**Abstracts**

**Cigarette smoke from conventional and harm reduction cigarettes inhibits proliferation of neural stem cells**

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*Mentor:* Prue Talbot  
Department of Cell biology and Neuroscience

Cigarette smoke, a mixture of over 7,000 chemicals, can affect development of the nervous system prenatally, which can produce cognitive problems in children after birth. The purposes of this study were to determine if chemicals in mainstream (MS) and side-stream (SS) cigarette smoke adversely affect proliferation of neural stem cells, which could explain the effects observed in humans, and to compare the potency of smoke from harm reduction vs. conventional cigarettes. Mouse neural stem cells (mNSC, clone C17.2, generously provided by Dr. Evan Snyder) were incubated in MS (smoke actively inhaled by the smoker) and SS (smoke burning off of the tip of a cigarette) smoke solutions from Marlboro Red, Marlboro Light, and Quest cigarettes. The cells were incubated in different concentrations of smoke solution (range = 0.001, 0.01 and 0.1 puff equivalents) for 48 hours at 37°C, 5% CO₂, and 95% relative humidity in a BioStation CT, and images of multiple fields were taken every 4 hours. The time-lapse videos were then analyzed using confluency recipes (which measures cell proliferation) created using the CL-Quant software. The results show inhibition of proliferation for most treatments, with SS smoke being more potent than MS smoke. The results also show that smoke from a “harm reduction” brand (Marlboro light) was a more potent inhibitor of proliferation than smoke from a conventional brand (Marlboro red). These data support the idea that cognitive deficiencies that appear after birth in humans could be caused by prenatal cigarette smoke exposure leading to decreased proliferation of NSC.

**A Venture Into Literary Translation: Guy de Maupassant from French to English**

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From theories posited by Walter Benjamin to scholarly work contributed by authors such as Douglas R. Hofstadter, much has been said on the theories and practice of literary translation. Can poetry be translated? Is a translator truly a traitor as in the expression “traduttore, traditore”? Should the reader feel the voice of the translator of a literary work and, if so, in what way and to what extent? To begin to find answers to these questions, I researched the works of authors such as Benjamin and Hofstadter as well as that of others and, in order to cultivate my own experience as a translator of literature from French to English, I selected three short stories by renowned author Guy de Maupassant. I elected to translate stories by this author in particular because of his range of subject matter. To illustrate this diversity, I chose stories whose storylines differ from one to the next: “Le Horla” is in the form of journal entries written by a man being overtaken by what he assumes is the next master race; “Le Signe” is a comedic tale of an honest woman turned prostitute by accident; and “L’Auberge” shows one man’s unraveling when faced with utter solitude. Each of these stories presented its own obstacles when the time came to translate them. I will present a detailed account of my experience with the process of translation, including preparation and reasons for the particular choices I made, as well as challenges I encountered during the process.
Phylogenetic Supermatrix of Carnivora

Joseph Antonios, Biological Sciences
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The mammalian order Carnivora is an ecologically diverse group of taxa which is divided into two lineages consisting of over 300 species: Caniformia (e.g. bears, pandas, domestic dogs, seals, walruses) and Feliformia (e.g. tigers, domestic cats, hyenas, mongooses). Carnivorans are found in both marine and terrestrial environments and occur on all continents. Previous studies have focused on individual groups or higher level relationships, but none have created a supermatrix consisting of all extant species. To address this deficiency, we data mined National Center for Biotechnology Information (NCBI) for three major protein coding mitochondrial genes (cytochrome b, NADH dehydrogenase subunit 2, cytochrome oxidase 1). This resulted in a data set which consisted of over eighty percent of all extant Carnivora species. The aligned data matrix was analyzed using maximum likelihood and maximum parsimony methods. The resultant molecular phylogeny is the largest and most comprehensive phylogeny of Carnivora. The results demonstrate that there are both similarities and differences in comparison to previous nuclear and mitochondrial phylogenetic studies.

Three-month-old infants’ perception of gender and race

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Gender and race are among the first things adults perceive when encountering a new face, both also discernible to infants in their first year of life. Interestingly, previous research shows that gender and race are combinatorial social categories such that adults’ perception of race influences their perception of gender. This could be explained by top-down process (overlapping stereotypes between specific gender and race) and/or bottom-up process (similarities in perceptual features of faces). This study investigates if the bottom-up process is a viable explanation by testing young infants’ perception of faces that vary in gender and race. 3 month-old infants (N=24) were presented with side-by-side displays of computer-generated faces systematically manipulated in race (Asian, Caucasian and African America) and gender (female, male and androgynous). We hypothesize this study will demonstrate how young infants perceive gender and race in faces and provide evidence for whether or not the bottom-up process is indeed responsible for the combinatorial relationship of gender and race.

Mental rotation in infants

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Mental rotation (MR) refers to the ability to rotate mental representations of 2-D and 3-D objects into different spatial orientations. This ability plays a crucial role in every-day activities such as object recognition and navigation. Previous research found that adult males perform better than adult females on MR tasks. Recent research with infants is consistent with this finding, with males outperforming females (Moore & Johnson, 2008). However, little is known about the development of this perceptual-cognitive skill and what may contribute to such sex differences so early in infancy. We will test two hypotheses: (1) that MR ability is related to infants’ experience manipulating objects and seeing them from multiple views over time, and (2) that sex differences in infants’ MR ability may be due to differences in testosterone levels, as has been shown with adults (Kempel et al., 2005). The results of this study are pertinent to learning more about the development of this vital perceptual skill.
Investigating the Sublimation Rate of a Potential HIV Microcide Delivery Vehicle in a Controlled Convection-Diffusion Environment
(Cancelled)
Nidhanjali Bansal, Bioengineering
Contributor: Prashanthi Vandrangi, Bioengineering
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Department of Bioengineering
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In our work, we analyze the transport characteristics of a novel device for continuous, zeroth-order delivery of an HIV microcide. The device drug transport is primarily dictated by the sublimation rate of pellets composed of hexa-methyl-cyclo-tri-siloxane (HMCTS). A Stefan tube mass transfer chamber with an inner diameter of 5mm is designed to host the 5mm x 15mm cylindrical HMCTS pellets to delineate the actual sublimation rate from the apparent rate of sublimation due to various mass transfer conditions. To model the normal human body temperature, the chamber is jacketed in a water bath which is constantly stirred, monitored, and maintained at a temperature of 37°C. To facilitate controlled convection, the inlet pressure of the air passed across the top of the chamber is digitally monitored. The pellet is carefully positioned to ensure that only the top surface, tangential to the airflow, is exposed. At regular time intervals, the weight of the pellet is measured and the effective rate of sublimation is estimated. We quantify the observed rate of sublimation of the HMCTS pellet and correlate it to the release rate of the HIV microcode. The results of this work will provide important specifications for effective drug loading and in-vivo dosing intervals.

Bernini and France: Arts and Politics in Seventeenth-Century Europe
Ramona Isabel Bartolome, Art History
Mentors: Kristoffer Neville, Malcolm Baker
Department of Art History

Gianlorenzo Bernini’s journey to France in 1665 has been perceived throughout history in varying ways. While it can easily be written off as one of Bernini’s rare failures, the circumstances of his visit suggest that this was more than the artistic visit that it claims to be. This paper seeks to show Bernini’s presence in France as having political implications, and to ascertain Bernini’s role as Pope Alexander VII’s reluctant diplomat. In understanding the origins of Bernini’s biographies, re-evaluating the role that Michelangelo Buonarroti plays in these biographies, and seeking out the great similarities between Peter Paul Rubens and Bernini, this paper has established Bernini as successor of the legacies of both Michelangelo and Rubens. In addition to being an artist, Rubens also played the role of a diplomat later in his life. With Rubens as a model for Bernini, Bernini’s role as a diplomat in France becomes much more likely and completely re-directs the readings of two primary sources that documented the trip: Paul Fréart de Chantelou’s Diary of the Cavaliere Bernini’s Visit to France and Charles Perrault’s Mémoires de ma vie. What is revealed is a much more complicated situation in France, where Bernini is intentionally mislead and kept from Rome. He was both rejected and praised by Louis XIV and his ministers. This leads to the conclusion that Bernini, sent as a diplomat, was only caught in the struggle for political power between France and the Vatican.
“I Wish I had a Sylvia Plath”: Turning a Blind Eye to Plath’s Art as a Writer in Popular Culture

Lauren Benard, English  
Mentor: Steven Axelrod, Katherine Kinney  
Department: English

Since Sylvia Plath took her own life in 1963, contemporary musicians and popular television episodes have continued to devote specific allusions to her haunting suicide and her marital anguish. Beyond the sensationalist reports of popular culture’s infatuation with Plath’s displacement, prominent scholars such as: (Banita, Blatanis, Gilchrist, and Sullivan) agree that Plath’s tragic story still pervades throughout popular culture even after close to 40 years following her death. In most cases, the references to Plath in these manifestations of popular culture prominently address her dreadful form of death and unfavorable separation from her husband at the time (Ted Hughes) as the two pivotal focuses on her. Unfortunately, the escalated issue concerns the lack of regard to her as a brilliant writer resulting in her art being compromised. Based on the numerous references to Plath in popular culture, scholars have raised a number of key questions about the love affair between suicidal rhetoric and domestic tension which permeates throughout her reputation and draws the attention of the average audience. In this paper, I contend that Plath’s influence continues to pervade the imaginary of popular culture through coeval music and television, bridging a gap between high and low culture; however, this generation is enamored by the shallow aspects of her life and fail to recognize her for her genuine talent.

Islamic Architecture: Monumental Mosques in its Cultural Urban Context

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Department of History of Art  
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Department of Religious Studies

Islam’s influence on Muslim civilizations has often been charged with oversimplified generalizations attributed to rigidity, archaically conservative, nomadic cultures, and exclusively Arab featured in its representation. Islam’s outward diffusion, expansion, and contact beyond the Arab Heartland, produced cross-cultural, innovatively refined, customized versions of Islamic architecture, particularly towards the investment of monumental mosques. In every cultural and regional context, monumental mosque architecture goes through an adaptation process, and acts as a mediator that synthesizes the cross-functional relationship between the institutionalization of Islam, its beliefs and ritual practices, and site-specific geographic, environmental, and secular forces. This paper will present a comparative case study of two historic periods within the history of Islamic architecture using architectural, literary and historical texts. It will discuss two such cases: the Medieval Safavid Masjid-i-Shah, in Isfahan, Iran (1611-1638), as a prototype of the Islamic mosque refined by religion and the Persian culture; and the modern Putrajaya Mosque, Malaysia, (1997-1999), whereby traditional and Islamic nostalgia is re-represented towards a progressive pan-Islamic Malaysian identity in a post-modern eclectic style. The formation of concretely visible monumental mosques, its heritage, refinement and advancement in these two cases confirm the inclusive approach that weaves the practice of faith as a unified tradition to its corresponding representation of nation-state through a system of architectural symbols, furnishings and non-representational embellishments identified as “Islamic”. Both medieval Safavid Isfahan and post-modern Putrajaya, Malaysia aspiring to be futuristic models of their times explicitly challenge the inaccurate advertisement and perception of Islam as an exclusively dogmatic and backward-looking faith creating obstacles for human and societal progress.
**Extraversion and Neuroticism as Predictors of Paranormal Belief**

Andrea Bink, Psychology  
*Mentor:* Curt Burgess  
Department of Psychology

Believers in the paranormal often think they have control over circumstances beyond the scope of their ability. Steadfast in their beliefs and reinforced by social norms, they might ignore evidence contradicting this impression of control, leading them to misinterpret natural events as supernatural. Based on past research, the current study attempts to do this by examining the relationship between paranormal belief, and extraversion and neuroticism. Seventy-eight undergraduates were tested using the Big Five Personality Inventory and the Paranormal Belief Scale. It was hypothesized that neurotic, and especially introverted neurotic individuals would be more likely to believe in the paranormal than any other group. Findings confirmed that neurotic individuals are more likely to believe, however, it was extraverted neurotic individuals who were found to have a greater tendency to believe in the paranormal. This can be explained by the interaction of extraversion and neuroticism and how personality differentially motivates extraverts and neurotics.

