

❧ Individual Projects ❧

Measuring Drug Concentrations in *Drosophila melanogaster* Using Mass Spectrometry

Ahmad Abazari

Mentors: John Greaves & Mahtab Jafari

This study was designed to develop a method for measuring drug concentrations in *Drosophila melanogaster*. No previous literature has defined proper techniques for analyzing drug concentrations in drug fed flies. These methods were intended to ensure that the drug mixed in their food was being up-taken. The experiment involved drugging approximately 560 flies in two test groups for 15 days with pioglitazone, a drug used for the treatment of Type 2 diabetes mellitus. From our drugged assay, ten flies were randomly collected per sample for analysis by a HPLC/MS. Once the analysis was complete, retention times, peak, and peak areas for Pioglitazone were observed showing the presence of our candidate drug in our fly samples. Six samples were analyzed, three which were spiked with pioglitazone during sample preparation and three dosed samples. Both spiked samples and dosed samples showed similar retention times specific for pioglitazone, allowing us to conclude that the drug was present inside the flies and thus ingested. We intend to further our analysis of the drug concentration experiment with tissue specific sampling from the fly abdomen and brain. We will also be working on forming a calibration curve that will allow us to find the optimal concentration range of future drugs to be analyzed by the HPLC/MS.

Asymmetric Information and the Manipulation of the Press by the White House

Carolyn Abdenour

Mentor: Matthew Beckmann

Our study seeks to answer the question of whether the White House manipulates the press during the time around the State of the Union Address. To answer this question, we collected and analyzed news articles from the *Washington Post* that discussed the State of the Union during the second, third, and fourth years of the first terms of presidents Carter, Reagan, H.W. Bush, and Clinton seven days before and seven days after the address was delivered to the American public. In these news articles, we noted whether the press coverage was positive or negative. Additionally, we investigated the types of sources the press used, including the president and his staff, the president's party, and the opposition party. We concluded that the White House can and does manipulate the press to generate positive news coverage for the president. This positive

news coverage is created with the help of White House tools such as spin doctors, pseudo-events, and press briefings. Our study strives to fill a gap of information regarding the symbiotic relationship between the White House and the press.

A Novel Approach to Deorphanization of G-Protein-Coupled Receptors

Abhishek Chadha

Mentor: Hans-Peter Nothacker

Research on G-protein-coupled receptors has implications on several medical conditions, including epilepsy. Genomic databases demonstrate the existence of previously unknown g-protein-coupled receptors. To determine the function of these receptors, however, the structure of the ligand that attaches to the receptor must be discovered. Because a receptor ligand has a natural affinity for its receptor, scientists can use purified receptor protein to fish the mystery ligand out of a tissue sample. Unfortunately, this is difficult when the receptor exists in low concentrations on the cellular surface. To rectify this, we are developing a method to localize receptors onto one side of a cell. After this localization, we will lyse cells to yield receptor-rich vesicles that we may use to fish out the ligand. Our project contains three parts: specifically conjugating magnetic beads to the receptor via an antibody; using magnetic force to slush these beads, along with their conjugated receptors, through the plasma membrane and towards one corner of the cell; and verifying that our method does indeed result in a greater concentration of receptor protein. A remaining obstacle in this project is the difficulty in finding the right conditions for conjugation of the magnetic beads to the receptor surface. The large amount of data collected while testing different conditions indicates that we are on the right track for accomplishing magnetic bead conjugation.

Identity, Narrative and Reconciliation: Towards a Model of Transitional Justice in Iraq

Hafez Adel

Mentor: Lina Kreidie

In the area of peace building, transitional justice refers to a broad set of initiatives that aim to redress the abuses of a past regime while creating a new normative order founded on a respect for human rights and the rule of law. The success of these programs has been shown to be largely contingent on how they are framed to the public and how well they interact with engrained identities and popular narratives about justice, fairness and reconciliation. The goal of this study was to explore Iraqi narratives about these topics through interviews and media analysis, especially as they

relate to current transitional justice projects in Iraq. The research has revealed a wide diversity of nuanced beliefs towards justice in the Iraqi context. A key narrative is the desire to make a clean break from the old regime through the operation of impartial and transparent public institutions. In this regard, many Iraqis expressed disappointment towards the politicized and sectarian nature of transitional justice in Iraq thus far. Though the desire for vengeance is strong among some, most prefer fair and public trials, which would allow the crimes of the old regime to be aired in a public forum. Ultimately, narratives of Iraqi unity were surprisingly strong given the prevalence of sectarian violence and rhetoric, and many voiced a desire for intergroup dialogue and national truth-telling to foster reconciliation.

Unexpected Patterns of Inheritance in Two *Brassica rapa* Fast Plant Mutant Strains

Katty Afshar

Mentor: Arthur Weis

As global climates change and environmental factors continuously affect the evolution of flowering plants, it is becoming increasingly important to understand how certain genetic traits are evolving in response to such changes. In this experiment, we attempt to identify factors affecting reproduction in two mutant strains of rapid cycling *Brassica rapa*. Based on anomalous results obtained from a previous experiment involving these mutant *B. rapa* strains, in which the Yellow-Green mutant strain appeared to be exhibiting a selective advantage over the Dwarf strain, we hypothesize that the deficiency in Gibberellin in the Dwarf mutants will negatively affect pollen tube growth and, therefore, inhibit the expression of the Dwarf phenotype in the subsequent offspring generation; and that the Yellow-Green *B. rapa* will produce more pollen than the Dwarf mutants. Our results showed that the Dwarves produced significantly more pollen than the Yellows ($p=0.044$), which does not provide support for our hypothesis. In addition, in terms of pollen competition, our results revealed that the phenotypic ratios of the F_1 generation were atypical from the expected phenotypic ratios derived using simple Mendelian genetics. The results of this study are important because they can lead to future studies on how the mutant alleles responsible for the Dwarf and Yellow phenotypes are affecting reproductive success.

Crystal and Keys: Exploring the Relationship of Acyl-CoA Carboxylase D5 and its Inhibitors

Shushmita Ahmed

Mentor: Sheryl Tsai

Tuberculosis is a highly contagious, multi-drug resistant disease, and is the seventh leading cause of death worldwide. *Mycobacterium Tuberculosis* is characterized by a thick, waxy membrane composed of long fatty acids called mycolic acids. This contributes to the bacteria's resistance to

antibiotics, disinfectants, and digestion by macrophages. As such, effective drug design should seek to block the formation of mycolic acids to make the bacteria more susceptible to treatment. A key component in mycolic acid formation is the multimeric enzyme Acyl Co-A Carboxylase. One important subunit of this complex is Acyl Co-A Carboxylase D5 (ACC D5). Through the crystallization of ACC D5 in both the apo form and with corresponding inhibitors, we hope to understand the structure of ACC D5 and effective ways in which the inhibitor interacts to prevent its activity. Thus far, I have been focusing on two inhibitors, both of which have been successfully co-crystallized with ACC-D5. The purification and diffraction of these crystals will give us insight into the nature of the inhibition. This will help lay the foundation of future drug design, in which we can specifically target ACC D5 to limit the production of mycolic acids.

