where participants essentially were unable to be contacted after numerous attempts. The findings of this study can shed light on the overall success of the program and newly informed program procedures may be developed to assist at-risk delinquent youths of various categories.

**Evaluating the Use of Structure-From-Motion in the 3D Reconstruction of the Human Airway**

Katherine Do  
*Mentor: Brian Wong*

Airway obstruction is a common pathological condition that can be found in all age groups. With its ease of accessibility, endoscopy is a standardized yet subjective method that aids physicians in diagnosing airway obstruction. While programs that allow 3D reconstruction of outer geometry are wildly available on the market, building 3D models from within is less developed. The objective of this study is to describe a method that reconstructs endoscopic airway footage in 3D to objectively measure quantitative information. The combination of three software packages—MATLAB, VisualSFM, and MeshLab—enables 3D reconstruction of an object from video of endoscopic images of a structure. The recorded video was segmented into images using MATLAB. The image set was imported into VisualSFM, which computed a sparse reconstruction using structure from motion algorithm and then a dense reconstruction via clustering views for multi-view stereo algorithm. With the reconstructed output, a point cloud, MeshLab was used to generate a mesh by Poisson reconstruction and applied texture to the final model. To validate the accuracy of the 3D model, a clay model of the oral cavity was constructed and video recorded using a 2-megapixels endoscope (DBpower, TD HD) at 30 fps and 720p. The volumes from the physical and computed models were compared. For the clay model, the distance between the maxillary central incisor and the mandibular central incisor was 93.0 mm, and the volume was 347.0 ml. For the computed 3D model, Netfabb was used to analyze the distance (5.17 unit) and the volume (59.2203 unit^3). The scaled volume from the computed 3D model was 344.6 ml, which yielded 0.692% error. The result showed less than 0.7% difference between physically measured and computed volumes. The proposed method has the potential to provide a low-cost, minimally invasive, and accurate means to reconstruct airway anatomy from endoscopic video footage.

**The Role of DABCO Derivatives in Blocking Kv1.1 and KCNQ2/3 Channels**

Timothy Do  
*Mentor: Geoffrey Abbott*

Voltage-gated potassium (Kv) channels play an important role in regulating diverse physiological processes and serve as potential therapeutic targets for diseases such as cardiac arrhythmia, ataxia, and type II diabetes. Tetraethylammonium (TEA), a widely used antagonist has been previously been shown to selectively block different Kv channels. Given that TEA is a quaternary ammonium ion used to investigate Kv channel structure and functioning, we hypothesized that compounds closely related in structure might target Kv channels with higher affinity and specificity. The Abbott lab previously discovered that 1,4-diazabicyclo[2.2.2]octane (DABCO) derivatives can block certain Kv channels at concentrations with higher affinities than TEA. Here, we tested several DABCO derivatives for their ability to inhibit Kv1.1 and KCNQ2/3 channels expressed in Xenopus laevis oocytes. The C16 DABCO sugar monostring DA-014b and C16 di-substituted diDABCO compound MT-157 inhibited both channels at micromolar concentrations. Di-substituted DABCO strings TH102 and TH101 inhibited both channels at similar concentrations. Therefore, DABCO derivatives can serve as potential lead compounds for molecular probes and therapeutic agents, with potency greater than that of TEA.
Identifying Potential Losses in Rehabilitation Performance in Patients Undergoing Total Joint Arthroplasty

Linda Doan

Mentor: Ran Schwarzkopf

The demand for lower-limb joint replacements is projected to increase twofold for hip replacements and sixfold for knee replacements by 2030. As a result, there has been progressive interest in the optimal rehabilitation setting for post-surgical care. Typically, after a patient undergoes a short course of post-operative physical therapy, he or she is discharged home or to an extended care facility such as a skilled nursing facility (SNF). However, there are few measures in place to ensure continuous and intensive physical therapy during the transition from hospital to SNF, making the patient susceptible to significant losses in functional performance. To address the uncertainty in post-acute care outcomes, we sought to measure gait training, subjective pain levels, and knee flexion performance for post- total joint arthroplasty patients during the immediate interval following discharge from the hospital. A preliminary analysis suggests that there is a significant decline in distance ambulated during the first two days following discharge from the hospital. Patients who began gait training at the SNF on the same day as hospital discharge experienced a greater decline in gait performance than those who started the day after hospital discharge. Finally, patients did not begin to report significantly reduced pain levels until two days after hospital discharge. Together, these results may point to a potential deconditioning process that occurs following hospital discharge, which may jeopardize long-term outcome or the duration of rehabilitation.

Level of Acceptance of Vietnamese-American Women on Various Education and Counseling Approaches

Vincent Doan

Mentor: Veronica Vieira

Cervical cancer, caused primarily by the human papillomavirus, can spread from one person to another through sexual contact. Vietnamese-American women have significantly higher rates of cervical cancer compared to other ethnic groups. This can be attributed to factors such as a lack of knowledge in regards to cervical cancer, poor health behavior/habits, and level of ethnic identity. This research aims to determine how receptive Vietnamese-American women are of various education and counseling approaches for cervical cancer. We surveyed 204 Vietnamese-American women ages 18–29 living in Orange County. The survey included questions that assessed participants’ knowledge of cervical cancer and their preferences for receiving education and counseling. Only 41% of respondents knew that the human papilloma virus was one of the primary causes of cervical cancer. In addition, 75% of survey respondents preferred to receive cervical counseling/education through a direct health care worker such as a doctor, nurse, or physician assistant. There was also a high acceptance rate of receiving cervical cancer counseling and education via social media and live chat websites as opposed to various in-person approaches. These findings support the feasibility of using social media and live-chat websites as avenues through which to broadcast cervical cancer education and counseling. The results from this study will help us better understand what cervical cancer education/counseling approaches Vietnamese-American women prefer and also aid in the development of future early-age preventative interventions among this population.

Giải Khuyến Học (GKH) in Orange County: Cultural Transmission through Vietnamese Language Education

Pauline Dong

Mentor: Dorothy Fujita-Rony

Heritage language is defined as a language that is normally not taught in mainstream schools, but has certain historical or personal connection to individuals. Rather than focusing on the effects that heritage language education has on learners, this project seeks to understand how first generation, Vietnamese Americans’ sense of culture and identity is transferred through Vietnamese language education in Orange County, California. In this study, I examine the Vietnamese Americans’ assimilation and acculturation struggles following the Vietnam War, and how the formation of Little Saigon also correlates with the solidification of the first-generation’s exilic community identity. With the development of community-run, Vietnamese language programs across the county, it is clear that Vietnamese language education plays a critical role in sustaining community culture and identity. In the case of many minority communities in the United States, knowledge and fluency of the heritage language disintegrates with each generation due to the necessary acculturation into a an English-dominant society. The emergence of Vietnamese language programs throughout the years signifies a movement to maintain the heritage language, and how the first generation of Vietnamese Americans has built a foundation for this continued growth. I argue that the Vietnamese language functions as a tool for first-generation Vietnamese Americans to transmit their culture, memory, and identity to the younger generations. Since this is a two-year project, I will interview organizers of Giải Khuyến Học, a Vietnamese language program that launched in 1984, to further
highlight the importance of language and cultural transmission in the community.