**Understanding the Underrepresentation of Minorities in Higher Education**

Laura Canela, Anthropology  
*Mentors:* Yolanda Moses  
Department of Thomas Patterson  
Department of Anthropology

The underrepresentation of minorities in higher education has been addressed by various persons and groups form different fields and perspectives. While plenty of scholarly work has explored the issues of race, ethnicity and even gender play in this phenomenon, more attention has to be placed on class in addition to how race, ethnicity and class together work in affecting the number of minorities who attend and graduate from universities and colleges. Explaining the history of minorities in education and obstacles that have been faced by minorities can help us to better understand what obstacles minorities have overcome and may still endure in relation to education. In this paper I seek to understand why minorities are further underrepresented in the STEM (Science, Technology, Engineering and Mathematics) fields. While it is important to know what factors have not allowed for minorities to excel in these fields it is crucial to understand what factors have allowed minorities to succeed in the STEM fields. This paper will explore the history of minorities in higher education, minorities in the STEM fields and proposed solutions for the underrepresentation of minorities in such fields.

**Characterization of a putative malaria parasite DNA Methyltransferase**

Michael Cervantes, Biology  
*Mentor:* Karine Le Roch  
Department of Cell Biology and Neuroscience

Malaria is a major health issue in developing nations and causes more than one million deaths per year. The most lethal form of malaria is caused by *Plasmodium falciparum*, which is responsible for up to 90% of fatalities. Our lab focuses on the potential role that epigenetics has on the parasite’s physiology. DNA methylation is a crucial epigenetic modification that is involved in regulating many cellular processes such as controlling gene expression. This modification is catalyzed by DNA methyltransferases (DNMT’s), and our lab has recently discovered DNMT activity in *Plasmodium* where it has not been found before. Additionally, our lab identified *in silico* one single gene, PfDNMT-M7, as a putative DNMT. In order to experimentally verify if PfDNMT-M7 possesses DNMT capabilities, we are taking three molecular genetic approaches; an *in vitro* gene expression, a gene tagging and finally a gene knockout strategy. The expression experiment entails the cloning, *in vitro* expression, and purification of the PfDNMT-M7 gene as well as the DNMT domain. We then confirmed DNMT activity using a DNMT assay with the purified protein. In addition, the gene
tagging and knockout experiments will examine the localization of the putative enzyme, its interacting partners and whether or not PfDNMT-M7 is essential to the parasite infectious cycle. This work will increase our understanding of DNA methylation in *P. falciparum* and provide a potential novel drug target.

**Wal-Mart’s International Successes and Failures**

Lu Chen, Business Administration  
Linda Tong, Business Administration  
*Mentors*: Jorge Silva-Risso, Department of Marketing and Management  
Yunzeng Wang, Department of Finance and Management

Wal-Mart is one of the most highly respected retail chains in the world, especially in China, Brazil, India, the United Kingdom and the United States. However, Wal-Mart like other businesses has its own share of failures and successes. Japan, the third largest economy in the world, is Wal-Mart’s next global target to help expand the company’s international business. The acquisition of Seiyu Ltd. and implementation of Western style of management proved to be major setbacks for Wal-Mart. Evidences show that the Western style of management differ from the way the Japanese conduct their business practices. Wal-Mart had to redesign its strategic plans so that its business practices comply with the values and culture of the Japanese. This indicates that Wal-Mart will have to reevaluate and make any necessary changes to its supply chain, marketing and corporate management. At the same time, the data that we have gathered from the survey that we have conducted with the students, staff and faculty of the University of California, Riverside, is used to show that the needs and values of the Western consumers differ from the Japanese consumers. The data from the survey provides insight to the needs and expectations of the upcoming consumers in the next decade. Certain areas that Wal-Mart will need to focus on making changes will be enhancing customer service, management of the store, products and layout. All businesses including Wal-Mart needs to make necessary changes to its style of management in order to successfully adapt to its new market and win the approval and loyalty of its customers.

**California Mouse Pup Vocalizations and the Paternal Response**

Ravi Choudhuri, Neuroscience and Psychology  
*Mentors*: Khaleel Razak, Sarah Rotschafer, Department of Psychology

The California Mouse (*Peromyscus californicus*) provides scientists with an exciting avenue of research because unlike other species in which only the females care for their offspring, the California Mouse is bi-parental. Extensive research has been done on female parental behavior in response to pup stress signals, yet little research has been conducted on the paternal behavioral response. In this study, we elicited stress calls from California Mouse pups by isolating them from any parental contact, and recorded the pup vocalizations in sessions that lasted two minutes for three pups of the same age. Age groups ranged from one-day up to twenty-four days old. To determine which aspects of pup vocalizations that fathers respond to, we analyzed the pup vocalizations for various acoustic properties. The vocalizations were categorized as either a stacked harmonic calls or FM sweep calls. The acoustic properties analyzed in our research are the frequencies of the harmonics, call duration of both types of vocalizations, and the rate of calling in the various age groups. So far we have found that the rate of pup vocalization calls decreases as the pups get older.

**Determining the Role of CCR7 in the Context of Infiltrating T Cell Entry and Migration within the Brain**

Kristina Chu, Biology  
*Mentor*: Emma Wilson, Division of Biomedical Sciences

During acute *Toxoplasma gondii* infections, *T. gondii* rapidly proliferates and invades any nucleated cell. After the primary acute
infection, the lifelong chronic phase of infection in the central nervous system develops and leads to the formation of cysts. Studies have shown that during an acute *T. gondii* infection, CCR7 is required for protective immune responses and the presence of an infection-induced reticular network on which peripheral T cells migrate within the brain parenchyma. In this experiment, we want to test if CCR7 is required for T cell entry and migration in the brain. We harvested T cells from CD45.2 CCR7 -/ and CD45.2 wild type mice and transferred each into CD45.1 wild type mice. Since CD45 is a marker for T cells, we used CD45.2 and CD45.1 to keep track of the T cells that we have transferred. After the blood mononuclear cells from naïve and infected mice are harvested at different time intervals up to 8 weeks after parasitic infection, the blood mononuclear cells are analyzed by Immunohistochemistry and Flow Cytometry. The Immunohistochemistry analysis assesses where CCR7- T cells migrate by comparing the number of CCR7- T cells in the parenchyma and perivascular areas of the brain. The Flow Cytometric analysis compares the quantity and phenotype of T cell populations in the brain that are endogenous or transferred in the mouse. Through this experiment, we determine if T cell entry and migration within the *T. gondii* infected brain is CCR7 dependent.

**International Research Experience for Students: Manufacturing of Silicon Wafers**

Wei Dai, Electrical Engineering
Cody Lewis, Computer Science
Isaac Lomeli, Electrical Engineering
*Contributor:* Rosemblim Lugo.
*Mentor:* Albert Wang

Department of Electrical and Computer Engineering

We identified and developed the clean room procedures and methods necessary to reduce errors by creating a set of sample silicon wafers that was then tested to determine the success of the procedures and techniques used. The process to create the final wafers included procedures such as coating the wafer with lead zirconate titanate (PZT), heating by rapid thermal process, and wafer cleansing with boiling acid. Once the wafers were developed, and in order to ensure a successful final product, we tested the wafers by optical observation: by tracing the surface of the wafer, and by using software simulation packages. Once tested the wafers were laser cut and packaged by using a specialized ultrasonic soldering machine to produce a functional design. The ultrasonic soldering machine connected the pads of the silicon wafer to the printed circuit board (PCB) to allow for easy interaction with the device on a macroscopic scale. In order to ensure the success of the final product we used clean room procedures such as full body suits, the prohibition of foreign materials inside the lab, and controlled access to the lab. This process gave us the methodology necessary to develop a set of silicon wafer based products with minimal errors.

**Do third hand smoke chemicals adhere to tissue culture plastic?**

Barbara Davis, Biology
*Contributor:* Sabrina Lin
*Mentor:* Dr. Prue Talbot
Department of Cell biology and Neuroscience

As a preliminary step to studies on thirdhand smoke, the adhesive properties of nicotine and tobacco-specific nitrosamines on tissue culture plastic are being examined. The absorption spectrum of nicotine in water revealed a peak at 260λ. Standard curves for nicotine concentration were established by reading various concentrations of nicotine in water and in four types of cell culture media at 260λ using a BioMate 3S UV-Vis spectrophotometer. To determine if nicotine adheres to tissue culture plastic, a nicotine solution that is dose dependent based on the type of cell culture media that is used was placed in various plastic dishes and tubes that are used for cell culture. Some samples were incubated at 37°C in 95% relative humidity and a 5% CO₂ atmosphere, while others were frozen at -80°C. After 24 hours, absorbance was read in the BioMate spectrophotometer, and nicotine concentration was determined from the standard curves. The concentrations of nicotine recovered following incubation in water, n-Tera-2 medium, or mEF medium were not significantly different than the
starting concentrations, indicating that nicotine did not adhere to culture dishes in these media. Additional experiments are in progress to examine adhesion of other chemicals in thirdhand smoke to plastic. These data will be valuable in designing future experiments in which thirdhand smoke chemicals are evaluated in toxicological assays using cells.

Using a functional genomics approach to identify cell wall genes in the model fungus *Neurospora crassa*

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Department of Plant Pathology and Microbiology

Although there are numerous studies done on the *Neurospora crassa* genome, the phenotype of some of these genes is still unknown. Our study focused on the hyphal tip genes in *N. crassa* and we hypothesized that the genes highly expressed in the hyphal tip are involved in cell wall biosynthesis and maintenance based on previous studies. A more extensive catalog of cell wall genes can help in the development of antifungal medications since most current antifungals attack the cell wall or its biosynthetic pathways. The cell wall of *N. crassa* contains three major components: chitin, Beta-glucans and glycoproteins. The genes that encode for these components of the cell wall can be characterized by observing growth phenotypes of strains with the genes deleted. Here the goal is to phenotype knockout mutants of candidate genes in order to validate a cell wall related function. We performed assays focusing on the growth and development (sexual and asexual). The asexual assays examined the growth, morphology and aerial extension. The sexual development assays studied the various stages for defects in formation of sexual structures, successful completion of meiosis, and production of viable ascospores. Several mutants in the asexual assay showed significantly decreased growth as compared to the wild type *N. crassa* strain. Some of the mutant strains also showed sexual developmental defects (much like the known cell wall gene mutants). Hence we have a reason to believe our approach will identify new genes having a cell wall function.

**An Interaction Between Kinesin-II and Dynein-1b**

Kevin Durgun, Biology  
*Mentor:* Leah Haimo  
Department of Biology

Intraflagellar Transport (IFT) is the transport of materials into and out of flagella and is known to play an essential role in flagellar maintenance and construction. This transport is mediated by two different motor proteins, kinesin-II and dynein-1b, which carry cargo along the flagellar axoneme away from and towards the cell body, respectively. An important issue is the recycling of motor proteins that reach the end of their pathway. Current models suggest active kinesin carries inactive dynein to the flagellar tip by mutual binding to an IFT or cargo protein, where the dynein then becomes activated and the kinesin inactivated. Dynein is thought to carry the inactive kinesin back to the cell body. To test this model, a strain of *Chlamydomonas reinhardtii*, bioengineered such that one of the subunits of the motor kinesin-2 was tagged with HA, was grown up in biochemical quantities. After isolation of the motor proteins from flagella, samples were subjected to immunoprecipitation using an antibody that recognizes the HA-tagged kinesin-2. The prediction is that kinesin-2 motors would be immunoprecipitated along with other proteins that bind to kinesin-2. The samples were subjected to SDS-PAGE, followed by western blotting to identify the immunoprecipitated proteins. If an interaction exists between dynein-1b and kinesin-2, both of the kinesin-2 subunits and the dynein-1b subunits should be in the immunoprecipitate. Although preliminary data suggested that dynein indeed coimmunoprecipitated with kinesin, it is possible that the apparent binding is nonspecific. Additional studies are being undertaken to determine if these motors do interact.
Sustainable Parking: Fighting the War on Congestion

Spencer Fong, Global Studies  
Mentor: Christopher Staggs  
Department of Environment and Sustainability

The Unsustainable growth of personal car consumerism has lead to an overload on our road, freeway, and parking infrastructures. The result has been significant environmental destruction as well as severe societal setbacks where transportation congestion has invasively affected our quality of life. Despite efforts from automotive and transportation industries to use sustainable design to reduce the effects of traffic congestion, pollution, and fuel consumption, little innovation has been developed in the field of parking to solve these problems. The goal of this research project is to realize and illustrate the negative impacts that parking has on our transportation systems, and formulate innovations for parking lots and garages that will improve these issues without unnecessarily needing to pave more roads, freeways, or parking lots. After determining the aspects of parking design that possess the most potential to improve, I have developed five strategies which can be applied to any parking site or network today. These strategies present viable ways for societies to plan for a more sustainable transportation future by using emerging technologies and policies to motivate users to drive and park with much greater efficiency.