FC/FGM in Northern Iraq: A Case Study on the Prevalence of the Practice

Nour Al-Hashimi

Mentor: Richard Matthew

A cultural practice challenged by many Human Rights advocates, Female Genital Mutilation (FGM), also known as female cutting, has been recently discovered in Iraqi Kurdistan. The procedure has been researched extensively by many international NGOs in various countries of Africa; however, the extent to which the practice prevails in regions such as northern Iraq is worthy of individual study. Linking the prevalence of FC/FGM to internal and external political oppression, religious orthodoxy in the region, and societal pressures, this study argues that the practice prevails because it is left unchallenged internally. When women rights are suppressed, the internal change directed towards women cannot occur. I have found that the complex societal hold that occurs with FC/FGM can only be understood through an empathetic lens. This practice extracts great controversy from the western world as healthy parts of the body are "mutilated"; however, this study takes a deeper look into society-influenced "mutilations" and the powerful culture behind them.

Space Cycle: Hypergravity Resistance Training

Saba Al-Hashimi

Mentor: Vincent Caiozzo

This experiment investigates the possibility of using a human-powered centrifugal device, called the Space Cycle, to counteract the muscle atrophy experienced when exposed to microgravity conditions in space. The aim of this study was twofold: to determine if the amount of G_z force generated through the midline of the body is linearly correlated to the amount of foot force produced, and to see if foot forces can be produced that immolate the force produced during a 10 repetition max (10RM) squat session.

Both of these tasks were achieved, demonstrating that hypergravity conditions can be met and tolerated with the use of the Space Cycle. This further validates the prospect of using the Space Cycle as a countermeasure to muscle atrophy in space.

Pitch Matching Among Native and Non-Tonal Speakers

Trevor Aller

Mentor: Bruce Berg

The objective of this experiment is to test whether there is a significant difference between tonal language speakers and non-tonal language speakers in their sensitivity to the pitch of pure tones. There is a correlation between tonal language speakers and sensitivity to pitch. This experiment investigates whether this difference can be replicated using a pitch-matching study. Subjects will be presented several trials of tones at different frequencies. Each trial will contain two tones, and the subjects will adjust the frequency of a second tone so that it has the same pitch as a target tone. These results will be assessed by analyzing the accuracy of matches across the two groups of subjects. Thus far, results are still tentative, although preliminary data suggests that native speakers tend to pitch match more accurately.

Using Bioinformatics to Analyze the RecX Protein

Albert Almada

Mentor: Alexander McPherson

DNA in all living cells are subject to base pair mismatches, mutations, or chemical alterations. If the genetic information encoded in DNA is to remain uncorrupted, damage must be corrected in a fast and efficient manner. DNA repair accomplishes this task by initiating the exchange of DNA segments at sites of sequence similarity between two DNA molecules. The RecA protein acts as a critical enzyme in this process, as it catalyzes the pairing of ssDNA with complementary regions of dsDNA in bacteria. It has been observed that over expression of RecA is lethal in *Pseudomonas aeruginosa*, underlining the importance of RecA protein regulation. In *Escherichia coli*, the RecX protein has been shown to attenuate RecA recombination activity *in vivo* and *in vitro*. However, the RecA-RecX mechanism of interaction has yet to be elucidated. We use a bioinformatic approach to reveal possible modes of RecA-RecX interaction and to describe a method to characterize a protein of unknown structure into its fundamental motifs. A multiple sequence alignment of 140 bacterial RecX protein sequences defined nine motifs based upon a 60% majority threshold. All motifs have been analyzed for possible ligand binding functional sites. Despite low similarity among RecX bacterial sequences, conservation of local folding was observed in our predicted secondary-structure alignment. Defined motifs cluster to the front face of our predicted *E. coli* RecX protein tertiary structure.

Extracurricular Involvement in Children with ADHD

Brenda Alvarez

Mentor: Carol Whalen

Attention-deficit/hyperactivity disorder (ADHD) affects a significant portion of today's youth. Although medication helps alleviate difficult symptoms associated with ADHD and allows children to function more effectively, problematic moods and behaviors often remain, which have direct implications for children's daily lives and learning opportunities. A developmentally important and relatively unstudied aspect of ADHD is involvement and performance in age-appropriate extracurricular activities during childhood. The relationship between activity participation and ADHD was examined through secondary analysis of data collected from a one-week electronic diary study of children with ages from 8 to 12 years. Twenty-eight children with ADHD (19 males, 9 females) and 28 comparison age-mates (19 males, 9 females) participated with their mothers. It was found that children with ADHD were less likely to participate in extracurricular activities overall than were their comparison peers. In particular, children with ADHD participated in fewer individual sports and youth groups than did comparison children. Interestingly, no group differences were found in the children's ability to perform these activities (as reported by parents), suggesting that parental time constraints or children's peer relations may be affecting participation rates. It is also possible that methodological differences in the assessment of ability and extracurricular participation may have contributed to the pattern of findings, given that measures of participation were more unobtrusive and thus presumably less susceptible to bias. These findings have implications for understanding and treating ADHD, because extracurricular activities provide opportunities for learning important social and performance skills.

A Comparison Between Mexican Immigration to the U.S. and that of Albanian Immigration to Italy: Social Networks as a Means to Adaptation

Jessica Alvarez

Mentor: Gilbert Gonzalez

This research explores the immigration process by focusing on the adaptation and survival strategies of immigrants, in particular, their social networks. Much research has been conducted on social networks, but not enough attention has been placed on how the use of social networks differs between immigrants of different ethnicity and host countries. To shed light on this issue, I compared two distinct immigrant streams in two distinct countries: Mexicans in the U.S. and Albanians in Italy. The question being studied is how the use of social networks differs between the two immigrant groups. This question was answered through a comparative design that looked at qualitative unstructured interviews of Albanian and Mexican immigrants. These

interviews revealed that both Mexican and Albanian migration streams used social networks as a means to adaptation, but the Mexican group tended to use networks more because their networks were stronger than those of Albanians.

Do Pioneer Trees Help Establish Valuable Hardwood Trees to Poor Farmland in the Tropics?

Laura Antonie

Mentor: F. Lynn Carpenter

Ecological succession is the process of recuperation of a biological community following a disturbance that scours vegetation from the land, such as tropical deforestation. Pioneer species may alter the microhabitat and therefore possibly influence establishment of later successional species. Their effects may either facilitate or inhibit colonization and growth of later successional species. The null hypothesis is that pioneers do not affect later stages. Restoration ecologists employ the concepts of succession to restore degraded land. One possibility is to plant pioneers, allow them to establish, and then plant later successional species under their canopies. From the point of view of local farmers, the later stage species are also valuable hardwoods. This project in southern Costa Rica focused on the effect of two pioneer trees, *Pinus tecunumanii* and *Vochysia guatemalensis*, on seedlings of four later successional species, *Calophyllum brasiliense*, *Astronium graveolens*, *Platymiscium pinnatum*, and *Tabebuia chrisantha*. Experimental blocks consisted of three treatments: seedlings planted under *P. tecunumanii*, under *V. guatemalensis*, and in adjacent pasture as a control. Seedling heights and basal diameters were measured at the time of planting and five months later. ANOVA on percent growth showed that treatment had a significant effect on *A. graveolens* but not on the other species. In conclusion, after five months, the pioneer trees had had minimal effects on seedling growth. However, differences may develop with time.