Effect of Biophysical Cues of Tumor Microenvironment on Macrophage Phenotype
Eilbret Dooman
Mentor: Weian Zhao

Macrophages are extensively distributed immune response cells that play a crucial role in homeostasis and defense. They can also be phenotypically polarized by the tumor microenvironment. The two extreme phenotypes are M1, which are classically activated macrophages (killers) that produce reactive oxygen species and pro-inflammatory cytokines and chemokines to drive inflammation, and M2, which are alternatively activated macrophages (healers) that contribute to debris scavenging, angiogenesis, and wound repair. My hypothesis is that biophysical cues of tumor microenvironment program macrophages towards an immunosuppressive phenotype. The goal of the research is to determine the effect of biophysical cues, such as matrix stiffness on macrophages at tumor microenvironment, so that we can finally establish a new paradigm to understand tumor immunosuppressive microenvironment and develop new therapies. Experiment is designed such that RAW 264.7 macrophages will be cultured on different substrate stiffnesses. (2 x 10 kPa, 2 x 100 kPa gels). Matrix substrate will be different stiffness of polyacrylamide gel or Q gels (I will try both and see which one works better). Stiffness of the substrates will then be modulated by different ratios. Cytokines will then be added to macrophages on the gel for morphology determination. It will be as follows: LPS/IFN-γ on 10 and 100 kPa and IL-4/IL-13 on 10 and 100 kPa. Flow Cytometer then will be used to detect the established markers: Proinflammatory (M1) will be identified by production of inducible nitric oxide synthase (iNOS) using real time PCR and prohealing phenotype (M2) will be determined by arginase expression using Western blotting.

Comparing Communication Preferences during Stressful Situations and Health Status among UC Irvine Undergraduates
Huong Duong
Mentors: Brandon Brown, Miryha Runnerstrom

Recent evidence suggests that the shift from frequent face-to-face (FTF) interactions to computer-mediated communication (CMC) has increased stress levels for CMC users. CMC allows people to connect with each other at any time and any place, leading researchers to believe users would be healthier due to the increased availability of online social support among its users. Nevertheless, studies have found mixed results in the relationship between communication type and health.

Therefore, the present study was conducted to assess the general relationship between communication preferences and health and to analyze CMC and FTF preferences during stressful situations. An online survey was sent to UC Irvine undergraduates (ages 18–24) via class emails through professors and Facebook group posts. The survey included questions on communication preference, stress perceptions, and the Duke Health Profile as a measure for health. To date, 318 students from a variety of disciplines have responded, of whom 69.5% preferred FTF, and 6.6% preferred neither FTF nor CMC. Those with FTF preferences displayed a statistically significant higher average overall health score of 66.7, compared to 60.7 for CMC and 53.5 for neither (p<0.001). We also found a significant relationship between general preference and actual usage during stressful situations. Our results indicate that those who prefer FTF have better health and general preference tends to predict actual usage. Based on these findings, we conclude educating people to use FTF interaction instead of CMC to cope with stressful situations can help users become comfortable with FTF interaction and can influence overall health.

Reclaiming Identities: Agricultural Laborers Depicting their Experiences through Photography in McFarland, California
Maritza Duran
Mentor: Ana Rosas

Agricultural laborers’ experiences have evolved over the course of history, and their current experiences remain unexplored. In addition, current media coverage of McFarland, California does not fully explore these identities and ignores the current experiences and identities of agricultural laborers. Through the use of images provided by women from McFarland, California these experiences will be fully explored and portrayed to depict their immigrant experience in the United States. Through their own images from their albums; their voices and stories will portray silences of immigration, romanticization of the United States, and the ways in which agricultural laborers form their identities in the United States today. This research will expose ways in which agricultural laborers from McFarland, CA have chosen to document themselves through photography and which photographs they choose to save as memoirs to highlight their identities and experiences.

Discovery of Small Peptide Binders to Cancer and Nephrotic Syndrome Markers using Phage Display
Joshua Edgar
Mentor: Gregory Weiss

Phage display uses genetically engineered phage particles with proteins or short peptide sequences that can be displayed on the PIII or PVIII coat proteins of M13
bacteriophage. Previous members in the Weiss laboratory created a Mega Random Peptide Library (MRPL) displayed on phage. This library contains $10^6$ peptide variants that can be used to find short peptide sequences that specifically bind to proteins with biological properties. I will use the MRPL phage library to select for short peptides that bind to protein markers indicative of bladder cancer and nephritic syndrome. In order to accomplish this, cancer markers must first be expressed and purified. Next, selections using the MRPL phage library will identify potential binders. Finally, characterization of the peptides will indicate binding affinity and specificity for the target protein. Long-term goals include incorporation of specific binders into a biosensor as a non-invasive assay for the detection of cancer or nephritic disease markers in urine. Recent experiments suggest that a peptide binder has been found that binds to Human Serum Albumin (HSA), a potential biomarker for nephritic syndrome, although complete characterization is still required. Additional future directions include expression, purification and selections against clusterin, a diagnostic for bladder cancer.

UC Irvine Undergraduate Student Population's Awareness of the roles of Physician Assistants (PAs) in Today's Healthcare

Nazgol Emami

Mentor: Terry Schmidt

Misconceptions regarding the level of training and credibility of Physician Assistants (PAs) negatively affects the patient acceptance of PAs in today's healthcare system. As a result PAs are often not able to fully practice medicine within the state’s legal guidelines. The purpose of this study is to assess the level of understanding of the UCI undergraduate student population of the many roles that PAs currently hold in patient care. Raising awareness and training more PAs is crucial especially in California. The projected physicians shortage is expected to increase dramatically (almost 6,000 physicians) by 2020. The costs to train a PA are estimated to be one fourth of the costs of training an M.D. Training more PAs could save the State of California a substantial amount of money and reduce delays in patient care and practice. The levels of awareness and attitudes of the participants were assessed through an online survey that includes both open and closed-ended questions. The majority of the questions tested participants’ knowledge. A few open ended questions were also included to examine the participants’ attitudes. Of the 351 participants, 49% reported being aware of the PA profession. Of those, only 55% were able to define what a PA is correctly. The majority of the participants (58.9%) though believe that PAs are “as credible as” or “about the same credibility as” a physician. The results of this research could open routes for future studies in underlying causes of misconceptions towards certain healthcare professionals, or to raise public’s awareness on the topic.

Inducing Familial Danish Dementia Fibroblasts to Pluripotent Stem Cells for Disease Modeling

Cindy Escobar

Mentors: Jorge Busciglio, Pinar Coskun

Familial Danish Dementia (FDD) is a dominantly inherited neurodegenerative disease mutation of the BRI2 gene causing ocular disorders such as cataracts before the age of 30 followed by impaired hearing, paranoid psychosis and development of dementia by the age of 50. The BRI2 10-nt duplication mutation results in an extended mutation that is released as an amyloidogenic peptide after proteolysis. Interestingly, neurofibrillary tangles, amyloid plaques, and cerebral amyloid angiopathy are pathological traits of FDD, very similar to the pathological traits of Alzheimer’s disease (AD). Due to the similar pathology of FDD to AD, FDD is possible alternative models that can help investigate the mechanisms involved in amyloid formation and neurofibrillary degeneration. The objective of this experiment is to induce pluripotent stem cells (iPSCs) from fibroblasts cultivated from a patient with FDD followed by differentiation of the iPSCs into neurons that can be used for disease modeling with the BRI2 mutation. Skin fibroblasts from two FDD patients and controls were selected for iPSCs. In addition to FDD samples, we included fetal Down syndrome meningeal fibroblast as our control line due to our past experiences with this line using a different reprogramming strategy. All four groups of fibroblasts were transfected with the Sendai virus for reprogramming. The Down syndrome line has shown robust reprogramming efficiency with multiple colonies expressing pluripotency marker TRA-81. Rest of the groups had slower progressing iPSC like colonies. However, to determine they are fully programmed, the cells need to be maintained up to four weeks post transfection. Hence, our results indicate that FDD cells are slower to reprogram compare to DS lines. This could be due to the age of the fibroblast where FDD fibroblasts are obtained from old adults that are more differentiated compared to DS fetal lines, hence is making the reprogramming back to stem cell stage prolonged.
Determining the Effects of Discrimination and Cultural Beliefs on Health Care Usage by the Latino Population in the U.S.