Permeability of Arid Soil Irrigated with Sulfur Burner Treatment

Shiyang Fu, Environment Toxicology  
Contributor: Julie Escalera  
Mentor: Christopher Amrhein  
Department of Environmental Sciences

Salinity and sodicity in agricultural soil is a major concern for crop producers. Salt accumulation is the result of poor quality irrigation in areas where evapotranspiration exceeds rainfall. Not only can excess salts lead to major decrease in agricultural production of crops, but can also contribute to soil degradation. Traditional methods used to displace sodium and improve soil quality are to apply gypsum and sulfuric acid. Sulfurous acid, added to irrigation water via sulfur burners is proposed as an alternative way to reclaim salt affected soils. We are currently evaluating sulfurous acid, sulfuric acid and gypsum treatments on soil from an Imperial Valley farm that has a high salt and sodium content. Four different water treatments will be used to compare the effectiveness of reclamation: a gypsum treatment, water with sulfuric acid, water with sulfurous acid, and a control of Colorado River water. The treatments will be applied to columns packed with 300 g of air dried 4.75 mm sieved soil. Columns will be treated with 100 mL of each treatment every other day. Leachate will be collected and hydraulic conductivity will be calculated with Darcy’s law. The leachate and soil will be analyzed for electrical conductivity, Exchangeable Sodium Ratio and Sodium Adsorption Ratio to determine the concentration of salts displaced from the soil. We will be comparing the effectiveness of each treatment by its ability to displace salt and the cost of each treatment. We propose that sulfurous acid will be both more effective and cheaper for agricultural producers for use in reclaiming saline and sodic soil.

Portrayal of Men and Women in Time Magazine Advertisements

Isabel Gallegos, Sociology  
Mentor: Tanya Nieri  
Department of Sociology

This study was designed to analyze how the portrayal of men and women in Time Magazine advertisements has changed in 60 years. The methods used in this analysis were based on Goffman’s framework for content analysis. Goffman’s (1979) coding schemes focused on the most subtle signs of behavior. In addition to using Goffman’s coding scheme (Relative Size, Function Ranking, Feminine Touch, Ritualisation of Subordination, and Licensed Withdrawal) Body Display, Movement, Location, and Objectification were also used. The results indicated that Body Display was not relevant in either 1950 or 2010. The Location of
women in advertisements has changed since the year 1950 with less women being portrayed at home in 2010. Overall, the results of this study show that there have been little changes since 1950, the most significant change has occurred in the products being advertised.

**Design and Synthesis of Novel Ligands**

Jorge Garcia, Neuroscience  
*Contributor:* Baback Bastin  
*Mentor:* Michael Marsella  
*Department of Chemistry*

Anandamide and Δ^1^THC are known to have an affinity for C_B1 and C_B2 receptors (C_B = cannabinoid receptor). Anandamide is an endogenous neurotransmitter and tetrahydrocannabinol (THC) is an exogenous ligand isolated from *Cannabis sativa*. C_B1 and C_B2 receptor ligands are currently being targeted as potential drugs in the treatment of a wide range of medical conditions such as neuropathic pain, nausea and vomiting related with cancer chemotherapy, and spasticity associated with multiple sclerosis. These characteristics bring promise for future medical treatment of Schizophrenia, Alzheimer's, and other CND disorders. This presentation will focus on the design of anandamide and tetrahydrocannabinol analogs as lead drug candidates. To date, first-generation analogs are synthesized from 1,3-dione-scaffolds and have shown activity in cells cultured from ALS patients (via UCLA Medical School). Latest efforts in the design and synthesis, as well as bioactivity, will be presented.

**Developing Compounds that are Resistant to Reduction by Biological Reducing Agents**

Jonathan Getscher, Neuroscience  
*Mentor:* Jack Eichler  
*Department of Chemistry*

Cisplatin is a commonly used anticancer drug that imparts tumor cell death by covalently binding to DNA, which disrupts DNA replication and normal cell functioning. Cisplatin, however, has several drawbacks; these include nephrotoxicity (kidney damage), adverse effects on normal tissues that undergo rapid cell division, and the development of resistant tumor cell lines. The affinity for DNA by gold(III) complexes is often lower than that found for cisplatin, and it has been found that gold(III) compounds cause tumor cell death due to the disruption of normal mitochondrial function. This is in fact a desirable outcome, since having a different mechanism of tumor cell death may allow gold(III) compounds to avoid some of the drawbacks of cisplatin, in particular having the ability to treat cisplatin-resistant tumors. Previous work in our lab has found that 5-coordinate gold(III) complexes with alkyl-substituted phenanthroline ligands are stable in biological reducing environments, and also cytotoxic against *in vitro* tumor cell lines. Current studies now aim to synthesize dinuclear gold(III) complexes with this 5-coordinate structure using the tetramethyl-TPPHZ ligand. The unsubstituted TPPHZ ligand and its corresponding gold(III) complex have been synthesized, and these results suggest the tetramethyl-TPPHZ gold(III) complex can be synthesized and subsequently tested for anticancer activity.

**Molecular Dynamic Analysis of a Short Polyalanine Helical Peptide**

Jose C Gomez, Bioengineering  
*Contributor:* Ronald D. Gorham Jr.  
*Mentor:* Dimitrios Morikis  
*Department of Bioengineering*

We report the conformational analysis of short polyalanine peptides of *de novo* design, using molecular dynamics (MD) simulations. The peptides are repeats of pentapeptide blocks of the type (E/DAAAK/R)n, where E=glutamic acid, D=aspartic acid, K=lysine, R=arginine, and n=3. These peptides have highly helical content because: (i) alanine amino acids have the propensity to form helical structures, and (ii) potential for salt bridges has been introduced to further stabilize the expected α, i+4 hydrogen bonds of an alpha-helix. Our simulations are based on the availability of the three-dimensional structure of a helical peptide with sequence Ac-W-EAQAR-EALAK-EAQAR-A-NH₂, which was previously determined by
nuclear magnetic resonance (NMR) spectroscopy [1]. This peptide contained polar and hydrophobic perturbations in the middle of the pentapeptide blocks, which aided in making it amenable to study by NMR, and the incorporation of tryptophan at the amino-terminus, which was essential for the evaluation of its concentration in circular dichroism measurements of helical content. These studies had shown the presence of competition between (i, i+4) and (i, i-1) salt bridges and an unusual bent involving a long-range (i, i+9) hydrophobic interaction. In the current study, we have modified the original sequence to (E/DAAAK/R)₃ variations. We present the results from the analysis of several MD trajectories, in which we evaluate the structural stability of the peptides and the underlying physicochemical properties that contribute to the formation of structure.


Comparing SFR’s from [OII] to other SFR indicators

Matthew Gonzales, Astrophysics
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Department of Astronomy and physics

The most widely used method in calculating the star formation rates (SFR’s) of galaxies is the Schmidt-Kennicutt Law, which relates the luminosity of an emission line feature in a galaxy, usually Ha or [OII]3727 to the SFR of the galaxy. The Schmidt-Kennicutt Law was originally calibrated based off of relatively bright nearby, z<0.1, sources. Recently nearby sources have been discovered with SFRs determined from other methods which indicate that the Schmidt-Kennicutt Law is not reliable for faint low surface brightness galaxies. To test the reliability of the Schmidt-Kennicutt Law at higher redshifts, I create a sample of faint, m_y > 22, [OII]3727 emitting galaxies in the redshift range z=0.5 -1.6. The sample of sources was obtained using the DEIMOS spectrograph on the KECK II telescope. I measure the [OII]3727 flux of each source, and use the Schmidt-Kennicutt Law to convert the measured flux into a SFR. I compare my estimated SFR from [OII]3727 to SFRs determined via the galaxies spectral energy distribution as a function of galaxy luminosity, color and other galaxy properties.

Women Suffering Human Rights Violations: Rape in the Congo

Dulce A. Gonzalez, Global Studies
Co-Author: Heidar Amirmehrabi
Mentor: Tamara C. Ho
Department of Women’s Studies

The Democratic Republic of Congo has been fighting a civil war since 1998 that has claimed more than four million lives while traumatizing countless others. Women of the Congo have not received much publicity throughout world media outlets and organizations. This research aims to illustrate rape as a deliberate and systematic form of terror that continues to affect victims in the Congo. Not only do anti-government soldiers rape women throughout the country, but so do members of the government’s military—those who are supposed to protect the general population. Women of all ages—from children to senior citizens—are victims of this method of warfare. My research reveals that the reasons behind the rapes are complex and serve a myriad of purposes. Some anti-government soldiers believe that raping women results in magical powers that increase their strength and survival in battle. Conversely, government forces attribute the widespread rapes to the fact that they are unable to return home for long periods of time. Rape supposedly results from the soldiers’ fear of the possibility of death without having sexual intercourse with a woman. Rape is also a strategy meant to traumatize local populations so they will not take sides in the ongoing conflicts. The victims of this sexual violence are often ostracized and shunned by their husbands and families. Thus, in many ways, rape is used to disintegrate the family structure and social fabric in an ongoing militarized conflict.
Even The Rain: Bolivia’s Privatization Policies

Dulce A. Gonzalez, Global Studies  
*Co-Researcher:* Israel Landa, Public Policy  
*Mentor: Steven Helfand*  
Department of Economics

Since Jaime Paz Zamora’s administration (1989-97), privatization had been a key component of Bolivia’s neoliberal policies. Zamora embraced the neoliberal economic model arguing that the private sector could deliver basic goods and services more efficiently and at lower costs than the public sector resulting in the creation and implementation of Law No. 1330 *Privatization of the Public Sector: Republica de Bolivia*. The privatization policy (no.1330) was lobbied and supported by the International Monetary Fund (IMF) and the World Bank (WB), which was part of a broader economic agenda that the two banks had set for Latin America during the 1990’s. However, the policy was never adhered to, due to the lack of regulation in the private sector combined with government corruption. This research aims to present the social and financial effects of Law No. 1330 by evaluating the role of privatization within the public sector. I will introduce the reasons behind the policy shift in relation to its social and economic results by examining the water policies signed into law in Bolivia. Bolivia’s privatization policies initially produced significant economic growth and the promise for rapid development, however the lack of governmental supervision and regulation led to inefficiency, corruption, and substandard service. Privatization achieved its goals in attracting foreign investment and reducing government expenditure, but the policies failed to meet the broader economic, social, and political promises of Bolivia’s leadership.