Influence of U.S. Policies on Oaxaqueña/o Immigration Trends

Lizbeth Antonio

Mentor: Gilbert Gonzalez

Discussion on immigration deals with illegal border crossings as a problem, but only from a myopic view that neglects a macro perspective. The debate assumes immigration to be a phenomenon that begins at the U.S./Mexican border but avoids any discussion of root causes in the sending countries. This research paper focuses on a smaller community in an attempt to connect the micro to the macro. Through a content analysis approach, using reports and publications, this paper focuses on the impacts that past U.S. economic policies have had on the Oaxaqueña/o community as a way of analyzing root causes of immigration. Using this approach, three stages of

immigration evolved and can be used to explain the Oaxaqueña/o immigrant experience. The first stage involves the introduction of the dollar into the Oaxaqueña/o community, a process largely influenced by the Bracero Program. The next stage followed by their dependence on this dollarized economy, which causes economic problems resolved by migration to the U.S. Finally, we now see the results of migration by the large Oaxaqueña/o immigrant population in the Los Angeles area.

Analysis of Triggered Star Formation in Interacting Galaxy Pairs

Jacob Arnold

Mentor: Elizabeth Barton

The most widely accepted model of galaxy formation is the slow accumulation and eventual merging of smaller galactic pieces into the larger units currently observed. At the core of this model lies the two-galaxy (galaxy pair) interaction. Analysis of the triggered star formation due to close galaxy interactions is conducted using galaxy pairs derived from the Two Degree Field Galaxy Redshift Survey (2dFGRS). Since it is only possible to measure galaxy velocities along an observer's line of sight and separations on the plane of the sky, setting limits on just these parameters identifies close galaxy pairs. The resulting data set contains 22,601 galaxies with 1,344 residing in a close galaxy pair system. The dependence of triggered star formation on the local environment is measured by using each galaxy's number of companions, within a projected separation on the sky of 700 kpc/h and 1000 km/s in redshift, as an environment statistic. Only galaxy pairs isolated within a projected radius of 700 kpc/h, have elevated average amounts of star formation in comparison to all galaxies with the same environment type. In contrast, close pairs of galaxies with additional companions exhibit similar or less star formation than the overall average. Properties of the 2dFGRS galaxies are inferred through the modeling and analysis of a redshift survey using numerical simulations. The simulations suggest that galaxies isolated in their own dark matter halos are very likely the immediate progenitors to the observed star forming close galaxy pair systems.

G-Protein Expression Levels of β - γ Subunits in $G_{i\alpha-2}$ Knockout Mice

Malerie Ayala

Mentor: Robert Edwards

Alterations in heterotrimeric guanosine nucleotide-binding protein (G-protein) have been found in many instances to be the basis for common human diseases. The pertussis toxin-sensitive inhibitory G-protein alpha subunit #2 ($G_{i\alpha-2}$) is important to the suppression of colonic inflammation and colon cancer, whereas the deletion of other G-protein alpha subunits does not result in a disease phenotype. This project investigates how the loss of $G_{i\alpha-2}$ signaling affects the expression levels of $G\beta\gamma$ subunits in

naling affects the expression levels of G β - γ subunits in primary cultures of subepithelial intestinal myofibroblast (IMF), colonic myofibroblast (CMF), and whole tissue samples in G α -2 wildtype/knockout mice in addition to effects seen in over-expression of dominant/negative G α -2 transfected human colon cancer cell lines. Primary myofibroblasts, human colon cancer cell line, and tissues were harvested and total proteins separated by SDS-PAGE and Western blotting using a pan G-beta antibody. Western blotting of G α -2 -/- cells and tissues revealed decreased levels of G-beta protein expression. However, semi-quantitative RT PCR on CMF G-beta subunits 1 and 5 showed cells expressing a +/- G203T- G α -2 G-beta 1, yet had no effect in G-beta 5. Our data suggests that loss of G α -2 protein leads to a decrease in beta subunit expression, while overexpression of mutant G α -2, although functionally inactive, enhances G-beta expression. G α -2 decreases adenylate cyclase activation, which decreases the catalysis of cAMP synthesis from ATP. Since ERK activation depends on G-beta signaling, decreased beta subunit expression may be responsible for decreased MAP kinase activity identified previously. This work illustrates the phenotypic complexity that can result from knocking out a gene.

Timing as a Predictor of Women's Adaptation to Parenthood

Megan Baker

Mentor: Wendy Goldberg

In a biological sense, the transition to parenthood is limited to conception through the birth of a couple's first child; in the psychological literature, this period when adults become parents includes the planning and behaviors leading up to pregnancy, the pregnancy period itself, childbirth, and into the first year following the child's birth. A recent trend in childbirth patterns among developed nations is increased rates of delayed transition to parenthood, and research has yet to fully decipher how late timing of parenthood impacts new parents' experiences. The purpose of this study is to examine the relationship between timing of the transition to parenthood and psychological adjustment to parenthood. This investigation involves a quantitative analysis of data from a short-term longitudinal study. Data were collected using interviews and questionnaires, which were given to expectant mothers (N=54) once during their pregnancy and again about one year following childbirth. Preliminary results indicate that later timing (age 29-38) women had higher work commitment during pregnancy than on-time women (age 20-28). Mothers' age was negatively correlated with their level of parenting commitment one year after becoming a parent. Analysis using multivariate models also will be reported. Results of this study suggest there are several key differ-

ences in the employment and parenting characteristics between women making the transition to parenthood at different ages.

Caffeine as a Cause of Coral Bleaching: Effects of Caffeine on the Proteins of Coral Symbiont Zooxanthellae

Kimberly Balazs

Mentor: Oladele Ogunseitan

If untreated, the caffeine in sewage effluent reaches the open ocean where it may affect marine life. Studies have shown that low concentrations of caffeine can induce bleaching in coral; i.e. caffeine causes coral to release their algal symbionts (zooxanthellae). Corals may recover from this, but bleaching events often lead to death. We hypothesized that caffeine causes the zooxanthellae to produce different proteins, which may lower their ability to adhere to the coral cells. We tested this by comparing proteins of four clades of zooxanthellae grown in low concentrations of caffeine with those grown in identical conditions without caffeine. Representative species were chosen from four clades of zooxanthellae to account for variation between the clades in their response to growth in caffeine. The proteins were extracted and analyzed using SDS PAGE performed on the PhastSystem with gradient 8-14 gels. The results indicated that our extraction procedure was successful in producing sufficient yields of protein; however, the resolution of the gels was too poor to show differences in the protein bands. We are now sending our extracted proteins to the School of Biological Sciences for a more detailed analysis using 2D PAGE. Since coral reefs are the most diverse ecosystems on Earth and provide many people with storm barriers, food, and a source of income, it is imperative that we determine the causes of bleaching and implement policy to lessen their effects. Thus, this research may have important implications for not only coral ecology, but also wastewater treatment and reef management.