Agueda Espinoza
Mentor: Annie Ro

Recent studies show Latinos in the U.S. are more likely to experience health disparities due to perceived discrimination and culture-bound illness that affect how frequently they access medical services. The objective of this study is to determine the effects of discrimination and cultural beliefs on health care usage by the Latino population in the United States. This research seeks to understand three concepts: does discrimination affect medical care access by the U.S. Latino population; do cultural beliefs of complementary alternative medicine affect how often Latinos use healthcare services; and is higher discrimination associated with use of complementary alternative medicine. This study is a secondary data analysis of the National Latino and Asian American Study (NLAAS). The NLAAS is a nationally representative survey of the U.S. Latino population. Data was collected May 2002 through November 2003. The sample included 2,554 Latino respondents. A chi square test and two-independent t-tests were used to analyze the results. The results of the study indicate that there is no association between general/racial discrimination and medical use. The study demonstrated significant association between the use of complementary alternative medicine (CAM) and medical use. This means that there is a relationship between the use of CAM and the use of a regular medical doctor. The study also revealed a significant relationship between general/racial discrimination and the use of complementary alternative medicine. This means that there is a relationship between higher discrimination and CAM use. The study concludes that discrimination does not appear to be a barrier to medical use; however the use of CAM may affect the use of medical services.

Anthropomorphic Robotic Manipulator

Adam Evangelista
Mentor: Ian Harris

The goal of this senior design project is to develop a robotic manipulator with similar parameters (dexterity, robustness, intuition) to that of a human hand. Robotic manipulators have been subject to much study for their uses in potentially high risk environments where high precision control is needed. However, our hand seeks to bridge the gap between high dexterity, expensive academic pursuits and cheaper, more fragile “do it yourself” kits. And eventually, hopefully a robust, cheap, easy to use robotic hand can be used in place of real humans in extreme situations. At present, our design consists of five moveable fingers actuated by a tendon-servo method (five degrees of freedom controlled by five flex sensors in the accompanying glove). This method has been marginally successful (evaluated using motion capture algorithms in MATLAB) in replicating only basic finger curling. Future designs aim to add more degrees of control and further refine the finger mechanism using 3D printing rapid prototyping.

Latino Medical Doctors: The Effects of Gender and Racial Inequalities in their Education and Professional Careers

Thalia Fabian
Mentor: Glenda Flores

The purpose of this study was to examine the gender and racial inequalities that Latino doctors experience throughout their medical education. The analysis of their experiences in the medical field gave us a better understanding of how gender and racial inequalities influence the underrepresentation of Latino doctors. Focusing on one ethnic minority group provides for a more in-depth analysis of gender and racial inequalities. The recruitment methods for this study required the participation in medical conferences, networking events, face-to-face interviews with 29 physicians in Southern California. The findings suggest that the inequality Latina physicians face in the workplace is primarily gender based. Racial inequality affects both sexes and is one of the major influences for the underrepresentation of Latino physicians. Female medical doctors are often paid less than their male counterparts, harassed, and looked down upon for childbearing. In addition, Latina women have to face discrimination because of their racial background. However, male Latino doctors do not experience gender inequality but do encounter bias because they are part of an ethnic minority group. The results of this study will increase the awareness of the inequalities that women face in the medical field in comparison to their male colleagues. Moreover, the data found in this study will serve a template for the changes that need to be made in the inequality that racial minority groups experience. Latino doctors believe that their underrepresentation of due to the lack of mentorship, resources, educational opportunities and the burden of cost to attend medical school.

The Door: An Insight into Hate Crimes towards LGBTQ Individuals

Lia Fakhouri
Mentor: Jane Page

Many people have different ideas on what Theatre is. I find that one of the most potent truths about theatre is that it creates a space for a wide spectrum of views to be heard and considered by many. By having an “audience” Theatre is an influential tool for promoting and creating change in this world. In the United States, Hate Crimes
Effects of Methamphetamine Withdrawal on Behavior and Papez Circuit Activation in Enriched Rats Exploring a Novel Complex Environment
Michelle Fang
Mentor: Gary Lynch

The impaired reward signaling pathway in the brain that characterizes a methamphetamine (MA) withdrawal state implicates MA-induced changes in the dopaminergic pathway associated with motivational behaviors. Hippocampal involvement in this pathway suggests withdrawal-prompted changes to learning and memory functions as well. This study examines the effects of MA withdrawal on rat behavior using an unsupervised learning (USL) paradigm, a model of behavioral testing that allows animals to freely explore a complex environment without explicit rewards for certain behaviors. This study also seeks to identify neurological changes produced by the effects of MA withdrawal in the Papez circuit, which includes the hippocampus and is known for its involvement in higher-order functions such as emotion, learning and memory, and social behavior. To examine this, MA withdrawal was induced in experimental groups of enriched rats after chronic exposure to MA, and all rats were given a single session of USL. Their brains were collected one hour post-USL and immunofluorescently labelled for Fos, an immediate-early gene that is transcribed upon neuronal activation. The results from the behavior analysis showed significant differences in behavior patterns between the withdrawal groups and the control groups. Analysis of the brain tissue showed imbalance of activation in different parts of the Papez circuit. As a previously unexplored mechanism for certain withdrawal symptoms, this circuit may offer insight into the changes in higher order functions affected by withdrawal symptoms and could help in developing treatments for withdrawal-state patients.

Identifying New Gene Targets with the Potential of Preventing Melanoma Tumor Cell Dormancy and Adaptation following PLX4032 Treatment
Ahmed Farhat
Mentor: Frank Meyskens

Vemurafenib (PLX4032) is a BRAF inhibitor that is often prescribed to patients suffering from melanoma skin cancer. For the first six months to one year of drug treatment, PLX4032 demonstrates extreme efficacy and efficiency in reducing and, in some cases, eliminating the tumors. Unfortunately, about one year after treatment, a significant subset of patients begin to show signs of tumor growth. We set out to understand and explore the underlying pathways that are responsible for inducing cancer cell arrest or adaptation ultimately leading to tumor return following drug treatment. Currently, very little research has been done in cancer cell dormancy due to the inherent difficulty in obtaining true dormant cells. In an attempt to obtain dormant cells, melanoma cancer cells from various cell lines were grown in the presence of 10 μM PLX4032 for two months. Additionally, PLX4032-adapted melanoma cancer cells were also cultured in the presence and absence of this drug. Next, cells were collected and RNA was extracted and analyzed through RNA sequencing. Gene expression profiles were compared and genes that demonstrated significant deviations between cell lines were analyzed through RT-PCR. Using this data and outside published literature, gene signaling pathways were constructed with the intent of addressing the mechanism by which melanoma cells undergo drug arrest or dormancy. Using this data, we have identified new potential drug targets that can be used to specifically target melanoma cancer cells that would otherwise undergo dormancy or adaptation and lead to subsequent tumor growth following PLX4032 treatment.