Made of Gold and Tulips: Inflation in Mexico and Istanbul in the 18th Century

Dulce A. Gonzalez, Global Studies  
*Mentor: Fariba Zerinebaf*  
Department of History

Istanbul and Mexico City during the 18th century were characterized by devastating wars, social unrest, and financial crisis. The two cities were greatly affected by high inflation, primarily caused by the exportation of minerals (gold and silver) and other products from the Spanish colonies to Europe. The objective of this paper is to explain how inflation during the 18th century fomented high unemployment, the scarcity of food, corruption in government, and economic stagnation leading to the increase of violence in Istanbul and Mexico City. I will depict the environments of Istanbul and Mexico City using information acquired from primary and secondary sources. The introduction will describe Bourbonic New Spain: their foreign policy, new laws, and the social and financial problems that New Spain was facing. I will then delineate the political and financial instability in Istanbul by focusing on the Tulip Age, where unintended consequences emerged such as class conflict, immigration, outbreak of disease, and economic pressures such as inflation. During the 18th century, Mexico City and Istanbul shared many of the above-mentioned characteristics and their eventual manifestation into overt violence. In this research I discovered the effects that New Spain had on the Ottoman Empire, as well as the effects that Ottoman’s policies had on the Spanish colonies. This research is a historical analysis of the growing global interconnections that became apparent after the discovery of the Americas leading to what we now call globalization.
The Illusion of Independence: Textuality, Visuality and Perspective in The Portrait of a Lady

Jaime Gonzalez, English
Mentor: Kimberly J. Devlin
Steven Gould Axelrod
Department of English

Henry James’ The Portrait of a Lady introduces a narrative structure which allows the reader to access different points of view, or positions, within the diegetic framework. This paper examines how each character’s positionality creates parallel and relative truths which highlight impotence in vision for the novel’s young heroine, Isabel Archer, as well as create a masochistic desire for knowledge. Utilizing a psychoanalytic lens reveals that the manner in which Isabel is framed and discussed, both by the narrator as well as by other characters, creates an ethical dilemma in which many traditional binaries (i.e. active/passive, text/creator, feminine/masculine, object of desire/subject of desire) are problematized and called into question. The primacy of Isabel’s “textual consciousness” becomes the source of her illusions in relation to political, social and gendered dynamics early in the novel and the misrecognition of her own conditions creates an illusion of independence rooted in a set of beliefs which do not correspond to her actual circumstances, or what Jacques Lacan calls the Real. Isabel originally resorts to literature as a source of identification, and this exposes her naiveté and suggests that her insistence on rationalizing or understanding the world in a textual way both clouds her ability to experience the world properly, as well as psychologically constructs false pretenses about the world itself. Ultimately, her identifications are highly textual, which masks “reality” and serves as a substitute for experience. The world that Isabel Archer experiences, as opposed to the advanced perceptions of the reader, is extremely illusive due to her limited scope and range of knowledge.

Molecular Similarity and Drug Discovery

Janel Gracia, Biochemistry
Mentor: Michael Marsella
Department of Chemistry

Drug design and discovery is a compilation of many components, one component is how a given drug (ligand) will affect a specific biological receptor. An ideal ligand will show exclusive affinity for a specific, targeted receptor; such an ideal drug could be expected to have minimal side-effects (via interaction with non-targeted receptors). Here we report a strategy to predict ligand-receptor interactions in silico. Our computational algorithm utilizes machine-learning to help elucidate which physical properties of ligands are most influential in defining ligand-receptor response. Our efforts to date focusing on a pool of 300+ FDA approved drugs will be presented.

Rise of Buoyant Emissions from Low Level Sources in Urban Areas

Eric Gutierrez, Mechanical Engineering
Contributor: Sam Pournazeri, Mechanical Engineering
Mentor: Marko Princevac
Department of Mechanical Engineering

Distributed power generators (DGs) are utilized by many institutions (e.g. restaurants, schools, hotels, and hospitals) and are stationed in urban areas to provide electricity. Because DGs emit pollutants that negatively affect the environment, the increase in the use of these generators has raised the concerns on the air quality problems in urban areas. Hence, there is a need to investigate the impact of these pollutants that reside within populated areas. The rise of emissions, or plume rise, is an important parameter needed for the determination of the pollutant concentration at ground level. In order to investigate plume rise from low level buoyant sources in urban areas, comprehensive field and laboratory studies were conducted. The field experiments were conducted in Palm Springs, CA in November of
2010. Plume rise from a DG was measured by taking images of the plume and analyzed by averaging the images. In addition to the field study, a laboratory study was conducted in a water channel in order to investigate plume rise associated with low level buoyant sources under different surrounding building geometries. Lego blocks were used to model single and double storey buildings situated downstream and upstream of the DG. The laboratory experiments reveal that plume rise from low level buoyant sources is highly affected by the complex flows induced by buildings stationed upstream and downstream of the source. The field and laboratory results will be presented.

The Suffering God: Divine Impassibility in 20th Century Theology

Chris Howell, History
Mentors: Howard Wettstein
Department of Philosophy
Sherri Johnson
Department of Religious Studies

In the last few centuries, a period notable for its widespread conflict, war, and destruction, a reopening of an apparently closed theological debate took place. Partly in response to witnessing human suffering on such a scale, theologians began to question the role of God in such trauma. Was he immune from suffering, as was traditionally thought? Or was he, as Whitehead believed, “A fellow sufferer who understands”? Since then, the idea of God suffering pain and anguish has enjoyed wide acceptance, on both the academic and popular levels. It has affected religious writing tremendously, from Christianity, to process theology, to Judaism, and beyond. In this paper, I will analyze the arguments for and against the idea of God’s suffering—which is bound up in the classical, divine attribute of “impassibility”—using books from David Bentley Hart, Jurgen Moltmann, and Rabbi Abraham Joshua Heschel. Primarily, however, I will analyze the effects that this idea (and the acceptance or rejection of it) has on the religious mindset, on both academic and lay thinkers. Rather than getting bogged down in a technical argument about the metaphysics behind the nature of God, I will argue that the positions held by these men are foundational to their worldview, and as a result are extremely important. Together with the aforementioned thinkers, I will use C.S. Lewis and G.K. Chesterton as examples where one's views on impassibility dramatically affect one's outlook on issues such as love, evil, and God’s role in human suffering.

Mining Data on Usage of Electronic Cigarettes from YouTube Videos

My Hua, English
Mentor: Prue Talbot
Department of Cell Biology and Neuroscience

E-cigarettes are relatively new devices brought into the world market by Chinese manufacturers. They are designed to have three major components: a battery, an atomizer, and a cartridge filled with nicotine and propylene glycol (also known as “e-liquid”). When an e-cigarette user inhales on the device, the battery heats the atomizer which vaporizes the e-liquid, and the user then inhales nicotine containing aerosol into their lungs and exhales residual aerosol into the environment. Currently, little information is known about them. This project used video data from YouTube to gather information on how these products are used. A total of 111 videos were watched from 66 different users who smoked various e-cigarette products and brands. Various parameters were mined from the videos, such as: e-cigarette users puff length (measured in seconds), comparison of inhalation times between genders, and comparison of inhalation times between various e-cigarette brands. Data mined from YouTube videos showed that inhalation time for e-cigarettes was twice as long as for conventional brands. Additionally, users who smoked different brands of e-cigarettes in multiple videos had varying inhalation durations. No two users smoked the same brand, in the same manner suggesting a wide range of smoking styles that can be further analyzed and evaluated. The results from this study can be used to establish a new smoking machine protocol for e-cigarettes and provide new
information that will be important in evaluating the safety of these products.

The Revolving Cycle; The “Mis-Education” of America

Krystal Huff, Women’s Studies and African American Studies  
*Mentor:* Paul Green  
Department of Ethnic Studies

The Los Angeles Unified School District (LAUSD) is terribly flawed. It utilizes textbooks that produce inaccurate and ethnocentric views of Africans that essentially lead to inadequate perceptions of the African-American identity. The result of this mis-education is the revolving cycle of the creation of convoluted misconceptions about Africans and African-Americans that account for racist views of them. In order to investigate this premise I explore the information presented in LAUSD middle school textbooks and question the validity of the substance. I then go on to discuss Woodson’s notion of “mis-education” by investigating the information presented about Africans and African-Americans in junior-high school history textbooks. Next I will interrogate the sociological language used to describe Africans and African-Americans in LAUSD textbooks with the help of Howard Winant’s (2000) *Race and Race Theory* and Horace Miner’s *Body Ritual Among the Nacirema* and show how this is troublesome for students’ sense of African and African-American-ness. Finally, I will confirm this reproduction of distorted images by interpreting the information that John C. Wood presents about the Gabra peoples of Africa in his work entitled *When men are Women; Manhood Among Gabra Nomads of East Africa*. His ideologies or beliefs appear to have been heavily influenced by the ideologies taught in LAUSD public schools. This research is important because it helps to explain why stereotypical thinking of Africans and African-Americans has remained throughout time.

Characterization of Electrostatic Properties of Cell Layers Using Streaming Potential Methods

Pamela Jreij, Bioengineering  
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*Mentors:* Victor G.J. Rodgers  
Department of Bioengineering  
David Lo  
Division of Biomedical Sciences

Within the epithelium surfaces, M-cells provide surveillance for the mucosal system as they lack a brush border on their surface. They contribute to the transepithelial transport and delivery of antigens from the intestinal lumen to the underlying immune system. Although they present a favorable site for pathogenic viruses and bacteria, the mechanisms behind their interactions remain unknown. Our group has recently shown that the ionic strength of the buffer solution in which nanoparticles are dispersed, affects in-vivo uptake by the M-cells; suggesting that uptake might be based on electrostatic interactions. In this study, we further investigated the processes lying behind the interactions between the surface of the M cells and the invading pathogens. We established an experimental protocol for characterization of electrostatic properties of cell layers using streaming potential methods. A device was designed to measure the normal streaming potential under pressure variations. The Helmholtz-Smoluchowski relation was then used to determine the zeta potential. Zeta potential was measured across epithelial Caco2 cells as well as EA926 cells used as a control. Measurements were undertaken after 7 and 14 culture days, the later period reflecting brush border development across epithelial cells. The results allowed the establishments of correlations between zeta potential measurements and the maturation state of Caco2 and EA926 cells.
Characterization of Electronic Transport in Polycrystalline Graphene Produced by Chemical Vapor Deposition

Philip Kratz, Physics
Mentors: Jeanie Lau, Leonid Pryadko
Department of Physics and Astronomy

Graphene, a two-dimensional carbon allotrope, exhibits a range of quantum electronic properties that have made it a focal point for fundamental Physics research and practical microelectronic device applications. With the recent development of chemical methods for inexpensive, large scale production of graphene, the material has a strong potential for replacing silicon and reducing the cost of consumer electronics. However, the polycrystalline nature of epitaxially-grown graphene due to topological defects has considerable implications for electronic transport. These defects have generally been believed to degrade the quality of graphene samples, as evidenced by previous observations of Raman D-peaks, comparatively high electrical resistivity, and weak localization. However, theoretical calculations have shown that grain boundaries in single-crystal graphene samples are capable of introducing bandgaps with energies determined by a multiple-of-three rule identical to that for the chirality-dependent conductance behavior of carbon nanotubes. The ability to introduce tunable bandgaps in graphene through controlled growth of grain boundaries is especially attractive due to the absence of an intrinsic bandgap in graphene and inefficiency of conventional electrostatic barriers resulting from the nearly perfect transmission of relativistic Dirac electrons. The goal of the present project is to investigate the effect of grain boundaries on electronic transport in polycrystalline graphene produced by Chemical Vapor Deposition (CVD) through conductance measurements with different placements of fabricated electrodes, in conjunction with TEM imaging to characterize grain boundary orientation. We develop a theory of charge carrier transmission through grain boundaries modeled as periodic arrays of dislocations to interpret the results of the measurements.