The Metro Gold Line Eastside Extension: Effects and Implications of a Rapid Transit System on the East Los Angeles Community

Nadia Bamdad

Mentor: Susan Brown

This project examines the development of the Gold Line Eastside Extension, a six-mile route that will connect East Los Angeles to Downtown Los Angeles and Pasadena. The line will directly pass through Boyle Heights and end in East Los Angeles, two of the most underprivileged communities in the Los Angeles area. Previous research has suggested that transportation expansions have the ability to both benefit and harm the communities in which they exist. This is especially true of disadvantaged minority communities. The goal of this study was to identify and appraise potential community benefits and losses to gain a

greater knowledge of how disadvantaged communities respond to transit growth. Future economic and demographic changes within the community were addressed, based on information gathered through a series of interviews with community members and census data analysis. The East Los Angeles area faces structural problems of poverty, unemployment, crime and gang activity. It is clear that a transit line cannot be the solution to all inner city problems, but it may have some potential to assist in the positive development of the East Los Angeles area.

The Role of Depakote in Behavior of Individuals with Mental Retardation and Developmental Disabilities

Khang Bao

Mentors: Christy Hom & Ira T. Lott

This study was undertaken to determine if depakote, a valproic acid, is widely prescribed for seizure disorder or behavioral disorders, such as bipolar disorder. The result of this observation will aid physicians in prescribing depakote and other valproic acids to individuals with mental retardation and developmental disabilities at minimal risk of possible overuse or misuse of psychotropic medications. Data of consumers' taking or not taking depakotes for seizures or reasons other than a seizure disorder were recorded. The average standard scores from the Aberrant Behavior Checklist (ABC) and Adaptive Behavior Scale-Residential and Community, Second Edition (ABS-RC: 2) instruments with and without the uses of depakote were also compared. The data demonstrated that significantly more subjects took depakote for behavior disorders than for seizure disorders. Furthermore, over 50% of the total population did not take depakote, which might be due to high health risks correlating to the dosages prescribed.

Identification and Analysis of Inhibitors of the Transcription Factor Cph1 in the Yeast *Candida albicans*

Kristin Beardsley

Mentor: Haoping Liu

The protein Cph1 is a transcription factor at the end of the signal-transduction pathway for mating in the yeast *Candida albicans*, an opportunistic human pathogen. How Cph1 is regulated is not yet known, but the presence of regulator proteins, specifically inhibitors, that regulate Cph1 activity was hypothesized based on the pattern of regulation of the *Saccharomyces cerevisiae* Cph1 homolog, Ste12, and the fact that mating in *C. albicans* can only occur after the cells have made the infrequent phenotypic switching from white to opaque phase. The latter suggests that there is some mechanism of inhibition of the mating pathway in white phase cells. From a screening of *C. albicans* genomic fragments by activity assay, War1, Gat2, and Met13 were found to inhibit Cph1. The effect of two *S. cerevisiae* proteins, Dig1 and Dig2, known to regulate Ste12, on the ac-

tivity of Cph1 was a control. Interestingly, Dig1 inhibited Cph1 activity though the sequence homology between Cph1 and Ste12 is not very high. Although the proteins found in the activity screening do show strong inhibition of Cph1 activity, none of them is specific to one of the phenotypic switching phases, and therefore the link between Cph1 and phenotypic switching is probably not solely embodied by any of these proteins. Further study of Cph1 and the inhibitors found in this experiment will probably lead to the discovery of this link, which may be a feasible drug target for the treatment of *C. albicans* infections.

Experimental Study of Ignition Delay for Applications to Hydrogen and Syngas Fired Lean Premixed Gas Turbine Engines

David Beerer

Mentors: Vincent McDonell & Scott Samuelsen

Pre-mixing fuel and air is an effective way to achieve more uniform burning and low emissions in gas turbine engines. A challenge for implementation of this approach is the possibility of spontaneous ignition if the fuel and air are allowed to co-exist for long periods of time prior to entry into the combustion chamber. Of particular interest in this study are hydrogen and hydrogen containing fuels, such as those derived from gasification of coal or other materials. For these fuels, current kinetics models appear to greatly overestimate the ignition delay time, based on comparison with limited experimental data at gas turbine pre-mixer pressure and temperature conditions. Further studies are needed to clarify the discrepancies between models and experiments so that reliable tools can be developed for the design of gas turbine combustion systems for these types of fuels. This study summarizes existing models and results and reports on new measurements obtained in a flow reactor operated at conditions representative of those found in gas turbine engines. Some empirical suggestions are made that help rectify the differences observed. The results obtained confirm and extend the earlier measurements and further establish the need for kinetics work in the low temperature regime to capture the observed behavior.

Contemporary Jazz Dance Across Europe: An Investigation of Historical and Geographical Influence

Rachel Bell

Mentor: Bob Boross

Jazz, characterized by the use of improvisation and influenced by rhythms and techniques of jazz music, is one of the most widespread styles of dancing. Gus Giordano once defined jazz as "a living art form." As a student of dance, I set out to experience and interpret the life of jazz as it exists today in Europe. This project was conducted over a two-month period in Florence, London, and Paris to in-

investigate the similarities and differences of jazz in the European dance community. Focusing mainly on the variety of movement and technique of jazz dancing, this study examines three European cities and the influence of the varied cultural surroundings in each country. The goal was to explore the jazz dance community on the European continent and evaluate and compare the dancing of each country to the other to bring back a greater insight in dance outside of the United States. Despite the language barrier in Italy and France, I discovered that the body movement of the teachers and fellow dancers allowed me to understand and follow their direction without verbal communication. This key realization opened up an understanding of dance as a language in a different context, which transcended onto my view of dancing in other countries as well as when viewing performances in a foreign setting.