The Role of Psychosociocultural Factors Affecting Latina/o Students’ Well-Being
Erick Felix
Mentor: Jeanett Castellanos

The Psychosociocultural (PSC) framework examines constructs within the field of counseling that provide context-specific and relevant services for Latina/o students. With Latina/o students recently becoming the largest minority population in higher education and limited understanding of their educational processes, it is important to understand factors that contribute to Latina/o undergraduate experiences and their well-being. The PSC framework allows researchers to examine...
psychological, social and cultural factors individually and collectively providing a comprehensive analysis of students’ educational context, processes, and outcomes. The purpose of this study is to analyze the role of family, perceived family, ser bien educado, family support, academic support, and university fit on Latina/o undergraduates’ well-being. Preliminary findings offer a better understanding of Latina/o educational processes while providing insight on the PSC factors impacting students’ well-being. In addition, results will help shape directives for future research and practice.

Spectroscopic Study of the Simplest Criegee Intermediate
David Feng
Mentor: Craig Murray
Criegee intermediates (CIs) are formed in the ozonolysis of alkenes, a major removal mechanism for unsaturated hydrocarbons in the troposphere. CIs are recognized as key species in tropospheric formation of secondary organic aerosols and are thought to play a role in atmospheric regulation of OH. We use cavity ring-down spectroscopy to identify and study the simplest CI, formaldehyde oxide (CH2OO), through the B1A′–X1A′ absorption band. CH2OO is produced by the reaction of formaldehyde oxide (CH2OO) with molecular oxygen; CH2I itself is formed from the photolysis of diiodomethane (CH2I2) at 355-nm. We will report high-resolution spectra of vibronic bands in the wavelength range 415 – 430 nm. The absence of resolvable rotational structure in these bands suggests that the B1A′ state is strongly dissociated, even at low excitation energies. We will address the discrepancies between experimental measurements of this absorption band.

Dichlorination Studies on the Core of Clionastatin
Sean Feng
Mentor: Chris Vanderwal
In collaboration with the Houk computation group at UCLA, we are investigating dichlorination as a function of different protecting groups on an intermediate of the synthesis of the core of clionastatin. Some protecting groups include trichloroacetate, trifluoroacetate, acetate, bulky silyl groups, and methyl, where different steric and electronic effects of these groups can alter the diastereomeric ratio of the dichlorination. From these studies, we have found that the more electron-withdrawing the protecting group is, the more the undesired diastereomer is favored.

Growth and Characterization of Syntrophic Co-Culture Biofilms of the Geobacter Genus
Jacob Fenster
Mentor: Allon Hochbaum
The anaerobic Geobacter genus (specifically Geobacter metallireducens, and G. sulfurreducens) bacteria exhibit a rare ability to transfer electrons to external surfaces as a result of their cellular respiration. This ability has been exploited to poise a potential within a galvanic microbial fuel cell (MFC) to drive a flow of electricity. Until now, the only successful MFCs within our lab have been mono-cultures of these bacteria. Mixed species biofilms of these bacteria could display synergetic properties, allowing the colony to subsist on a wider range of carbon sources or produce a higher output of power. To design a mixed species fuel cell, I have conducted metabolic screening experiments to assess the various conditions under which these two species could live. It was concluded that these species could not engage in fermentation, a promising result for a respiration driven microbial fuel cell. Ethanol and glycerol were tested as carbon sources for respiration in standing cultures, and in agreement with literature, only the ethanol could be used in a co-culture of G. metallireducens and G. sulfurreducens. These results are applied to grow and characterize an ethanol driven bi-layered co-culture biofilm within a MFC. The contention is that the outer layer of G. metallireducens in contact with the growth medium will oxidize ethanol, forming acetate, and the inner layer of G. sulfurreducens will oxidize the produced acetate. The first trial of this experiment was unsuccessful, and a second trial is currently underway.

The Design and Implementation of a Waste Heat Recovery System for a Solid Oxide Fuel Cell
Christopher Ferro
Mentor: Jacob Brouwer
Solid oxide fuel cells play an important role in the future of distributed generation. They give companies and corporations the ability to power localized projects at little to no harm to the environment. The Microsoft Corporation looked to use solid oxide fuel cells in powering server racks for data center storage. In order to make the solid oxide fuel cell system more cost efficient, a waste heat recovery system is necessary so that the excess heat from the system can be reused for other means. My project dealt with tackling this endeavor and discovering the ways in which a waste heat recovery system could be designed and implemented. To do this, I researched other waste heat recovery systems for other solid oxide fuel cells and used them as a template to design one for our lab. However, this process is very long and can take a while to fulfill, so this project is far from being over. In the meantime, several
steps were taken to analyze the heat transfer elements of the solid oxide fuel cell system. Type K-Thermocouples were used to measure the high temperatures of the fuel cell as well as get estimates on the overall enthalpy values. Using this, heat transfer values were estimated for the system and will help in determining overall system efficiencies. This project will be used for future research in SOFCs concerning waste heat recovery.

Restorative Justice at Anaheim High School
Jessica Figueroa
Mentor: Ana Rosas

Restorative justice has been described as an alternative behavioral regulation that promotes positive behavior; some studies analyze its effectiveness in underserved high schools. Restorative justice aims to enhance student experience by restoring the high school setting in favor of student retention and graduation. The sample size of this study consisted of 28 prior and past Anaheim High School Latino/Latina students. To assess the influence of Anaheim High School’s restorative justice model known as Respectful, Responsible, Optimistic, Community-Minded, Kind, Safe or R.R.O.C.K.S on student experience the following research methods were utilized: textual analysis, informal conversation, and survey. R.R.O.C.K.S’ objective is to support social and academic success among the student body. The findings of this study indicate that on the contrary, the integration of R.R.O.C.K.S in the year of 2010 resulted in an increase in the suspension and dropout rates.

Anti-Neoplastic Sphingolipids Truncate the Tubular Recycling Endosome and Reroute Nutrient Transporter Proteins to a Late Endocytic Compartment
Brendan Finicle
Mentor: Aimee Edinger

A subset of transporters for amino acids and glucose are internalized via an Arf6-dependent, clathrin-independent pathway. GLUT1, a surface glucose transporter, and 4F2hc, a chaperone protein for amino acid transporters, normally traffic between the plasma membrane and the tubular recycling endosome (TRE) that is marked by the protein MICAL-L1. Endogenous and synthetic sphingolipids such as C2-ceramide and FTY720 inactivate Arf6 and lead to down-regulation of surface 4F2hc and GLUT1. We hypothesized that sphingolipids induce surface nutrient transporter loss in part by inactivating Arf6, thereby trapping nutrient transporters in a recycling compartment. To test this model, 4F2hc trafficking was followed by indirect immunofluorescence microscopy using markers of endosomal compartments to determine the localization of 4F2hc following FTY720 treatment. Surprisingly, 4F2hc localized to late endocytic structures rather than the TRE after treatment with FTY720. To determine whether FTY720 affected the structure of the TRE, MICAL-L1 positive tubules were evaluated. FTY720 resulted in truncation or complete loss of the TRE as determined by MICAL-L1 staining. These findings suggest that loss or functional disruption of the TRE may reroute 4F2hc to the degradative rather than the recycling pathway. Overall, this work provides a possible mechanism for sphingolipid-induced surface nutrient transporter loss and suggests additional studies to determine how TRE structure and function is disrupted.