Discovery of CuS and Cu$_2$S Binding Peptides

Joon-Bok Lee, Chemical and Environmental Engineering
Mentor: Elaine D. Haberer
Department of Electrical Engineering

The world’s energy needs are predicted to double 2001 levels by 2050, and triple them by 2100. In comparison, the annual oil production is projected to peak sometime this coming decade, and then fall dramatically in the following years to less than 1985 levels by year 2050. Alternative energy sources will be required to meet global energy demands. Solar energy is a promising and abundant energy resource; however the technology necessary to harness solar energy in a highly efficient, affordable manner requires further development. Realizing efficient, low cost photovoltaics will require innovative, nanometer-scale materials engineering capable of precise manipulation of composition and bottom-up assembly. Nature has been assembling complex, highly-ordered nanometer scale structures for millennia using biomolecules. Moreover, Nature’s manufacturing conditions are generally mild, occurring under ambient conditions and in aqueous solution. Cu$_2$S/CdS solar cells were investigated extensively throughout the 1960s, 70s, and early 80s, but were abandoned because the high temperatures required for fabrication caused significant interface diffusion and reduced device performance. Therefore, the low temperature assembly made possible by biomolecules is particularly important for the CdS/Cu$_2$S material system. In this work, combinatorial phage display was used to discover amino acid sequences which bind to Cu$_2$S and CuS. A biopanning protocol which minimizes the biocidal effects of Cu$^+$ ions was developed for these CuS materials and used to identify binding peptides. The chemical character of the sequences was analyzed and the selectivity of the sequences for Cu$_2$S and CuS was evaluated.
Determining Site Amplification in the Biobío Region of Chile Using S-WAVE Method

Eric J. Liao, Environmental Science
Contribution: Corrie J. Neighbors
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Department of Earth Sciences

Site amplification is the local response of seismic energy to subsurface structure and geologic material, which can result in spatially variable patterns of surface damage following an earthquake. Site amplification analyses of urban areas that are located on sedimentary basins are important in earthquake engineering to understand how buildings respond to ground motion to mitigate future seismic hazards. We assess local site response in the Biobío region of Chile through the S-wave method utilizing seismograms captured by the Quake-Catcher Network (QCN) Microelectromechanical System (MEMS) accelerometers from the aftershock sequence that followed the February 27, 2010 M8.8 Maule, Chile earthquake. Seismograms of recorded earthquake events can be understood as the convolution of source, path, site effects, and instrument response. The relative amplification at different sites can be simplified to a function of only the site effect as the seismic source is the same for each station, instrument response is removed in processing, and for closely spaced stations in which the station spacing is small relative to the source-receiver distance, the path is assumed to be the same. Analyses of spectral ratios (amplitude vs. frequency content) of direct S-waves are used to determine the site amplification effect; an additional correction is made for geometrical spreading. As a result of the site response analysis, we highlight areas of the Biobío region that may be more susceptible to higher amplitude ground shaking and that are in need of stronger engineering practices to mitigate loss following future large earthquakes.

Banditry as a Mode of Resistance in Nineteenth-Century California

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Department of History

This project seeks to understand why the proliferation of banditry in late-nineteenth century in California occurred. By comparing already existing models provided by Eric Hobsbawm and James C. Scott with primary sources as evidence of the nature of banditry in California, a better understanding of California banditry is developed. Key to this project is the factor of the American acquisition of California and the supplication of one group's hegemony by another. As the United States annexed California, is is important to acknowledge that not all groups or persons completely accepted this new hegemony. The history of California in the years following the annexation of California is rife with resistance and disobedience. Banditry is one such expression of this resistance and disobedience. The questions I seek to answer lay with the nature of these so-called bandits: Who where they? Were they really purely criminals or was there an essence of resistance in their activities? What conditions influenced the individual to take arms and abandon whatever their position in the socio-economic was in order to pursue a life of crime? Did he even have a choice? By observing the responses of Mexican and American communities in newspapers and other records of the time we find that the presence of bandits was hardly ignored. While some members of the Spanish-speaking population venerated the exploits of bandits, it is important to note that others feared, if not resented, their exploits. Thus the image of banditry as a mode of resistance found in nineteenth-century California is not as simple as that hypothesized as being universal by Hobsbawm. The resulting understanding is more nuanced, and unique, to conditions in California.
The Impact of Diverse College Interaction upon Racial Attitudes and Racialized Desires of White Students

Mary Aisling Martin, Sociology  
*Mentor:* Karen Pyke  
Department of Sociology

Currently, racial minorities constitute a numeric majority in California, and this trend will continue throughout the U.S. with non-whites projected to become a majority within the next fifty years. As a white student at the most racially-diverse UC campus with a student population that is a majority of minorities, I am interested in learning how whites in non-white social settings are changed by the experience. Do they experience less racial stereotyping? Do they have increased desires to date outside their race? George Allport’s 1954 contact hypothesis posits that white interracial contact leads them to hold more positive racial attitudes. My thesis presents a critical review of the existing literature on the effects of interracial contact on white racial attitudes and stereotypes, as well as their interracial romantic desires, dating behavior, and rates of outmarriage. I will draw from the literature to project how white students at UCR might be changed by their attendance at a majority-minority university.

The Effects of Television Use on Children’s Social Behaviors

Michelle McDonnell, Psychology  
*Mentors:* Rebekah Richert, Steven Clark  
Department of Psychology

Children are experiencing increasing amounts of television use for many reasons ranging from parental fear of missing their own program to using television/DVDs as a teaching device. This research investigated the relationship between the amount of time a child spent with the television on in their home and behavioral problems, such as aggression, timidity, and attentional-deficit. It was hypothesized that there would be a significant positive correlation between the amount of time a child spends watching television or DVDs/videos and behavioral problems. Correlational analysis was conducted to examine the relationship between three temperament dimensions (surgency, negative affect, and effortful control) and media use. There were significant positive correlations between negative affect and the amount of time children spent watching television; the amount of time children spent watching DVDs/videos; how often the television was left on at home; and the degree to which parents felt that educational television would promote intellectual growth. In addition, there were significant positive correlations between surgency and the degree to which parents felt that educational television would promote intellectual growth. In addition to the correlations, an independent samples *t*-test was conducted to compare boys and girls in all aspects of media use and temperament. Boys had significantly higher surgency and effortful control than girls. These results indicate that the amount of television viewing a child participates in is correlated with potential social behavioral problems, especially in regards to the gender of the child.

Potassium-dependent epileptiform activity in mice hippocampus

Martina Mikail, Neuroscience  
*Mentors:* Gregory Filatov, Maxim Bazhenov  
Department of Cell Biology and Neuroscience

Increase of extracellular potassium concentration ([K⁺]₀) is known to play an important role in synchronization of the brain activity, which is a manifest of epilepsy. However the causes of epilepsy and the specific mechanisms of potassium action still remain unclear. Recent studies of tissues from epileptic human patients and animal epilepsy models revealed aberrations in [K⁺]₀ regulations [1]. We used a new technology known as multi electrode array (MEA) to record activity of the hippocampal slice preparations, which is induced by elevated [K⁺]₀. Broad range of [K⁺]₀ was tested including 2.5 mM, 5 mM, 7.5 mM, 10 mM, 12 mM, and 15 mM. We obtained concentrations dependence curve, which we used to estimate how much of [K⁺]₀ is required...
to cause synchronized network response. Observations from the 60-channel array recordings exhibited that, while 7.5 mM [K⁺]₀ was enough to induce first response, the most stable amplitude and frequency of network synchronizations was obtained when using 10 mM of [K⁺]. When [K⁺]₀ was elevated above 12.5 mM, it caused a depolarization block which prevented network synchronization. This synchronized network activity was reversibly blocked using synaptic inhibitors, specifically NBQX. In the future we plan to explore other drugs that may act as specific agonists/antagonists of the epileptiform activity.

Analyzing for 3-O-Methyl-Rhamnose in a Nucleotide Diphosphate Sugar Fraction

William Moore, Botany and Plant Sciences
Wynter Hernandez, Cell Biology and Neuroscience
Contributors: Ayeh Barekat, Brittany Chung, Shika Jain, Kathleen Noche
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Department of Botany and Plant Sciences

This project is a portion of a biochemical approach taken to investigate the complex carbohydrates present in the primary cell wall of Physcomitrella patens, a species of moss. This moss is of interest because certain polymers in the cell wall contain an unusual methylated sugar which is not found in the more advanced flowering plants. This sugar is 3-O-methyl-L-rhamnose, which occurs in the type II arabinogalactan glycan chains of arabinogalactan proteins (AGP) present in the primary cell wall and plasma membrane. The central question we have been investigating is at what level is L-rhamnose methylated? Does this event happen before or after the sugar is added to the growing polysaccharide? We hypothesize that this methylation event occurs at the level of uridine-diphosphate (UDP)-rhamnose, the form in which rhamnose is activated prior to being incorporated into a polysaccharide. If this hypothesis is correct we should be able to observe the presence of UDP-3-O-methyl-rhamnose in the soluble fraction. We have found supporting evidence of this when assaying for 3-O-methyl-rhamnose in a total nucleotide diphosphate sugar fraction prepared from the moss by anion exchange chromatography. Evidence is based upon the carbohydrate profile (taken by phenol sulfuric assay at 485nm), UV spectrum profile (taken at 260nm), and analysis of glycosyl composition by gas chromatography-mass spectrometry of both alditol acetate and trimethylsilyl sugar derivatives. Additional work is needed to further purify the fractions containing 3-O-methyl-rhamnose to isolate and characterize the sugar, determining if in fact it is connected to UDP.

Deciduousness as a Strategy for Desert Shrubs to Deal with Drought

Fortino Morales III, Environmental Science: Social Science
Mentor: Louis Santiago
Botany & Plant Sciences

Shrubs in California have three methods of dealing with drought conditions: (1) having a hydraulic system that is resistant to low water potential, (2) having deep roots, and (3) through losing leaves during drought, or, drought deciduousness. With an interest in studying the last strategy, drought deciduousness, measurements of leaf area and sapwood area of nine desert species were taken in the Spring and the Fall of 2010. Comparing leaf area seasonally is a useful tool for determining the degree to which plants lose leaves during drought as a strategy for reducing water loss. Near Morongo Valley, California, three distinct plants were sampled for each species, cutting three stems on each plant to the first branching point. From each stem we measured area of three representative leaves and averaged per individual then per species. Sapwood measurements of each stem collected were taken using a digital caliper. Differences between leaf areas from Spring to Fall were calculated and plotted using SigmaPlot (Ver. 10). Six out of nine species were found to have lost leaf area and had a lower leaf area-to-sapwood area ratio from the Spring to the Fall, which is consistent with drought deciduousness. Two species showed no significant change in leaf area-to-sapwood area, and one showed an overall increase in leaf area-to-sapwood area ratio.
Drought deciduousness appears to be part of a strategy to deal with drought for most of the species studied.

**Exploring Alternative Birthing Options**

Shirfaye Morgan, Anthropology  
*Mentor:* Chikako Takeshita  
Department of Women’s Studies

From the time they discover they are pregnant, many women create a birth plan which fits into what they imagine to be their ideal labor and delivery. Most birth plans include selecting a medical practitioner who will provide pre-natal care and assist in the delivery of the child. Most women do not consider midwives, birthing centers, or their own homes as options when it comes to creating their birthing plan, even though mothers who have given birth in these settings express a high level of satisfaction. Have women been so preconditioned to seek out a physician that they consider no other options, are they - unaware of other options that are available to them, or are there other reasons which deter women from considering home birth or the assistance of a midwife during pregnancy and labor and delivery? Based on interviews with mothers and pregnant women, this paper offers potential explanations to these questions.

**Do You Want the Good News or the Bad News First? News Order Influences Outcomes for News-Recipients**

Ann Nguyen, Psychology  
*Mentors:* Kate Sweeny  
Ruth Chao  
Department of Psychology

Giving bad news can be anxiety-provoking. When faced with a bad news delivery situation, people may use prosodic techniques such as mixing good news with the bad. In these events, people may ask, “Do you want the good or the bad news first?” In this study we examined whether news order has affective, cognitive, and behavioral consequences. Participants completed a personality test and received fake results in either a ‘good then bad,’ ‘bad then good,’ or ‘bad only’ order. Participants completed questionnaires about how they felt about their results and chose whether to watch a personality improvement video. Results revealed that news order has consequences. People who received good news last reported better mood and appraisal of the results. In contrast, people who received bad news last significantly changed their perceptions about the importance of having a good personality compared to their baseline ratings. Additionally, people who received bad news last reported greater intentions for behavioral change and were more likely to watch the improvement video. Our findings suggest that there is no correct approach to delivering news and that instead news-givers should consider the optimal outcomes for the recipient. To buffer negative affect they should relay good news last, but if the goal is behavior change then ending with bad news may be best. Our findings have important implications for the bad news delivery process and its consequences between news-givers and recipients.