UCI Satellite: Latest Progress in the Endeavor to Space

Matthew Bennett

Mentors: Derek Dunn-Rankin & Benjamin Villac

UCI Satellite (UCISAT) is the university's first team assembled to develop a pico-spec cube satellite (CubeSat) for launch into Low Earth Orbit. A CubeSat is required to have 10x10x10 cm cubic dimensions and weigh less than 1 kg. These physical requirements present significant challenges to the design of a complex spacecraft, including component size and weight constraints, reduced power storage and output, and limitations on attitude correction capabilities. In addition, effects of the space environment, ionosphere, orbital speed, and altitude on the spacecraft's components and overall mission must also be considered. After three years of research, development, and requirement testing, the latest team has nearly completed the final design of the flight-ready spacecraft, UCISAT-1. This spacecraft not only addresses the considerations above, but also incorporates new on-orbit firmware update and recovery innovations not yet demonstrated by a university CubeSat in space. In addition, the project has expanded to include an overseas collaboration with engineering students of Aoyama Gakuin University in Japan. These students continue to develop the low-power magnetic torquer panel for attitude stabilization—another technology not yet demonstrated in a CubeSat mission. The combination of collaborative efforts and a fresh, innovative team have propelled the project to its highest level of achievement, and has also enabled the team to secure a position on the preliminary payload manifest for a launch aboard a Dnepr rocket in Spring 2008. This presentation will provide an overview of the mission and required research, an in-depth look at the status and innovations of key subsystems, and discussion of the challenges ahead for the upcoming launch.

The Effects of Betamethasone on Infant Cortisol Response at Six Months of Age

Shaheena Bielman

Mentor: Elysia Davis

Antenatal treatment with a synthetic glucocorticoid (GC) such as betamethasone is the standard of care for women at risk of premature delivery. Aside from the beneficial effects of antenatal betamethasone (AB) in infant lung maturation, improved respiratory function, and higher rates of survival, the potential adverse consequences raise concerns. Animal models have demonstrated that prenatal exposure to elevated levels of GCs negatively impacts certain aspects of infant development. In addition to exhibiting more anxious behavior, these animals display dysregulated hypothalamic-pituitary-adrenal (HPA) axis activity, one of the body's major stress regulatory systems. Limited information currently exists regarding the effects of prenatal corticosteroid exposure in humans on the functioning of the HPA axis. As few studies have considered the effects of prenatal corticosteroid exposure on preterm infant behavior and stress regulation, fewer still have considered the effects of betamethasone on infants born full-term. Premature infants with AB exposure have been observed to exhibit a suppressed cortisol response. The goal of this study was to investigate the effects of AB on the full-term infant cortisol response to stress. As results are presently in progress, it is necessary to determine whether AB exposure will have a prolonged effect on full-term infants' ability to mount a cortisol response to stress.

Investigation of the Microstructure after Creep Deformation of Metals at Very Low Stresses

Rita Blaik

Mentor: Farghalli Mohamed

Creep refers to the time-dependent plastic deformation of materials under constant stress or constant load. It assumes major importance in the high-temperature range—namely, above one half of the melting temperature. Detailed studies on the creep behavior of materials, for both ultra-high purity and commercial purity, at low stresses are of scientific and practical significance. In this research, focus was placed on studying the microstructure associated with a creep process that leads to acceleration in creep rates at low stress. This process is useful not only because it is relevant to the prediction of geological deformation, but because of its relevance to many design considerations. As a result of our work, isolated evidence regarding the occurrence of dynamic recrystallization (DRX) was found by means of optical and transmission electron microscopy. This new data tends to consolidate the previous data. The work in progress is to test single crystal aluminum for the purpose of establishing the occurrence of DRX.

Children's Internalizing Behavior: Comparison Between Divorce and Intact Families

Lauren Bloom

Mentor: Alison Clarke-Stewart

Divorce may affect children's psychological well-being, specifically their "internalizing behavior," which reflects anxiety and depression. Previous studies have shown that children of divorce tend to have poorer overall well-being and display higher levels of internalizing behavior in comparison with children from intact families. However, most past research has not followed children longitudinally from before the divorce. This study uses data from a large longitudinal study, the NICHD Study of Early Child Care and Youth Development, to assess children's internalizing behavior before and after divorce and to examine moderating effects of attachment security and emotional reactivity. Mother and teacher reports of children's internalizing did not show significant differences between children from divorced and intact families; children's self reports of depression were necessary to tap into internalizing problems. This information is important in developing age appropriate programs for children's adjustment after divorce.

The Effects of the 2000 Violence Against Women Act: Grants to Reduce Violence Against Women on College Campuses

Lauren Bloom

Mentor: Inderpal Grewal

The Office on Violence Against Women's budget for the Campus Grant Program, created to reduce violent crimes against women on college campuses under the Violence Against Women Act of 2000, has not increased in six years. Likewise, the federal appropriations for this program have steadily decreased over the last three years. It would appear that a correspondence between declining funds, the annual reported crime statistics that institutions of higher education are required to report under the Clery Act, and the effectiveness of the grants received by college campuses merits investigation. Forty grant recipients of these college programs were asked questions regarding the grant during telephone interviews. The results show that a large percentage of subjects believed that it was not difficult for their institutions to comply with the Clery Act, and many participants also acknowledged that there was an increase in students seeking services after their campuses received the grant. The increase in students seeking services is not a result of more crime occurring on campuses, but rather the creation of a more conducive environment for students to come forth with their experiences of sexual assault. This research shows that a longer funding period for this grant is necessary for directors of these awareness programs to prove to their administrations the importance of institutionalizing these programs on their campuses.

External Noise Generation for Electroconvection

Michael Blume

Mentor: Michael Dennin

Nematic liquid crystals have been shown to exhibit non-linear pattern-forming properties when driven by an alternating electric field. The modification of this behavior as the electric field becomes noisy has been studied, but the generality of the results has been limited by the fact that the noise used was not truly noisy. An investigation was made into ways by which truly random analog noise can be generated—specifically the use of resistors to generate thermal noise. It was found that resistor noise is probably not an optimal method for controlled noise generation. The issues encountered included the driving of the resistors, as DC power sources have imperfect outputs, swamping the signal being sought. This means that such a setup would, in practice, have to be run by battery, which is less than optimal for laboratory use. Another issue involved the isolation of the noise term from the driving term. Capacitors were used to subtract the large, unchanging voltage, but measurement or amplification of the remaining voltage invariably tainted the charge, causing the signal to drift. Researchers considering this problem may wish to investigate other methods for noise generation first.

Dance Through the Eyes of a Camcorder

Elena Briber

Mentor: Lisa Naugle

"Barter not the garden of eternal delight for the dust-heap of a mortal world. Up from thy prison ascend unto the glorious meads above, and from thy mortal cage wing thy flight unto the paradise of the Placeless" (Baha'u'llah). With this quote as an impetus, the dancer takes a journey to realize that she has a spiritual identity in an overwhelmingly material world. She finds that, although attachment to material qualities brings passing happiness, it is not ultimately the source of sustained contentment. Using a mixture of choreography and video editing techniques, the viewer of this videodance follows a solo dancer on a journey as she physically and metaphorically moves toward higher levels of consciousness. The visual effects in this composition are achieved primarily through the use of varying degrees of camera exposure and different camera angles and levels to portray the ascent of the performer. The dance that was recorded took place in three locations. The separate recordings were then manipulated to enhance the idea of the dancer in a process of transformation. While the dancer finds herself gradually ascending a staircase in one scene, in another she winds her way through a garden, at times thorny and unkempt, to discover a blooming rose at the end. The combination of video and dance has a double advantage to an emerging media artist and choreographer by allotting increased freedom of space-time elements and interpretation of reality that would be impossible in stage choreography alone.