Fannie Lou Hamer and Sakia Gunn in Contemporary Black Feminist Thought: Intramural Conversations
Cheryl Flores
Mentor: Tiffany Willoughby-Herard

Contemporary Black feminist thinkers who work at the intersection of urban studies and geography and youth politics have enabled us to re-historicize figures in civil rights activism. Their attention to “intramural conversations” enables us to consider how race, class, and gender or “structural intersectionality” constrains politics. Using cultural studies, feminist research, and historical research methods, I examine how particular intersectional identities such as age, sexual orientation, class, health, and educational status are now being written about instead of minimized. By examining historical debates about two iconic figures: Fannie Lou Hamer (1917–1977) and Sakia Gunn (1987–2003) as USC political scientist Dr. Ange-Marie Hancock (2013) has done in her research on the multiple identities that are politically salient for “millenials” Fannie Lou Hamer is revealed to be both an icon of voting rights as well as an activist for the rights of landless and evicted people, labor unions, and disabled people. Similarly, Sakia Gunn, a victim of a heinous hate crime, is revealed to be an activist for the rights of youth, LGBT communities, and the “right to the city.” Using concepts offered by Zenzele Iseke’s Urban Black Women and the Politics of Resistance I explore the failures of histories that depict such iconic figures as being wedded to single-issue civil rights projects and highlight the role of intramural conversations in creating space for political action.

Perceived Clinical Effectiveness of Treatments for Post-Traumatic Stress Disorder: A Qualitative Pilot Study of Clinicians’ Views about Empirically-Validated Treatments
Christopher Flores
Mentors: Linda Levine, Tonya Schuster

The American Psychological Association has long called for, and at times mandated, the adoption of “empirically-supported treatments” by mental health providers and clinical psychology training programs. In this approach,
treatments are tested using randomized-controlled trials (RCTs) against placebos or other established forms of therapy to report a treatment’s efficacy. However, efficacy and clinical effectiveness are somewhat divergent concepts, which have led to years of controversy and debate over the appropriateness of normalized therapies and the generalizability of their RCTs. Whereas efficacy denotes a controlled experimental setting, clinical effectiveness denotes the degree of a treatment’s success as delivered in the field with consideration for client factors, such as gender, age, socioeconomic status, and co-occurring disorders. This paradigm logically predicts an important gap between efficacy and effectiveness in treatments for post-traumatic stress disorder (PTSD), which can vary significantly in expressed symptoms, severity, and trauma type. This currently-in-progress study incorporates qualitative, semi-structured interviews with psychotherapists who specialize in the treatment of PTSD. Its central goals are to explore the efficacy-effectiveness gap, identify patterns of reported effectiveness along the factors of client background, trauma type, and method of treatment, and also to identify testable hypotheses for future research.

Learning, Play, and Identity in Gendered Lego Franchises
Tammie Foliaki
Mentors: Rebecca Black, Stephanie Reich

Play is an important part of learning, as through play, children are exposed to and exercise social roles. Prior research has shown that the product design and marketing associated with toys can guide how children play. This can be especially true based on whether the product is marketed towards boys or girls. The current study focused on Lego products and how their marketing of social roles differed or aligned for girl-targeted and boy-directed products. The study sought to answer the following questions: (1) What are the facilitated play practices of the products marketed toward boys (Lego City) and toward girls (Lego Friends)?, and (2) What are the anticipated social roles associated with these facilitated play practices? The study qualitatively analyzed 132 narratives from two Lego product lines, and compared the dominant themes in the narratives. The analysis identified many gender differences in the narratives for Lego City (marketing to boys) and Lego Friends (marketed toward girls). The most dominant themes in the narratives for the Lego City products involved work, power, and danger, while the narratives for Lego Friends were dominated by themes of leisure, food, and appearance. Considering the messages provided by sets like Lego building kits is important, especially when these messages are highly gender-stereotypic. While the creative building opportunities provided by Lego can be educationally beneficial, the others “lessons” provided via associated media and marketing materials should be considered.

Feedback Connectivity of Visual Cortex in Autistic and Wild-Type Mice
Munib Francis
Mentor: David Lyon

This study aims to determine a mechanism through which symptoms of Autism Spectrum Disorder (ASD) arise. Occurring in about 1.5% of the population, ASD very often affects an individual’s ability to integrate local and global visual details. Of the circuits that could potentially affect visual integration, feedback connectivity to primary visual cortex (V1) was chosen as the target mechanism of this investigation. A modified rabies virus was used to trace feedback connectivity to V1 in wild-type mice and a MeCP2-null mouse model of human Rett Syndrome (ASD associated disorder); the levels of feedback were compared. Although overall feedback connectivity to V1 did not differ between the strains, there was less feedback connectivity to V1 from areas lateral to V1 and more feedback from areas medial to V1 in the MeCP2-null mice. Although the levels of lateral and medial feedback were significantly different between MeCP2-null and wild-type populations, suggestions are made for further investigation which might validate that these pathways serve as the mechanisms through which underperformances in visual integration may arise.

Chicano/a and Latino/a UC Students’ Mental Health between the Years 2000–2014: Acknowledging the Effects of Everyday Life
Mayra Franco
Mentor: Ana Rosas

In this article, I present a study that focused on the views and practices revolving mental health and the coping of stress by Chicano/Latino undergraduate students at the University of California Irvine. Twenty-five self-identified Chicano(a) and Latina(o) undergraduate students participated (nine men and 16 women). Twenty students completed a survey/questionnaire and five students took part in an informal conversation. The purpose of the survey/questionnaires and informal conversations was to understand: (a) key life points that cause the most stress; (b) views of mental health and how they have seen it in their own lives; and (c) what activities they are participating in to relieve stress. Participants reported that they do not think about mental health, but they revealed to be active in taking care of their mental well-being. Talking to specific people and doing some kind of exercise were the most common responses when asked about what they do to relieve stress. The most
interesting finding was that participants felt that support groups (the people they talked to) were an important part of feeling healthy; however, these support groups identified by the participants also worked as stressors. This research should be used to increase exposure on the importance of the effects of support groups on Chicano/a and Latina/o students and of mental health research.

Undocumented Latina/o Students’ Perspectives on Mentorship: A Psychosociocultural Perspective

Veronica Franco

Mentor: Jeanett Castellanos

Latina/o undocumented students are a growing group in U.S. colleges and universities. Although the group is accessing higher education and showing progress, they report experiencing alienation, marginalization, and low student satisfaction. The purpose of this study was to understand the role of mentorship and its influence on Latina/o undocumented students’ persistence. Using the psychosociocultural framework and implementing a qualitative design, eight undocumented Latina/o students were interviewed. Specifically, topics on motivation, perseverance, resources, mentorship roles and culture competency were examined in 45–80 minute interviews. Findings show that mentorship is a critical element to academic persistence in creating opportunities. Empathy and advocacy were key components to the reported mentorship dyads. Practical and research implications in working with Latina/o undocumented students are provided.

African Migration into Europe: The Impact of the 2008 Spanish Economic Crisis on Spanish, European Union, and Moroccan Migration Policies and African Migrant Experiences

Christopher Galeano

Mentor: Caesar Sereseres

Spain’s geographical proximity within the European Union (EU) makes the country a gateway to Europe for many migrants. Subsequently, from 2000–2008 Spain’s economic boom saw the immigrant population grow 69%, and attract regular and irregular African migration flows leading to a 161% growth of the African immigrant population, especially from Morocco. However, Spain’s 2008 economic crisis negatively impacted the flow of African migrants. Today, this has led to three questions: (1) what impact has the economic crisis had on the traditional routes Africans use to arrive to Spain, (2) what are the relationships and policies between Spain, the EU, and Morocco like today, and (3) how have these relationships and policies affected the African migrant experience? Analyses of field research I did in Spain and Morocco, and of various international databases on migrant statistics reveal: (1) African migrants continue to use the Western Mediterranean route to reach Spain, (2) Spain and Morocco are now both receiving and transit countries for African migrants, which have created two separate experiences for North African and Sub-Saharan African migrants, and (3) increased border maritime enforcement efforts, repatriation agreements and African investment programs to control migration to Spain, the EU, and Morocco have led to cooperation and conflict between these three actors negatively impacting African migrant experiences, especially for Sub-Saharan African migrants.