**Effect of essential fatty acid linoleic acid on the expression of nuclear receptor HNF4α in murine liver.**

Peter T. Nguyen, Premedical Sciences  
*Contributors:* Jane Evans, John Ta  
*Mentor:* Frances M. Sladek, Department of Cell Biology and Neuroscience

Hepatocyte nuclear factor 4 alpha (HNF4a) is a highly conserved member of the nuclear receptor superfamily of ligand-dependent transcription factors and a master regulator of liver-specific gene expression. HNF4a targets include genes involved in glucose, fatty acid, xenobiotic and drug metabolism as well as those involved in the immune system and cell proliferation, and link HNF4a to several diseases such as diabetes, atherosclerosis and cancer. A loss of functional HNF4a is therefore thought to aggravate a variety of conditions. A recent study from our lab showed that the omega 6 fatty acid, linoleic acid (18:2(n-6), LA), is the endogenous, reversible ligand of HNF4a. However, the effect of LA on HNF4a and the liver are not clear. In order to investigate the effect of LA on HNF4a, mice were fed diets with varying levels of (LA): a generic regular (RD), a specially formulated...
LA-deficient diet (LA-), and an LA-deficient diet with linoleic acid restored (LA+). Mice were fasted for 24 hours to clear existing LA from HNF4a and then fed the specific diet for 1 to 7 days. Proteins were extracted from livers and the amount of HNF4a was analyzed using western blotting and ImageJ. Livers from mice fed an LA-deficient diet had lower levels of HNF4a protein compared to mice fed the LA-deficient diet supplemented with LA, suggesting that LA causes a decrease in HNF4a protein levels in hepatocytes. However, the LA-deficient diet had less HNF4a protein than the regular diet (RD). Since the RD had other differences in composition aside from LA, it is possible that the effect of LA on HNF4a may be dependent on the presence of other nutrients. The mechanism of down regulation of HNF4a by LA warrants further investigation.

Analyzing the Interaction between Epstein-Barr Virus Glycoprotein gp350 and CR2 using AESOP

Aaron Nichols, Bioengineering
*Mentors: Dimitrios Morikis, Ronald Gorham*
Department of Bioengineering

Epstein-Barr virus (EBV) infects a large percentage of the world’s population and is responsible for infectious mononucleosis and in rare cases, Burkitt’s lymphoma and nasopharyngeal carcinoma. EBV’s primary means of infection is the association of the viral surface glycoprotein gp350 with complement receptor 2 (CR2) of the immune system. Various mutagenesis studies have identified key residues on both gp350 and CR2 necessary for binding. These mutagenesis studies have recently been used to derive constraints for a computational docking study in order to generate a putative three-dimensional structure for the gp350-CR2 complex, using the soft-docking program HADDOCK (High-Ambiguity Driven biomolecular DOCKing). We have applied our own AESOP (Analysis of the Electrostatic Similarity Of Proteins) protocol to analyze the electrostatic contributions to complex formation, using the HADDOCK-derived structure of the gp350-CR2 complex. Our atomic-detail studies using AESOP suggest that the original HADDOCK structure may not be optimized and warrant a re-evaluation of the docking process. Using an alternative set of restraints, we have generated a new ensemble of potential structures for the gp350-CR2 complex and have analyzed them using AESOP. This study will help delineate the molecular mechanism underlying infection by EBV.

Social Networking Websites and Political Activism

Kyle Noble, Political Science
*Mentors: Juliann Allison, William Barndt*
Department of Political Science

The genesis of social networking sites like Facebook, Youtube, and Twitter has captivated the Internet users of the world and fostered billions of web-based interactions. During the early summer of 2009, many members of the media applauded the use of Twitter during Iran’s elections to further the Green Movement’s pro-democratic agenda. This situation raises the question: Do social networking websites increase activism and/or political participation in non-democratic regimes? In this chapter, I assess current arguments for and against the democratic properties of the Internet to argue that social networking websites increase activism and political participation by increasing connectivity and openness, even in non-democratic regimes. I compare China and the United States to show how social networking websites supplement the arguments made that the Internet increases the ability to access political information and associate freely with those who share their beliefs. My analysis indicates that social networking websites are unable to overcome obstacles like socio-economic status, power law properties, and government filtering to promote connectivity and openness. My research demonstrates that the vast potential of social networking websites are undermined by the availability of Internet to all members of each society as well as the power law properties that exist in the social networking sites. As social networking websites continue to spread and grow, individuals will need to learn
to manipulate the sites in order to promote openness and make meaningful connections with people outside of their typical network.

**Do You Have the Elephant? A Look at Speech Alignment through an Interaction Task**

Alan Nong, Psychology  
*Mentor:* Lawrence Rosenblum  
Department of Psychology

Speech alignment is defined as the tendency for individuals to produce speech with characteristics similar to that of a perceived speech signal (Giles, Coupland & Coupland, 1991; Natale, 1975). In the current study on speech alignment, 20 female students from the University of California, Riverside were recruited and performed an interactive search task where participants would utter nine key words multiple times. Half of the pairs were placed in an auditory-only condition and the other half in an audiovisual condition. Speech tokens were taken from a pre-, post-, and main interaction tasks. These tokens were then used in an AXB procedure where raters would judge the level at which the participants’ speech aligned. Further research may examine the specific visual stimuli and its influences on speech alignment.

**Influence of Growth Media on Escherichia coli Surface Characteristics**

Stephen R. Opot, Environmental Engineering  
*Contributor:* Ian Marcus  
*Mentor:* Sharon Walker  
Department of Chemical and Environmental Engineering

Bacterial adhesion to various aquatic surfaces is important in environmental applications; especially, in mitigating the impacts of pathogenic water contamination. However, while investigating the fate, adhesion, and transport of bacteria in the laboratory, non-representative results arise from culturing cells in rich experimental media such as Luria–Bertani (LB) broth. As a result, data from the experimental investigations do not reflect the actual cells’ surface characteristics as would exist in the natural environment. In this study different natural *Escherichia coli* isolates of dairy cattle (DP) strains were used to understand the influence of growth media on these cells’ surface characteristics. Cells were analyzed after simultaneous incubation in two different media; one ideal (LB) and the other a real growth media (manure extract), simulating a natural breeding environment for bacterial cells. Extensive cell characterization techniques were conducted to evaluate the cells’ hydrophobicity, electrophoretic mobility, zeta potential, extracellular polymeric substances (EPS) analysis, size, and surface charge density. Results indicate that there is substantial variation in the cell characteristics whether grown in LB or manure. This research helps us to, further, understand different bacteria surface characteristics and behavior in real environment, and to utilize the research outcome to optimize effective water treatment and distribution. Results to date of this ongoing extensive surface analysis will be presented.

**When Bias Shows: Comparing Accurate and Racist Portrayals in *The Blue Lotus***

Elizabeth Paich, Asian Studies  
*Mentor:* Michelle Bloom  
Department of French & Comparative Literature

*The Blue Lotus* is a turning point in the Tintin series, as Hergé’s research of Mainland China and Chinese culture with his colleague Zhang Chongren would lead to candid portrayals of foreign peoples and lands for the rest of the graphic novel’s series instead of through Eurocentric misconceptions and stereotypes. However, after researching the creative process behind the graphic novel and examining the work itself, it is clear that while the album strives for accurate portrayals of China, it is still not without racist caricature. As the protagonists Tintin and Chang bond, representing a comradery between East and West, there is still racist caricature inspired by the Japanese occupation of Shanghai and eventual exiting of the Japanese from the League of Nations during the 1930s. Thus, Hergé does not combine the appearances of the Chinese and the Japanese into an indistinguishable group of “Asians”, but
maintains racist portrayals of both Asians (specifically the Japanese) and Westerners because they are supporters of governments that maintain Imperialistic ideology. Thus, *The Blue Lotus* contains characters that are a combination of both accurateness and racist exaggeration – displaying Hergé and Zhang’s disdain for the Japanese actions in China during the 1930s and the bigotry of Caucasian white supremacists.

**Constructing a Database to Assess Competitiveness and Complementarity of Airlines and Route Segments**

Ju Hyun Park, Information System  
*Mentor*: Robert A. Hanneman  
Department of Sociology

The objective of this project is to construct a multi-dimension global airlines routes database for research in competitiveness and complementarity of airlines industry. The two criteria are measured by counting and analyzing the airlines’ routes. Database is built by using PHPmyadmin and MySQL. There are several tables populated with the data of airports, airlines, and routes. The data of airlines, airports, and routes were downloaded from the OpenFlights/Airline Route Mapper Route Database in a text file format. PHP and MySQL were used to parse out the appropriate data into the database. MySQL was used to implement static queries to insert the data into the tables. The competitiveness and complementarity of route segments and airlines are constructed by comparing and analyzing the computed variables and re-shaping data. Competitiveness refers to the overlapping route segments among airlines. Two routes are complementary if they share a node. Two airlines are complementary if they share a node and do not have identical sets of operating routes. Constructing competitiveness and complementarity is done by joining the tables—routes and airlines—to observe the overlapping route segments. MySQL was used to narrow and organize the necessary data for analysis among over 130,000 records of route segments. The competitiveness and complementarity of route segments and airlines were computed and ranked by the numbers. Future analysis will include the relationships among competitiveness, complementarity, and codeshare of airlines.

**Contextual and environmental effects on the Horizontal Vertical Illusion**

Isaac Rodriguez, Biochemistry  
Amanda Roos, Psychology  
Abigail Montes De Oca, Psychology  
Dalton R. Downey, Psychology  
Theresa Cook, Psychology  
*Mentor*: Lawrence D. Rosenblum  
Department of Psychology

The overestimation of vertical distances in relation to horizontal distances of the same size is known as the Horizontal Vertical Illusion (HVI). The study of visual illusion allows us to better understand the human visual system. Previous research has found that distance estimations including the HVI can vary due to visual cues, illusion configuration and the environment. In two experiments, we investigated how the HVI found in the laboratory (e.g. on computer displays) relates to the HVI found in the real environment. In Experiment 1, 70 participants estimated the height of 10 vertical objects on a computer display, matching that size to a horizontal distance on a number line below each object. Participants saw 10 images in 4 contexts: full context photographs, reduced texture, edge only, and no context images. We found a significant interaction between context and image; the HVI increased as context increased for images of walls, and the HVI decreased as context increased for images of more complex objects. Our second experiment (n=48) took place outdoors. Participants estimated the same objects from the images in Exp. 1. We found a significant correlation between the HVI for full context images and the HVI in real life. These novel findings provide new insight into the current body of knowledge about the HVI. It is important to understand visual misperceptions in many contexts because of the deeper understanding of the visual system it provides and potential application for height navigation.
The Ideologies of Modesty in Sephardic Orthodox Jewish Communities of Brooklyn, New York

Jordan Rohde, Women’s Studies
*Mentor:* Piya Chatterjee
Department of Women’s Studies

I am ultimately attempting to identify the importance of modesty and personal aesthetics within the context of women in Sephardic Orthodox Jewish communities in Brooklyn, NY. I will also include comparative ideologies and practices from other sects of Judaism and from other Orthodox Jewish communities. The study will center on the concept of modesty laws (tzniut). I want to examine how aesthetic presentation within this group transcends into their ideologies around culture, religion, and community-specific gender roles. This community only allows for a certain amount of flexibility around how you may act as a "man" or a "woman". What are the consequences of acting out of those expected roles? It is my prediction that rules of dress are partially in place to reinforce patriarchy as well as demand that women are responsible for the sexual desires of others. Conversely, I predict that these rules of dress, particularly modesty codes, may provide an escape from objectification, judgment, and act as a marker to those that are in the "community". I will mainly gather my data from participant observation and interviews, as well as primary and secondary sources on the subject.