Effect of Fraud on Health Care Evaluation: Journal of the American Medical Association

Erin Britt

Mentor: Paul Jesilow

Healthcare studies are important for determining evidence-based healthcare. Research in healthcare uses various methodologies. This study focused on articles published in the *Journal of the American Medical Association* (JAMA), from the years 2000 through 2005. We reviewed articles in this Journal that relied on various methods, including clinical trials, surveys of medical records, claims data, interviews, and surveys of a population. JAMA is one of the leading journals in the healthcare field, and is read by medical personnel and healthcare policy experts. The data used in the Journal's articles is important because of the Journal's visibility. The distribution of methods used in articles that appear in the Journal sheds some light on data being used in studies that impact healthcare policy. Our findings show that clinical trials are the most common data used in JAMA. This is a positive outcome, as clinical Trials are considered the "gold standard" in medical research. The implication here is that a leading journal in healthcare is using the best type of data.

Reconsidering Constantine: Did Bernini Really Bomb—or Did They Just Shoot the Messenger?

Elizabeth Broderick

Mentor: George Bauer

The lofty ambitions of the 17th century papacy were articulated primarily through the creations of one artist, whose sculptural and architectural triumphs transformed St. Peter's and the Vatican Palace, and decorated much of Rome during the course of his estimated seventy-year career. Gianlorenzo Bernini was the dominant artistic force in Rome for much of the Seicento due to his extraordinary ability to evince the spiritual ideals of the Catholic Counter-Reformation Church through visual forms that now define Baroque style at its pinnacle. One notable exception to the artist's success was his sculpture of Emperor Constantine on horseback—installed at the foot of the *Scala Regia* grand staircase entrance to the Papal Palace—also designed and executed by Bernini. *Constantine* was reviled by critics and the public alike upon its unveiling in 1670. This project aimed to explore the meaning of Bernini's sculpture within the context of patronage, artistic method and influence, and the work's location and its relation to the heart and soul of the Catholic Faith—the basilica of St. Peter's. My research led to the surprising conclusion that Bernini's sculpture was likely condemned for the audacity of the work's message, rather than because of its purportedly flawed execution. Bernini's *Constantine* was an unambiguous assertion of the papacy's temporal authority—and surely this message was not lost on the contemporary viewer.

London versus Irvine: Artistic Identity, Theatre, and Culture

Meghan Brown

Mentor: Donald Hill

Art, particularly theatre, is a definite product of environment. This summer I traveled to London with the Duke in London Drama Program to observe the differences between theatre created in America and theatre created in England. I saw over 30 plays in London, and tape recorded interviews with several artists (most notably famed British playwright Samuel Adamson) while immersing myself in an entirely different theatrical culture. In London, the theatre is valued as a vital and affordable art form, in which experimentation and risk is appreciated and new work is celebrated. This is drastically different from the theatrical culture of Southern California, where new work has trouble getting a strong audience and the taste tends towards revivals and classic musicals. The emphasis on new work was particularly valuable, granting an exposure to modern playwriting that is difficult to find in America. While abroad, I also attended plays in Dublin, Stratford-upon-Avon, and the Edinburgh Fringe festival. After returning home I used transcripts of my taped interviews, and concepts I had observed through experiencing day-to-day life in London and the theatre to begin work on my own play, titled "Psyche." I developed "Psyche" through meetings with professors and student theatre groups, culminating in a selective-scene staged reading at the end of fall quarter at UCI. The plot of the play is the culmination of my observations of differences in British and American theatrical cultures.

Characterization and Improvement of a Piezo-Driven Motor

Jaim Bucay

Mentor: Riley Newman

Research was conducted to characterize the motion of an existing piezo-driven motor that uses inertial slip-stick motion to progressively rotate a torsion pendulum. Through use of a program written in Mathematica, it was possible to determine which parameters of the motor's design have the greatest influence on its performance, and the range of values in which the motor could run most efficiently. Many parts of the original motor were redesigned to allow for ease of testing of these parameters and to improve its performance. Improvements included the implementation of improved piezo stacks and their housing, bonding the stacks to the lever arms, and changing the mass and moment of inertia of certain parts to insure the proper timing involved in accomplishing efficient slip-stick motion. At room temperature with no load, the original motor proved erratic and unreliable. Through the implementation of our improvements, the motor is now able to reach speeds of 39.2×10^{-4} (rad/sec) carrying a load of 955g.

Analysis of Trace Gases in Breath Samples to Diagnose Pneumonia Infection

Erin Bufalini

Mentor: Donald Blake

Pneumonia is one of the leading causes of death in people aged 65 and over. It results in the inflammation of alveolar sacs and increased fluid accumulation in the lungs, which can impair oxygen uptake by the body. Since the children of the Baby Boom are aging, the number of senior citizens is expected to increase in the near future along with the incidence of pneumonia infection. Physicians usually rely on a patient's symptoms and physical examination to diagnose pneumonia infection. Other modes sometimes used for diagnosing infection are chest X-rays, sputum samples, urine antigen analyses, and blood tests. Many of these modes of diagnosis, however, are either time consuming or have low sensitivity. This study attempted to use trace gases in the breath of pneumonia patients as a mode for quick and accurate diagnosis. Five pneumonia patient breath samples were collected in evacuated cans in the UC Irvine Emergency Department, along with the corresponding number of subject controls and room air samples. All of the samples were analyzed and quantified for over fifty gases on an ultra-trace gas analytical device developed in the Blake and Rowland Lab at UC Irvine. In pneumonia subjects, it was found that several sulfur halogenated and hydrocarbon gases were present in enhanced levels. Until further data is collected, the significance of these findings cannot be determined; however, trace gas analysis is a promising prospect that may decrease the cost and time of diagnosing infected individuals and increase the accuracy of diagnosis and treatment.

Perceived Barriers to Reporting Elder Abuse Among Hospice Professionals

Erin Bufalini

Mentor: Solomon Liao

Elder abuse is a widespread problem today in the U.S. It has been estimated that each year in the U.S., two million elderly are abused and that 84% of the abuse cases are going unreported. A majority of hospice patients have relatively little access to the outside world, so their health care staff may be the only other people, besides their caretakers, they come into contact with. This makes the training of these health care professionals about the signs and ways of reporting elder abuse vital in this population. We hypothesized that some elder abuse underreporting among hospice professionals was due to their belief that adult protective services (APS) would not consider some cases as abuse. In this study, surveys were delivered to all health care staff in an Orange County hospice care facility and to all employees in APS of Orange County involved with accepting and refusing reported abuse cases. The surveys listed five elder abuse scenarios and asked whether the situation should be

reported/accepted. There is not enough data to determine the results thus far. Once 50% of the surveys have been collected, the answers will be statistically analyzed via group mean independent t-tests, and compared between the two groups to determine the reluctance of health care professionals to report abuse cases and the willingness of APS to accept them. A one-way ANOVA will also be performed to determine the difference in report trends between hospice professional subgroups.