The Role of Netrin-Mediated Receptor Signaling in the Developing Visual System of Vertebrates

Anthony Gallegos

Mentor: Susana Cohen-Cory

The goal of this study is to explore the roles of Netrin-mediated signaling in the organization and wiring of developing neurons in the visual system. We use Xenopus laevis tadpoles as a vertebrate model in conjunction with a single-cell electroporation technique that allows us to introduce either morpholino antisense oligonucleotides or DNA plasmids into a single cell body in the midbrain to manipulate expression of Netrin receptors such as Down Syndrome Cell-Adhesion Molecules (DSCAM), DCC, and UNC5. To further our understanding of how interactions between Netrin and its receptors guide visual system neural development we used confocal and two-photon fluorescent microscopy for spatiotemporal analysis of neurons. Our results indicate that UNC5 and DCC signaling act cell autonomously to influence development of central visual neurons.

Dual Energy Mammography used to Analyze Breast Density to Indicate Breast Cancer Risk and Tumor Formation

Priyanka Ganesh

Mentors: Huanjun Ding, Sabee Molloi

Breast cancer remains a great challenge in its early and reliable detection using current imaging techniques. Mammography remains the only breast screening modality that has been shown to reduce the breast cancer mortality. Breast density, which is defined as the percentage of glandular tissue over the whole breast, has been shown to be an independent risk factor of breast cancer. High mammographic density also reduces the sensitivity of lesion detection in screening mammography. In current clinical setting, breast density is rated using the semi-quantitative BI-RADS system, which suffers greatly from inter- and intra-observer variations. Dual energy (DE) mammography has been proposed as a technique for accurate measurement of breast density. In this study, patients were recruited from the breast screening program at the UCI medical center. Approval of the institutional review board and the
Radiation Use Committee and written informed consent were obtained for this HIPAA-compliant study. DE mammography was performed on both breasts. Glandular and adipose equivalent phantoms of uniform thickness were used to calibrate a (DE) basis decomposition algorithm. DE decomposition was applied after scatter correction to calculate breast density. Right-left correlation was used to evaluate the precision of the technique. We obtained a strong correlation between the left and right breast densities among individual patients. Breast densities obtained from dual energy mammography were also compared to that from breast MRI, thus obtaining good correlation between the two. The results suggest that DE mammography can provide accurate breast density measurements in a simple and cost-efficient manner.

Can One Man Make a Difference? The Life and Career of Ernesto Galarza
Jasmin Garcia
Mentor: Ana Rosas

Ethnic identity and national origin was important to agricultural workers in California during the 1950s, which created a lot of tension in rural communities. This paper examines the life and career of Ernesto Galarza, a writer and activist among ethnic Mexican, Mexican and other agricultural laborers in California. Based on the Galarza’s own writing I argue that Galarza’s advocacy among agricultural workers was revolutionary and inclusive because of the methods he used to challenge arbitrary dichotomies between recent immigrants from Mexico and people of Mexican heritage who had been resident in the US for a significant period of time. Such intra-ethnic conflicts along with inter-ethnic conflicts destabilized agricultural communities; Galarza actively sought alternatives. This paper also demonstrates how Galarza was able to bring awareness to the difficult working conditions all agricultural workers faced and his efforts to bring about change.

The Double Headed Eagle: Alexander II as a Conservative and Liberal Reformer
Peter García
Mentor: Lora Mjolsness

Alexander II took the throne after Nicholas I's unexpected death. Not only did Alexander inherit the throne, he inherited a failing state that was losing a one-sided war. Seeing that Russia could no longer progress as a power, never mind a European power, in its current state, Alexander sought to fix the state with a round of reforms. The reforms were liberal to an extent, such as the numerous judicial reforms that were enacted, but Alexander was wary about how the public would see these reforms. Alexander had to tread lightly around the nobility, his main supporters, to avoid giving the impression that their powers were in danger. At the same time, he had to please the vast peasant and serf populations that were living in terrible conditions, giving them reason not to revolt against the autocracy. Alexander himself was a conservative figure, and he refused to legislate anything that hinted at democratization and made it clear that he still had the final word in government. This resulted in a delicate balancing act that Alexander had to successfully perform, but did not. I will argue that his reforms, save for the judicial reforms, were unsuccessful as a result of balancing two opposite beliefs and that these incomplete and failed reforms paved way for revolutionaries against the autocracy to revolt and eventually, assassinate the Tsar Liberator.

Fathers and Children with Autism: Is the Severity of ASD Symptoms Associated with Emotional Co-Regulation during Play?
Christina Garibay
Mentors: Wendy Goldberg, Yuqing Guo

Autism spectrum disorder (ASD) is a neurodevelopmental disability that remains a major public health concern. Individuals with ASD typically display deficits in social interaction, verbal and nonverbal communication, and behavior. During early development, regulating emotional impulses serves a critical function in establishing social-interaction skills. The current study examines the associations between the severity of autism symptoms measured by the Autism Diagnostic Observation Schedule-2 (ADOS-2) and the dynamic of how fathers and children with ASD co-regulate emotional engagement. Previously, 92 families were observed and videotaped in a semi-structured play session in the home. Of those 92 cases, 60 children (72% male) had been clinically diagnosed with ASD. Father and child interaction was filmed for 10 minutes during the Three Boxes semi-structured play procedure. An original coding scheme was created by the research team to evaluate positive, negative, and disengaged interactions between each father and child. Fathers and children were coded independently by reliable, trained raters. Observed behavior was coded in 5-second intervals using Mangold International’s INTERACT 9.47 software. Each child’s severity symptoms were assessed using the Autism Diagnostic Observation Schedule (ADOS-2). Coding has been completed on all father and child videos. Results are forthcoming that will compare symptoms severity with father-child emotion regulation.
Recombinant Monoclonal Antibody Production using an Optimized HEK293T Cell System  
Juan Garibay  
Mentors: Charles Glabe, Jorge Mauricio Reyes Ruiz

Immunostaining is one of the most common laboratory techniques in research laboratories and requires a constant supply of antibodies. Although generic antibodies for the most common proteins are available in the market, the study of unconventional proteins requires labs to develop their own antibody production system. Hybridoma cultures are among the more common choices for antibody production systems, but their excessive consumption of materials and time render them costly to maintain. As such, this project aimed to develop a more cost-effective alternative to hybridoma cultures. We produced monoclonal antibodies by transfecting human embryonic kidney cells (HEK293T) with an Epitomics-derived plasmid containing the sequences for the light and heavy chains of the antibody. When compared to media from hybridoma cultures of the same antibody, the media from transfected HEK293T cells contained a similar level of antibody concentration than the hybridoma media. Therefore, we determined that the HEK293T transfection procedure is a more feasible antibody production procedure than the hybridoma cultures as the HEK293T require less media and less complex culture environments. If the transfection can be adapted to a suspended cell system, the lab should expect a much higher production rate of antibodies, perhaps high enough for commercial distribution.

The Difference in Rape Myth Acceptance among Latina and White Undergraduate Students  
Laura-Elena Garza  
Mentor: Francesca Polletta

The number of sexual assaults on college campuses is alarming; however, a large number of acts of sexual violence go unreported. Latina women are less likely than white women to report a sexual assault. Studies have shown that belief in rape myths and victim-blaming reduce the likelihood of victims reporting the crimes to authorities. The purpose of this study is to investigate: (1) whether Latina undergraduate students are more likely than White students to accept rape myths; and (2) if so, why that is the case. Survey data revealed that Latina women accepted rape myths at higher rates than White women. Focus groups made up of Latina undergraduates and White undergraduates were conducted in order to probe these differences.