Cytometry analysis of surface markers for embryonic stem cells overexpressing ΔS37 beta – catenin

Tavia Rucker, Biological Sciences
*Contributors:* Aashima Singhal, Beatrice Kuske
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Department of Cell Biology and Neuroscience

Embryonic stem cells (ESCs) are pluripotent cells capable of unsurpassed self-renewal. This self-renewing ability and their pluripotency is maintained by an interplay of a handful of signaling pathways, among them the Wnt signaling cascade. The prime effector of this pathway is beta-catenin (CatnB), which is cytoplasmically stabilized upon cellular binding of Wnt ligands. This stabilization is due to inactivation of a CatnB upstream regulator, glycogen synthase kinase 3beta (GSK-3β). In order to discern the function of CatnB in pluripotency in more detail, the lab has previously established an ESC line that stably expresses a form of CatnB that lacks a specific GSK3β phosphorylation site (ΔS37) and therefore shows elevated levels of nuclear CatnB. In ΔS37 mutants, pluripotency is lost as evaluated by extremely low Oct-4 levels and loss of typical colony growth. Coupled with the loss of pluripotency, the ΔS37 mutant line also shows accelerated osteogenic differentiation capability. Hypothesizing that overexpression of ΔS37 CatnB caused the cells to differentiate into a stable osteoprogenitor, we employed here flow cytometry and cellometer analysis to establish the identity of the ΔS37 ESCs. Through these two methodological approaches we are able to come to the conclusion that the mutant ESCs are an induced early line of differentiating cells that are capable of continuous growth in culture.

Para-liturgical Ritual in Egeria's Travels: A Move Toward the Standardization of the Popular Phenomenon of Pilgrimage in the Fourth Century

Anna Katharina Rudolph, History and French
*Mentor:* Michele Salzman
Department of History

The pilgrimage account written by Egeria describing her three year pilgrimage (381-384) is one of the most unique documents that has come down to us concerning fourth century pilgrimage. Despite a large number of studies on this text, there are still several previously unrecognized issues. In my paper I will show that there is evidence, not hitherto noticed, in Egeria’s text that shows how pilgrimage rituals came to be defined during the fourth century. There are striking similarities between Egeria’s descriptions of the Jerusalem Easter liturgy and the repetitive actions she participated in at almost every holy site she visited. These
para-liturgical rituals represent an attempt on the part of local priests to shape popular practices of religious enthusiasm through the implementation of the sanctioned liturgical practices already in place at Jerusalem. The frequency with which Egeria encountered these rituals suggests a move toward the standardization of the popular phenomenon of pilgrimage in the fourth century.

Le Lotus Bleu and the Transformation of Hergé’s World View

Anna Katharina Rudolph, History and French
Mentor: Michelle Bloom
Department of French

In his graphic novel, Le Lotus Bleu, Hergé seems to have distanced himself from his characteristic stereotypical portrayals of foreign cultures. The Chinese in Le Lotus Bleu do not appear overly orientalized and the characters are not collectively homogenous. Hergé seems rather to divide his characters into “good” and “bad” types based on their own personal merits. The “bad” types are drawn as caricatures with all the typical stereotypical qualities one could expect, whereas the “good” types appear more natural and realistic, lacking any culturally offensive qualities. In addition, Hergé negatively portrays xenophobic westerners and openly addresses the problem of stereotyping, dispelling negative western preconceptions of the east. In addition, the prominence of the character of Tchang in Le Lotus Bleu seems to reference the real-life Tchang who gave Hergé an appreciation for Chinese art and culture and helped to dispel his own misconceptions.

Volunteerism and the pursuit of happiness: A correlational study

Ioana Sana, Psychology
Mentors: Sonja Lyubomirsky, Kate Sweeny
Department of Psychology

In an online survey we measured college students’ motivations to volunteer, direct volunteer behavior, happiness, and well-being. More specifically, motivations such as participant’s moral values and understanding about a cause were measured to gain a greater understanding of why people choose to volunteer. Although volunteerism was generally low among college students, results demonstrated positive relationships between volunteerism, happiness, life satisfaction, and eudaimonic well-being. Subjective happiness was positively correlated with values as a motivation of volunteerism. In addition, valuing and understanding volunteerism were positively correlated with one another. Understanding had the strongest positive relationship to eudaimonic well-being out of all the motivation to volunteer subscales.

Analysis of Au(100) Surfaces Using Na Ion Scattering

Robert Sanderson, Physics
Mentors: Jory Yarmoff
Department of Physics and Astronomy
Roland Kawakami
Department of Physics and Astronomy

When a beam of low energy ions is incident on a solid surface, much information can be gleaned by analyzing the projectiles that are scattered. The energy of the scattered ions provides the distribution of atomic masses at the surface. The fraction of ions that are neutralized upon scattering provides information about electrical properties and quantum levels of the incoming ion and the material surface. Studies of ion scattering from the (100) surface of gold (Au) by Esaulov et al. have shown that scattered lithium (Li⁺) ions have anomalously high neutral fractions. This result can be accounted for by two possible explanations: The surface states of Au(100) interact with the 2s levels of the Li⁺ ions causing the neutralization to increase, or the Au surface needs to be considered as individual atoms instead of a sea of free electrons because of the close approach of Li. In the present study, Sodium (Na⁺) ions are used to compare with the Li results. The enhancement of neutralization is not seen for Na, which supports the individual atom model of the Au surface, since Na⁺ ions do not get close enough to the Au surface for this effect to be significant. This result has implications in the use of ion scattering for studies of the electronic properties of metals.
properties of nanomaterials and their use as catalysts.

**Glassy Winged Sharpshooter Population Survey and *Xylella fastidiosa* Detection**

Candice Sanscartier, Bioengineering  
*Mentor:* Thomas Miller  
Department of Entomology

Across the United States, grapevines are succumbing to Pierce’s Disease (PD) which currently infects more than 30% of America’s 30 billion dollar wine industry. PD is caused by the bacterial pathogen, *Xylella fastidiosa*, which blocks water from flowing through the xylem of plants. Affected grapevines develop leaves that are discolored and dried out, and usually die within 2-5 years. *X. fastidiosa* is transmitted by xylem feeding insects. The most effective vector is the leafhopper, Glassy Winged Sharpshooter (GWSS). GWSS are most commonly found in mild to scorching temperatures and are able to feed on the woody stems of plants which make it an optimal vector for the pathogen. In the summer, GWSS populations explode, creating the greatest period of infection of grapevines. During summer 2010, we performed a survey on unsprayed grapevines on the UCR campus to determine patterns of GWSS visiting the plants and their infection status. Insects were collected on yellow sticky traps checked weekly from late June to late October. All insects were surface sterilized, the bacterial DNA was extracted, and real time PCR was used to test for *X. fastidiosa*. GWSS visitation to the plants was highest in midsummer. From 112 insects collected, 83 were tested for *X. fastidiosa* and approximately 80% were found to be positive. These results indicate that many of the GWSS feeding on the unsprayed grapevines on the UCR campus are infected with the causal agent of PD, placing the plants at high risk of infection with the pathogen.

**New Species of *Astyanax* (Ostariophysi: Characiformes: Characidae) from the Neotropical Río Magdalena System, Colombia**

Victoria Senechal, Neuroscience  
*Contributor:* Mauricio Torres  
*Mentor:* David Reznick  
Department of Biology

A new species of characid of the genus *Astyanax* is described from the tributaries of Río Cascajales, within the Río Magdalena system, Santander, Colombia. *Astyanax* is a genus of tropical freshwater fishes in the Characidae family of the order Characiformes, more commonly known by aquarium hobbyists as tetras. With roughly 128 described *Astyanax* species, this genus is the most diverse of the order Characiformes, and the third largest genus among the Neotropical freshwater fishes. Such diversity and taxonomical gaps makes the description of new species of *Astyanax* rather difficult. However, this particular species of *Astyanax* has such unique characteristics that it can be readily distinguished from all its congeners. These characteristics include the presence of two vertically elongated humeral bars, a distinct anteriorly directed chevron pattern along the midlateral line, and a caudal spot that extends to the end of the median caudal rays. To further confirm that this species is different from previously known species of *Astyanax*, we also measured other anatomical characteristics such as body shape and meristics by direct observation of specimens under the microscope, their pictures, and x-rays. We then used this data to compare the new species to the other species of *Astyanax* and Neotropical freshwater fishes and are in the process of publishing our findings.
Measuring Specific Surface Area of Soils and Soil Minerals by Water Vapor Adsorption

Yusuf Setiawan, Environmental Sciences
Mentor: Christopher Amrhein
Department of Environmental Sciences

Surface area is related to many physical and chemical properties of soils. Reactive surfaces in soils vary widely because of the differences in particle-size distribution, mineralogy, and organic composition. Some properties closely related to the specific surface area of soils are water retention and movement, cation exchange capacity, heavy metal and pesticide adsorption, and biological processes. Specific surface area of soils has been measured in many ways, some are tedious and time intensive. The most common method is EGME adsorption, which measures the total surface area but is only valid to an estimated single partial pressure equilibration. We tested a rapid method to estimate surface area on a variety of soils with wide ranging physical and chemical characteristics by using water vapor and comparing the results to the EGME method. Water vapor sorption curves are constructed by equilibrating the soils to six different relative humidities (8%, 11%, 20%, 24%, 32%, and 48%). Measuring the amount of water vapor covering all soil particles and the partial pressure we construct a soil-water characteristic curve (SWCC). From this SWCC, we can apply the BET equation to determine the specific surface area of soils. Our results were generally in agreement with the surface areas measured by the EGME method except for soils with extremely high surface areas. This method could become a new, low cost, easy way to determine the specific surface area of soils.

Inhibition of acetohydroxyacid synthase (AHAS) by the herbicide Imazapyr in susceptible wild-type and resistant mutants of Arabidopsis thaliana and its effect on primary root growth

Vishwa Shah, Biochemistry
Mentor: Cynthia Larive
Department of Chemistry

There is an enzyme called acetohydroxyacid synthase (AHAS), which is the target of the widely-used imidazolinone herbicides. Modern agricultural practice has employed herbicide-resistant crops; one such mutation conferring herbicide tolerance involves an amino acid substitution at position 621 of the wild-type AHAS enzyme. I will be working with this mutation in the model plant Arabidopsis thaliana and performing phenotypic characterization of the susceptible wild-type in comparison to the resistant mutant. Arabidopsis is a useful model for larger crop species such as lentil because it can be easily cultivated on Petri dishes in compact growth chambers. Within the Arabidopsis community there exist a large collection of well-studied mutants, the seeds of which can be purchased for a nominal fee. A small collection of AHAS mutants has been established in the Bailey-Serres lab at UCR’s Center for Plant Cell Biology (CePCeB). There will be two EMS mutants, csr1-1 and csr1-2 which are resistant to Imazapyr, and a wild type called Col-0. I will be studying primary root elongation and how it may be inhibited by a chemical called Imazapyr. I will be seeing how the enzyme AHAS, whether it is in its native state or carrying a mutation, will have an impact on the growth of the primary root, and how long its roots will under the influence of the Imazapyr herbicide. We will be doing this by using the dry and wet method to sterilize the seeds and then use the t-test to determine significant differences between treatments and genotypes.
The effect of soil inoculants on the growth of annual herbaceous coastal sage scrub plants

Sonya L. Sharp, Botany and Plant Sciences  
Dwight Williams, Botany and Plant Sciences  
*Mentor*: Edith B. Allen  
Department of Botany and Plant Sciences

Coastal sage scrub plant communities have become invaded by many Mediterranean plants. Invasions by exotic plant species have changed the overall plant community and decreased the abundance of native plants. In addition, invasive plants can change soil microbial communities such that native species are disadvantaged. Often, remediation consists of simply planting seeds without modification of the soil inoculum. A greenhouse experiment was performed to test the effects of inoculum collected from the rhizospheres of native and invasive species. The soil inoculum may include beneficial mycorrhizal fungi as well as pathogenic and saprotrophic microorganisms. One native plant species (*Amsinckia menziesii*) and two dominant exotic nonmycorrhizal plant species (*Brassica geniculata* and *Bromus madritensis*) were grown from seeds in each other’s rhizosphere soil. The soils were collected from the Box Springs Mountains in Riverside, which is an area that receives high anthropogenic nitrogen deposition and has high soil nitrogen concentrations. We predicted that inocula containing mycorrhizae (soil from the two mycorrhizal species) would promote plant growth. Observations of the overall dry biomass proved this inconclusive as plants grown in *Brassica geniculata* inoculum had the best results. Furthermore, days to emergence and weekly height growth showed no differences between the different sources of inocula. Although mycorrhizal fungi often provide plants with growth benefits, they may also cause growth depressions, especially in seedlings or in nutrient-rich soil.