Panics and Bank Failure During the Great Depression

Andrea Bui

Mentor: Gary Richardson

A key debate about the Great Depression asks if contagion among depositors—bank panics—was a significant cause of bank failure from 1929 to 1933. Milton Friedman and Anna Schwartz popularized the theory that a contagion of fear led depositors to withdraw their funds from banks en masse, causing widespread failure of the banking system. Recent research on the relative importance of contagion in Depression-era bank failures supports Peter Temin's theory that bank failures were not caused by autonomous financial sector shocks, but merely reflected the overall weakness of the economy. An important limitation of this study is the use of only Federal Reserve member banks in the sample. Nonmember banks during the Great Depression outnumbered Federal Reserve member banks and may have reacted differently to panics. The goal of this study was to examine the same survival duration model used by Calomiris and Mason with a sample that included data on both nonmember and member banks. Though it was unclear exactly how the inclusion of nonmember banks affected measures of bank distress under the Calomiris and Mason model, the analysis suggests that nonmember banks are important in understanding bank failure during the Great Depression and should be included in further investigation of bank distress.

Determination of the Role of Endocannabinoid Signaling in the Anxiety Induced by Social Isolation

Lauren Burgeno

Mentor: Daniele Piomelli

Psychosocial stress is known to result in a higher prevalence of mood disorders, such as anxiety and depression. However, the neurobiological mechanisms of stress, and its impact on emotional states are not well understood. Recent evidence highlights that one of the neurobiological substrates involved in psychosocial stress is the endocannabinoid system, consisting of arachidonylethanolamide (anandamide), 2-arachidonoylglycerol (2-AG) and their corresponding receptors (CB₁ and CB₂). In particular, preliminary studies conducted in our lab show that anandamide levels are decreased in the prefrontal cortex and striatum of rats that were subjected to isolation-rearing, a

well validated model of psychosocial stress. Recent studies suggest that anandamide might attenuate anxiety-like behaviors in animals. The purpose of this study is to determine the role of anandamide in the anxiety-like behaviors induced by isolation rearing. To this end, I will test whether a specific inhibitor of anandamide degradation, URB597, can inhibit anxiety-like behavior in isolation-reared rats, by increasing anandamide levels in select regions of their brains. As a corollary of this hypothesis, I will verify the ability of rimonabant, a selective CB₁ receptor antagonist, to prevent URB597-induced effects in isolation-reared rats. Levels of anandamide will be determined via lipid extraction followed by analysis using HPLC/MS. Assessment of anxiety will be done using the elevated plus maze.

The Use of Claims Data in Medical Studies: Do Researchers Recognize Weaknesses?

Bryan Burton

Mentor: Paul Jesilow

Healthcare studies are important for determining evidence-based healthcare. Such studies employ diverse data—including claims data, which are derived from Medicare, Medicaid and other third party insurance providers. They are derived from billing information, and generally include patients' diagnoses, treatments given, and providers used. The use of claims data in medical studies has been questioned; some researchers suggest that the data may not reflect reality, and that studies that use them may produce inaccurate conclusions. We wondered whether researchers who used claims data addressed these weaknesses in their publications. We addressed this concern by focusing on articles published in the journal *Medical Care* in the years 2000 through 2005. We determined the percentage of articles in the journal that used claims data and calculated the proportion of claims data studies in which the authors recognized that the data might be flawed. Of the 722 articles in *Medical Care* from 2000–2005, 139 (19.3%) used claims data; only about one-third of the articles mentioned any limitations of the data. Researchers and policymakers may be unaware of the data's limitations; poor policy may be a result.

Tissue Discrimination via Laser-Induced Fluorescence

Lisa Butler

Mentor: Roger McWilliams

Skin cancer diagnosis often involves taking a skin biopsy sample. A non-surgical alternative would be less damaging, possibly less expensive, and faster to diagnose. Fluorescence spectroscopy may be the solution. When ultraviolet radiation is incident upon biological tissue, it gives off a

fluorescence spectrum that is unique to the sample's protein make-up. A model of tissue fluorescence may take advantage of this phenomenon. A reproducible experimental setup that allowed the fluorescence of tissue *in vitro* was developed, and is in the stages of progressing to *in vivo*. The results were obtained by statistically comparing the fluorescence of biological fluorophores known to exist in the sample analyzed to the fluorescence of the sample as a whole. The experiment verified that UV radiation incident on biological tissue induces fluorescence. Three key fluorophores (Keratin, NADH, FAD) were identified in the samples under investigation. Constrained multivariate statistical analysis is a promising method for identifying relative fluorophore contributions. Since different samples of different tissue types return varying coefficients, this method may provide a means of discriminating tissue types and diagnosing skin ailments such as skin cancer.

Microbial Resistance to Antibiotics Targeting DNA Synthesis

Daniel Cantu

Mentors: Luis Mota-Bravo & Toai Nguyen

Antibiotic resistance can cause longer hospital stays, increased bills, and even death. Quinolones are a class of antibiotics that inhibit DNA gyrase and/or topoisomerase IV, preventing transcription and/or DNA replication. Novobiocin, a coumarin, also inhibits DNA gyrase. Most clinically used quinolones are fluoroquinolones, which contain a fluorine attached to the antibiotic core domain. This study aims to examine the pattern of resistance of those antibiotics in environmental isolates. Ninety-seven bacterial isolates were collected from creek water and soil samples in the environment near UCI, and from tap water, bottled drinking water, and melted ice from various restaurants. Isolates were characterized by Gram stain, and tested against seven DNA synthesis-inhibiting antibiotics using the Kirby-Bauer method of disk diffusion susceptibility testing and following standards set by the Clinical and Laboratory Standards Institute (CLSI). The level of resistance to these antibiotics was: 0% gatifloxacin, 2.1% ciprofloxacin, 4.1% enrofloxacin, 0% levofloxacin, 2.1% norfloxacin, 17.5% nalidixic acid, 70.1% novobiocin. Fluoroquinolones showed the lowest levels of resistance, all less than 5%. Multiple resistance does not follow a random distribution. Differential efficacies against Gram(–) or Gram(+) isolates were not observed for any of the antibiotics.

Benefits of Exercise to Spatial Cognition Endure After Exercise is Stopped

Nicholas Castello

Mentors: Nicole Berchtold, Carl Cotman & Hans-Peter Nothacker

Previous experiments with various spatial learning tasks, such as the Morris water maze and the land-based radial arm maze, have generally found that spatial cognition is enhanced in rodents with exposure to exercise. This study assesses how long enhancements to spatial cognition endure after exercise is stopped. Mice were allowed voluntary access to running wheels for three weeks, followed by 0, 1, or 2 weeks without access to running wheels. Sedentary controls were never given access to running wheels. Following the completion of these exercise paradigms, spatial cognitive performance was measured on a radial arm water maze. All exercised animals, including those tested after a period of inactivity, made significantly fewer errors and had a significantly lower latency in the last block of water maze testing when compared to sedentary controls. Interestingly, exercised mice with one week of inactivity prior to water maze testing learned the task most rapidly, reaching criterion in significantly fewer trials than sedentary controls. These results confirm that exercise does improve the rate of spatial learning, and suggest that the exercise-induced changes to cognitive function and its underlying brain biochemistry remain for a period of time after exercise is stopped. A better understanding of these mechanisms may be important for the design of an exercise-based intervention to maintain normal cognition or cease memory deterioration.