Likelihood of Voter Turnout among First and Second Generation Pacific Islander Immigrants: Education, Gender, Citizenship Acquisition  
Savenaca Gasaiwai  
Mentor: Caesar Sereseres

According to the census data that was released in 2012, the U.S. population is 317 million. Out of this 317 million, 14 million are immigrants and more than half of the immigrant population is female. First and second generation immigrants differ significantly in terms of voter turnout in the U.S. This study will be investigating how the three factors—education, gender, and citizenship acquisition—influence the likelihood of voter turnout among first and second generation immigrants. Education is perceived to be the strongest predictor of voter turnout based on the literature. In this overall assessment of first and second generation immigrants, this study will specifically evaluate the likelihood of voter turnout among first and second generation Pacific Islander immigrants living here in California. It will be based on existing, comparative analysis on other racial groups and assessing where Pacific Islanders (PI) will most likely fall under in terms of voter turnout. The current aggregated data under Asian and Pacific Islanders (API) conceal the latent disparities that exist among and between groups in this blanket categorization of APIs. Additionally, in the absence of reliable, disaggregated data, the study will only reflect the existing efforts that have been undertaken to separate the data based on the three independent variables in the demographics report for Native Hawaiian and Pacific Islanders.

Analysis of Growth and Invasiveness of Heterogeneous Glioblastoma Cell Types in Response to Irradiation  
Alexander Gau  
Mentor: Yi-Hong Zhou

Glioblastoma multiforme’s (GBM) resistant nature to irradiation and chemotherapy treatment may be related to its heterogeneous composition of cell subpopulations. These subpopulations consist of neural stem-like cells (NSLC), which are especially resistant to chemotherapy and irradiation treatments, tumor mass cells (TMC), and endothelial-like tumor cells (ELTC) that integrate into the endothelium and enhance tumor vascularization. In this study, primary cultures enriched with these cell subpopulations were established from five GBM clinical specimens, which were used to study their radiation sensitivities and the effect of radiation on the pro-invasion molecule MMP2. Trypan blue staining was used to determine survival rates to irradiation treatment. Zymography was used to determine levels of MMP2 activity; ImageJ was used to perform densitometry of the
zymography results. We found that the subpopulations had different survival rates to irradiation and that in 9 of 14 lines under study, there was an increase in levels of MMP2 after irradiation treatment. The levels of MMP2 suggest invasiveness of the tumor cells through their ability to degrade matrix and will be further investigated in future experiments.

Examining Pattern Separation and Memory Performance in Aging Adults
Jessica German
Mentor: Craig Stark

The objective of the research was to investigate whether age-related memory deficits are linked to the reduction in a computational process known as pattern separation, which is the ability to distinguish among similar experiences. Previous research from our lab has demonstrated a relationship between age-related hippocampal dysfunction and impaired behavioral pattern separation performance. In the Behavioral Pattern Separation Task, we present items for study and later test with identical items, similar lures, and new items. We hypothesized that a change in the test format might demonstrate a rescue of the age-related pattern separation impairment when two similar items were presented simultaneously, allowing for a clean retrieval of the original study item. To our surprise, older adults were impaired on this test format. From these data, we can conclude that the age-related impairment in behavioral pattern separation is similar when assessed by “old”/ “similar”/ “new” judgments of individual items and forced choice tests where similar items are presented simultaneously.

Anatomy of a Fireteam: Social Connections and Looking for Groups in Destiny
Jordan Glenn
Mentor: Tom Boellstorff

As video games rise in popularity, the study of online interactions within these games becomes increasingly important in understanding sociality in digital spaces. Destiny, a Massively Multiplayer Online Video Game, allows for very little communication with others who are not in the same group, or “fireteam.” Yet players have taken matters into their own hands by establishing websites dedicated to “Looking for Groups” (LFG for short). On these sites, players can post statistics about their character and what mission they are looking to play with. In a short amount of time, players find one another and begin playing together within Destiny, often using chat headsets to talk to interact. My aim for this study is to uncover player feelings towards these LFG sites, and how they feel LFG sites play into the larger social experience of Destiny. My goal with this is to see how these LFG sites function as “paratext,” or outside media that gives meaning and additional value to the main work, and whether this paratext is seen as essential to enjoyable social gameplay. My survey, which asked questions regarding age, play habits, and the frequency of LFG use has received nearly 70 responses. Currently, I am in the process of conducting interviews. This is an important field of study, because as online games become even more connected, it is important to understand the ways in which players form social bonds with one another.

The Implementation of Jumpstart in the Santa Ana Unified School District
Karen Godinez
Mentor: George Farkas

For more than two decades, the program Jumpstart has served low-income communities in the United States. Jumpstart is a non-profit organization that helps prekindergarten students prepare for kindergarten with the assistance of trained college students and community Corps members. Jumpstart’s mission is to help prekindergarten students acquire social, language, and literacy skills needed for an easy transition to kindergarten. This early preparation is intended to guide students down a successful academic path with the hope of closing achievement gap. In this article, the study focuses on the Jumpstart site located in Santa Ana, CA which partners with the University of California, Irvine. The goal of the study is to analyze Jumpstart’s impact in prekindergarten classrooms in Santa Ana through ethnographic interviews of Jumpstart teachers and yearly data collected through the program. A second component of the study is to analyze if there is a correlation between elementary school’s demographics and their participation in the program measured through the selected independent variables: school’s percent Hispanic, school’s percent socioeconomic disadvantaged, school’s percent English learners, and the school’s CST test scores. The findings within the study show that Jumpstart indeed contributes to the student’s preparation for kindergarten. By understanding the effect Jumpstart has within Santa Ana schools, students who are in danger of failing in their early school years can continue to be assisted before the learning gap increases.

Prevalence of Enamel Demineralization: A Screening Study using Clinical and Imaging Tools
Afarin Golabgir Anbarani
Mentor: Petra Wilder-Smith

If detected early, enamel demineralization can be reversed using simple remineralization techniques. However, most dental decay is detected at a more advanced stage, when the pathology is no longer
reversible so that caries excision and structural replacement become necessary. Conventional visual exam often overlooks incipient decay, and probing can damage the fragile demineralized enamel surface. The International Caries Detection and Assessment System (ICDAS) screening technique reportedly has greater sensitivity, but is complex and laborious. An effective screening tool is urgently needed to allow the implementation of validated prevention interventions. The goal of this study was to identify the prevalence of incipient enamel decay in patients attending a public dental hygiene clinic using conventional clinical exam, the ICDAS-II and a novel autofluorescence-based device. In each patient, visible decay/demineralization in all bicuspid and molar occlusal surfaces was scored (0–6, with 1–2 representing early decay). Finally, a novel prototype caries detection device with polarized reflectance and blue autofluorescence imaging capabilities was used on all bicuspid and molar occlusal surfaces to map decay/demineralization using prescribed cut-off points. Sixty-one percent of subjects were diagnosed with early decay using conventional clinical exam. Prevalence measured 70% using ICDAS diagnostic techniques (stage 1–2), and 68% using autofluorescence, with 91% agreement between ICDAS and AF diagnosis. A polarized reflectance/autofluorescence-based imaging approach may provide an inexpensive, effective and simple means of screening for early decay, providing a much-needed basis for improved prevention interventions in dental public health.