Steric interactions between sp and sp^3 carbons in acyclic alkynes and nitriles

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Department of Chemistry

Each atom within a molecule occupies a definite volume in space. As a result, one would expect an unfavorable interaction when atoms are placed too close together. This paper explores various conformations of acyclic alkynes and aliphatic nitriles in order to obtain the most stable geometries, utilizing the supposition that molecules prefer to minimize steric strain. The two conformations of interest in this study are synclinal and antiperiplanar interactions, which are theoretically the most stable geometries. However, *ab initio* calculations utilizing the 3-21G basis set for geometry optimizations show that the most stable conformations do not necessarily prefer maximizing distances between carbon atoms. The molecules analyzed consist of twenty 1-alkynes, one 2-alkyne, and sixteen nitriles that ranged from 5 to 10 carbon atoms. For each molecule, the three most stable conformations were found by geometry optimizations utilizing the 3-21G method to calculate the electronic energies. On the one hand, even after taking into account the zero-point energy corrections for 1-alkynes in the gas phase, the calculations predict that *sp-sp^3* synclinal interactions are stabilizing relative to fully extended (antiperiplanar) conformations. The effects of *sp-sp^3* synclinal and *gauche* interactions do not appear to be additive for 1-alkynes. On the other hand *sp-sp^3* synclinal interactions in nitriles do not have a large effect (neither stabilizing nor destabilizing). The effects of *sp-sp^3* synclinal and *gauche* interactions appear to be additive for nitriles.
Differentiation of Osteoblasts from Human Induced Pluripotent Stem Cells

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Contributor: Beatrice Kuske  
Mentor: Nicole I. zur Nieden,  
Department of Cell Biology and Neuroscience

Human embryonic stem cells (hESCs) are pluripotent cells of embryonic origin with the ability to differentiate into all cell types found in the body. This characteristic has prompted the biomedical research community to investigate their clinical use as treatment for a variety of degenerative diseases, including those involved in bone and cartilage loss. Our lab has previously shown that hESCs are capable of differentiating into matrix-secreting osteoblasts under the influence of ascorbic acid, beta-glycerophosphate, and vitamin D3. Specifically, these inducers permit the cells to time and stage dependent expression of a variety of genes associated with the osteoblast phenotype. Although these results are promising, the use of hESCs faces a variety of ethical controversies, revolving around their embryonic origin, that deter the continuation of their investigation. In contrast, human induced pluripotent stem cells (hiPSCs) offer a less controversial path and are a great tool in the modeling of human diseases, since they are artificially generated from adult somatic cells. This project aims to validate the applicable use of hiPSCs as fully differentiated osteoblasts through study of the molecular similarities found between hiPSC-derived osteoblasts and those differentiated from hESCs. The human iPSCs will be followed through differentiation over time with analysis of the cells executed every five days for a period of thirty days. The results of this osteoblast differentiation project and its relevancy will be presented.

Spatial Arrangement of Symbiotic Bradyrhizobium Bacteria in Plant Nodules

Rina Suzuki, Biology  
Mentors: Joel Sachs  
Department of Biology  
Darleen DeMason  
Department of Botany

Bacteria in the genus Bradyrhizobium form a symbiotic relationship with leguminous plants. The plants provide the bacteria with carbohydrates and a relatively safe home in return for nitrogen fixed by the bacteria. These processes occur in nodules, small growths on the roots of the plants where the bacteria reside. Several strains of Bradyrhizobium have been isolated from natural populations and characterized for their benefit to the plant. The strains range from highly beneficial (nitrogen fixing), to non-beneficial strains that provide no benefit to the plant (non-fixing). One of the goals I would like to accomplish is to describe the intracellular arrangement of the bacteria in the nodules. This type of work has previously been done with nodules using lab generated mutant strains of bacteria. For this study, we will be using a naturally occurring host/bacteria system. In addition, the relative benefit provided by the different strains of bacteria has been previously assessed. As a result, we can compare the make up of nodules of naturally occurring beneficial strains with non-beneficial strains. I also intend to characterize and compare nodules that have been singularly infected and nodules that have been co-infected with multiple strains of bacteria. In order to accomplish these goals, I plan on using light microscopy to view sectioned samples after they have been properly fixed and embedded. My hope is that this research will provide some insight as to how the host spatially structures Bradyrhizobium within nodules and can potentially bias host resources towards beneficial rather than harmful infections. I anticipate that we will find structural separation of the bacterial strains within co-infected nodules. Previous research results show that non-beneficial bacterial strains grow to high populations within nodules by avoiding differentiating into bacteroids. These nitrogen fixing cell types are relatively large in size and
occupy more space than the standard infection form of the bacteria. Therefore, I would expect that nodules which have been infected by a non-beneficial strain to contain no bacteroids.

**My Dear Noble: An Historical Analysis of the Civil War Letters of Edwin Hall Higley**

Charles Taylor Libolt, History  
*Mentors:* Kendra Field, Randolph Head  
Department of History

Edwin Hall Higley’s sense of duty and high morale, the two traits that caused him to enthusiastically enlist with the First Vermont Cavalry, were challenged and tested during the Civil War. The bloodiest war in United States history took Higley on an emotional roller coaster, spurred by the sheer violence of Second Bull Run and Spotsylvania, a false arrest and discharge for cowardice, reinstatement after months of petitioning his case, and finally his capture by Confederate troops less than a year after his reinstatement. The letters and articles left behind by Higley illustrate how his morale dramatically fluctuated throughout the war, while also providing a glimpse of the reasons why he clung to such a strong sense of duty throughout the war. Through transcribing and analyzing the collection of letters, I was able to conclude that Higley had such an initially strong will to serve his country because of a number of reasons: His religion and the possibility that he was raised to believe that the battlefield was a place where glory was achieved are two topics that I focus on in my essay. Throughout the course of the war, Higley found that the glory he sought was nearly impossible to reach. By the end of his service, it seems to have been a combination of his pride, and a deeply engrained sense of duty to his country that caused him to follow through with his service until the very end.

**Cellular Automata Shuffler**

Sean Townsend, Applied Mathematics  
*Mentor:* Michel Lapidus  
Department of Mathematics

Keeping important information secure is one of the most vital things that one can do. The development of the Cellular Automata Shuffler (CAS) intends to add another tool at one’s disposal to help in this process. After looking at different methods of encrypting data, CAS was developed. CAS is a transportation cipher with a symmetric key system. CAS uses Cellular Automata (CA) to rearrange data based off of the key and the particular CA rule used in the cipher. The encryption process starts with the key that is generated by the user; the key is then used by the CA algorithm to generate an array that identifies the placement of real and random data. Then by taking a stream of data and placing it into an array, and breaking the data set into small pieces; you place the real data into the places that were identified by the CA algorithm. The orientation of these pieces can be altered by the user, depending on the algorithm used. By breaking the new set of data into a stream you have created the cipher text; it is now secure to send. Decryption is easy with the cipher text and the key that was sent securely; it starts by reassembling the cipher text into the array and identifying the real data with the key and the CA rule. This allows you to recreate the original data.

**Exploring Binding Conditions Between Proteins and Nanoparticles**

Jimmy Vo, Biology  
Ni Li, Chemistry  
*Mentor:* Wenwan Zhong  
Department of Chemistry

Nanoparticles are characterized by having at least one dimension measuring from 1 to less than 100nm. Although small, these particles have the potential to deliver drugs, enhance MRI contrast, or even detect proteins. Once nanoparticles enter the human body, protein from the serum interact and cluster around these
particles, forming “corona” – a shell-like structure encasing the nanoparticle. Exposure to nanoparticles can be accidental. Sunscreen is used as a barrier from the sun’s rays, but contains titanium oxide, which can enter cells of living systems. On the other hand, there is intentional exposure to nanoparticles, such as using iron oxide as a contrast for MRI patients. It is unclear what will come as a result of constant exposure to nanoparticles. Therefore, the first step to obtaining insight on this phenomenon is to study the interactions between iron oxide nanoparticles and common human proteins. To satisfy this inquiry, capillary electrophoresis is used to observe the binding affinity the protein exhibited on the nanoparticle. The first conjugation study recorded was that between the iron oxide and immunoglobulin G. By using a cross-linker, the antibody formed a bond with the iron oxide nanoparticle. From this result, it was concluded that immunoglobulin G exhibits binding onto the nanoparticles and further suggests that common proteins in serum with an amine group could possibly bind to the nanoparticles as well.

Finding a Voice for East-West Intercultural Music

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Combining Eastern and Western music has long interested many musicians and composers. The incorporation of music from various parts of the world creates a global conversation and identity. In my thesis, I address composers’ fascination with exoticism, Asian mysticism, and the creation of re-imagined Asia. The original composition that is the core of my thesis incorporates ethnographic interviews with the musicians who agreed to perform the work. I reconstruct their responses as a narrative, allowing me to catch a glimpse of the intercultural musical process in particular musicians' minds. I featured three musicians from various backgrounds in my thesis composition. We aim to explore ways of forming a music ensemble to collaborate in an unique artistic expression. I have composed a three-movement piece that combines instruments from various culture, influences, and backgrounds. Intercultural music is a process: an intercultural music-making happens not only during the performance but before and after. As each member of my ensemble negotiates and learns from each other, the voice of an East-West fusion emerges. In this presentation, I will present my second movement, where I have the singer perform a Chinese poem in the style of a African American spiritual. This movement enacts an intercultural fusion in the text, notation, soundscape, and most importantly the dynamic between the musicians and myself.

The submergence tolerance regulator, *SUB1A*, modulates physiological and molecular adaptations to drought stress in rice

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Submergence and drought are major natural disasters that cause severe damage to crop production, including rice. Most rice cultivars die within 7 days of complete submergence due to carbohydrate starvation. Yet, rice cultivars with *Submergence-1A* (*SUB1A*) survive complete submergence for 14 to 17 days. *SUB1A*, a transcription factor, restricts carbohydrate consumption, chlorophyll degradation, and elongation growth, allowing rice to economize carbohydrate consumption during stress. Upon de-submergence, the plants can reinitiate production of new leaves using carbohydrate reserves spared under stress. The role of *SUB1A* in response to water deficiency (drought) was evaluated. Comparative analysis of nearly identical rice lines with and without *SUB1A* indicated that *SUB1A* enhances recovery from prolonged drought stress at the vegetative stage by forming new leaves. Investigation of leaf relative water content reveals that *SUB1A* helps maintain the plant’s water balance. *SUB1A*
also restricts reactive oxygen species accumulation under drought stress to protect cells from significant damage. Gene expression analysis revealed that the submergence-inducible SUB1A is triggered by drought and polyethylene glycol treatment, whereas application of abscisic acid, a stress hormone, decreases accumulation of the SUB1A transcript. Notably, constitutive expression of SUB1A activates dehydration-resistance genes even under normal growth conditions. These gene transcripts are also up-regulated by drought-induced SUB1A. The overall findings note that SUB1A enhances drought stress tolerance by maintaining leaf water content, suppressing ROS accumulation, and inducing genes linked to drought tolerance. The data suggest that new rice cultivars bred for submergence tolerance (so-called SUB1 rice) may have increased drought tolerance during vegetative development.