The Action of Rhodiola rosea on Drosophila melanogaster Lifespan and Cyclic AMP Levels
Rupal Golakia
Mentor: Mahtab Jafari

Rhodiola rosea, also known as the golden root, has been found to have life extending, immune enhancing, anti-aging, and anti-cancer properties. Studies show that Rhodiola rosea plays a role in increasing lifespan in adult Drosophila flies without negative physiological side effects. However, the mechanism through which Rhodiola rosea acts to increase lifespan remains unknown. Previous studies show that up-regulation of cyclic AMP and modulation of the PKA pathway increases fruit fly lifespan. Flies with elevated cyclic AMP levels showed greater longevity, and exhibited increased reproductive fitness, reduced ROS production, and increased resistance to heat and oxidative stress. Thus, it is hypothesized that Rhodiola rosea may work to increase lifespan by increasing levels of cyclic AMP. A lifespan experiment using Rhodiola rosea and cyclic AMP supplementation with the w118 Drosophila melanogaster fruity fly model was completed. Results from the lifespan experiment showed that supplementation with dibutyryl cyclic AMP had no effect on male or female Drosophila lifespan. However, an additive increase in lifespan was seen when supplementation of cyclic AMP was combined with Rhodiola rosea for males, and a toxicity seen in female Drosophila. It is possible that Rhodiola rosea and cyclic AMP may be working synergistically to increase male Drosophila lifespan by elevating cyclic AMP levels, while female cyclic AMP levels may be maxed out to begin with resulting in the toxic effect with cyclic AMP supplementation. However, further experimentation involving measurements of cyclic AMP levels in Drosophila would be necessary to confirm this.

“Origins of Medical Exclusions”: An Analysis of Birthplace Countries of Sanctioned Physicians by the Federal Government in the United States
Sabina Goldstein
Mentor: Paul Jesilow

This study examines the birthplaces of physicians who were excluded by the Office of Inspector General (OIG) from federal healthcare program from 2008 to 2013. Previous demographic studies of sanctioned physicians did not consider the physician’s place of birth. Birthplace information was largely collected from the American Medical Association (AMA) Physician Masterfile. The AMA Physician Masterfile compiles demographic information on United States physicians. The Masterfile, however, does not contain all birthplace information. We were able to obtain additional birthplace information through a variety of publicly available data sources, such as ancestry.com, Newsbank, and newspaper articles. The birthplace of all excluded physicians could not be located. There are some initial findings from the research. Physicians who are not born in the United States are disproportionately removed from participation in federal healthcare programs. Physicians who are born in the U.S. are underrepresented on the list of exclusions. There are a number of possible explanations for these findings.

Incorporating the DACAmented: Material Benefits of DACA and Recipients’ Sense of Belonging and American-ness
Rosemary Gomez
Mentor: Laura Enriquez

Deferred Action for Childhood Arrivals (DACA) is an administrative relief action taken by the president in June 2012. The program grants eligible young adults a renewable two-year protection from deportation and permission to work. Recent studies on the impact of DACA find recipients experienced an increased social
Linguistic Analysis of Pride Expressions
Nicholas Green
Mentor: Belinda Campos

Recent work examining the nature of pride has revealed that pride has two distinct variants: positive pride, and hubristic pride. Positive pride refers to a sense of satisfaction from a personal or collective achievement. Hubristic pride however, aligns more with boastfulness and is associated with feeling accomplishment specifically by outdoing others. The proposed study sought to explore potential differences in language used in positive pride expressions versus hubristic pride expressions. Statements of hubristic pride were hypothesized to show a higher occurrence of words used to express dominance, “you” directed statements, and greater semantic complexity, where as higher usage of socially connecting words and “I” directed statements were thought to come from positive pride statements. Data for our analyses came from a study performed in spring 2014 where students at the University of California, Irvine (n=144) related on video a time of intense pride either to a loved one (positive pride), a competitor (hubristic pride), a stranger (control), or no one (control). These interviews were then transcribed and analyzed using the Linguistic Inquiry and Word Count software. Consistent with our hypotheses, those in the competitor condition (M=3.08, SD=2.69) used a higher proportion of the “you” pronoun compared to the loved one condition (M=2.02, SD=1.68). Those in the loved one condition (M=11.53, SD=2.59) used a smaller proportion of words six letters or more than the no context condition (M=13.19, SD=2.81), though this relationship was only marginally significant.

Human Trafficking Law Enforcement Training Operationalizing the Trafficked
Matthew Guevara
Mentor: Valerie Jenness

Anti-human trafficking discourse is a developing field academically and in action. The focus of this study is to determine how law enforcement perceives human trafficking participants in formal writings. Trafficked bodies are often described in terms of victim and/or criminal and this distinction is crucial for the successful policing of human trafficking. Committed law enforcement training programs are a primary way a law enforcement agency’s mission is conveyed in hoping to ensure an officer’s compliance and enhancement of performance. At this point, agency level policies are not widespread and locally focused training programs provide an empirical window into how agencies operationalize human trafficking discourse. Specifically, the goal of this paper is to examine how human trafficking training programs understood and oriented trafficked individuals to the law enforcement. Training programs conflate victim and criminal definitions and rarely create a clear distinction between the two labels placed on trafficked individuals. Most training manuals solely use the term victim but do not place direct effort to victimize the individual away from the inherent criminal label Officers place on these individuals.

Racial Microaggressions and Well Being among UC Irvine Students of Mexican Heritage
Edward Gutierrez
Mentor: Jeanett Castellanos

Previous literature has examined the phenomena of racial ethnic minorities and microaggressions but limited research has examined the phenomena with Latina/os. Examining the literature in higher education, some researchers have directly addressed the impact of role of racial micro-aggressions on Latina/o undergraduates but no research has pursued understanding the deep-structured processes of these experiences on Mexican American college students’ and their well-being. Incorporating the psychosociocultural theoretical framework, this study examines the unique and collective influence of psychological, social, and cultural variables that are beneficial for undergraduates of Mexican heritage in the university environment. Through a qualitative design, 16 undergraduate upperclassmen (eight females and eight males) of Mexican heritage were interviewed. Results included common themes amongst the sample. For both groups, the role of family support, peer support, and community influence helped to buffer the racial micro-aggressions.
and maintain their well-being. By sex, both groups reported different processes (self motivation vs. self-efficacy; peer roles vs. peer support) to navigate racial micro-aggressions and preserve their well-being. Findings provide insight for research and practice.

Detection of Soluble Cancer Biomarkers using Nanoparticles
Robert Gutierrez
Mentor: Jered Haun
Molecular diagnostics can decipher the dynamics and heterogeneity of cancerous cells, including well needed single cell characteristics. One area that needs further investigation to reach single cell capabilities is secreted products. Current methods used to identify secreted soluble proteins, such as immunofluorescence (i.e. ELISA) and flow cytometry, are unable to detect products while still inside the cells, so there is no time-based information available. Also, ELISA does have high detection sensitivity, but lacks the spatial resolution needed for single cells. To improve detection sensitivity, we have used a powerful bioorthogonal cycloaddition chemistry between tetrazine (Tz) and trans-cyclooctene (TCO) that connects luminescent quantum dots (QDs) with antibodies. We hypothesize that the combination of the bioorthogonal nanosensor amplification will increase detection sensitivity of soluble products. To do so, bioorthogonally modified detection antibodies with affinity for Tumor Necrosis Factor alpha (TNF-α) soluble protein were tested, where first the TNF-α protein at different concentrations was targeted by the detection antibody panel and subsequently the quantum dots were allowed to react. The measured fluorescence intensity was compared to the concentration of TNF-α in the sample—this bioorthogonal method was almost able to achieve ELISA detection sensitivity, but added the spatial resolution that standard ELISA format lacks. Future work consists of determining through microscopy the TNF-α levels expressed by stimulated immune cells in microwells. We expect detection sensitivity to improve due to the advantages of QDs and their clustering effect.