Turkish Guest Workers in Germany: Temporary Workers Causing Permanent Dilemma

Joanna Chao

Mentor: Caesar Sereseres

The *Gastarbeiterprogramm* guest worker programs in Germany were created to fill low-skilled, industrial sector jobs generated by the post-World War II economic recovery effort. Laborers participating in the program were granted one to two year stays in Germany, which were designed to prevent permanent settlement while providing access to a large possible number of industrial jobs. The hope was to equip laborers with the broader skill set upon return to their country of origin. My study abroad experience and extensive travel in Germany sparked an interest to research the bilateral agreements between Germany and Turkey. While the *Gastarbeiterprogramm* was effective in filling short-term labor needs, the long-term ramifications showed that a vast majority of foreign workers stayed beyond the visa term and, through family reunification, the German foreign population increased rapidly. As the economic growth period cooled, Germany was left with a largely unemployed foreign population. Germany serves as an insightful

model to study foreign laborer return tendencies. The purpose of this study is to examine the motivations for staying. I returned to Berlin to conduct first-hand interviews and field research, which showed that first- through third-generation German Turks remain deeply rooted in their Turkish heritage despite their German citizenship. In focusing on the traits and characteristics of guest workers who either chose to remain in Germany or return to their home states, the return of guest workers and their families is not likely. Unless the German government becomes more stringent in its immigration policies, the Turkish immigrant population will continue to increase and, consequently, put more strain on the social security system.

Cavitation in Nanocrystalline Nickel Subjected to Uniaxial Tensile Deformation

Kelvin Cheung

Mentor: Farghalli Mohamed

It is well documented that some materials fail during tensile deformation as a result of the growth and interlinkage of internally nucleated voids or cavities. Also, it is well established that cavities can nucleate, grow, and interlink in the process of superplastic deformation, leading to premature failure. The presence of those cavities degrades the mechanical properties of superplastically deformed components and consequently results in serious constraints on the commercial use of superplastic materials. For this reason, intensive efforts have been devoted to studying the role of cavitation in limiting superplastic behavior. In this study, cavitation has been observed in nanocrystalline (nc) Ni that exhibits an average initial grain size of 20 nm and has been tested in the temperature range 393 K–473 K. Preliminary data indicates that the extent of cavitation increases with increasing test temperature. Samples are now being examined using transmission electron microscopy (TEM) for the purpose of providing guiding information that can be used to identify the origin of the cavitation processes. In addition, future work will involve the use of atomic force microscopy (AFM) to examine the occurrence of grain boundary sliding, which, in the absence of accommodation, can lead to the nucleation of cavities.

Does Restoration of Vegetation to Degraded Land in the Tropics Also Restore the Diversity of Insect Communities?

Wesley Chin

Mentor: F. Lynn Carpenter

Dr. Lynn Carpenter's lab at UCI has studied reforestation of eroded pasture soils in Costa Rica since 1993. One finding has been that planting native trees speeds up forest regeneration compared to natural regeneration. Some of these reforestation plots have grown well, but in the natural regeneration plots only pasture grass and some ferns exist, even after 13 years. Therefore, the re-

forestation plots are ecologically succeeding compared to the natural regeneration plots. However, nobody has tested whether reforestation success relates to increased diversity of insect communities. To test the hypothesis that it does, I tried several methods of assessing insect diversity in successful versus less successful plots. I settled on baited pit traps to collect insect samples in reforestation and natural regeneration plots. Using the Shannon Diversity Index on insect orders, I found that insect diversity was higher in my limited sample of the reforested areas than in the natural regeneration plots. This study suggests that the reforestation efforts of the Carpenter Lab are not only helping to expedite succession of the flora, but also increasing the diversity of insect communities as well.

The Future of the US-ROK Alliance: Limitless Potential but Likely Failure

James Cho

Mentor: Robert Uriu

Since its liberation, the Republic of Korea (South Korea) has been a stalwart ally of the United States in East Asia, along with Japan. However, with the changing regional political landscape, and with the United States' evolving post-Cold War priorities, prospects for the alliance are grim. The purpose of my paper is to examine how the various aspects of the alliance (economic, political and military) are crumbling. I also examine the potential of other angles, particularly the regional historical and cultural ties, and Kim Jong-Il's recalcitrance, to be the death knell for the alliance. I study the health of the alliance immediately following the end of the Cold War, and explore how drastically it changed within a generation. Other layers of analysis include evolving trade relations and differences in perception within the South Korean generations. Historical and cultural ties cannot be ignored, and I take that into consideration as I analyze the future of the alliance. I find that there exists tremendous opportunity for the continued or renewed cooperation for the alliance (such as the containment of a rising China). However, I believe that that the ultimate test will be U.S./China relations; if they begin to heat up, Korea will be faced with the unfortunate decision to choose between the two. At the best, Washington could hope for Seoul's ambivalence, but at the worst, Korea may even side with Beijing.

Use of Ultrasound to Risk-Stratify Pregnancy Outcome in Emergency Department Patients with First Trimester Vaginal Bleeding

Hee Sun Choi

Mentor: John Christian Fox

Ultrasound is an excellent tool to use to obtain exceptional information about the status of the conceptus, and we studied how the information can be used to predict preg-

nancy outcomes in patients with vaginal bleeding. Vaginal bleeding during the first trimester of pregnancy can be a result of spontaneous abortion, gestational trophoblastic disease, implantation bleeding, cervical ectropion, cervicitis or ectopic pregnancy. It is essential to include all diagnoses, due to potential life threat and threatened abortion. Pelvic ultrasonography is considered the best procedure to evaluate every pregnant patient with vaginal bleeding in early pregnancy, due to there being no evidence of risk to mother or fetus and immediate test results, while providing five potential diagnoses in such situations. For example, pelvic ultrasonography can reveal ND IUP (no definitive intrauterine pregnancy), IUP (intrauterine pregnancy), LIUP (live intrauterine pregnancy), ABN IUP (abnormal intrauterine pregnancy), and ectopic pregnancy. Finding ND IUP, IUP and LIUP indicates potentially viable pregnancies, while finding ABN IUP and ectopic pregnancy signify non-viable pregnancies. A total of 182 women were enrolled and, of the 136 that met inclusion criteria, 38 (28%) carried to term and delivered live babies. Of the 38 live births, 31 (82%) were noted to have a documented LIUP at the time of the emergency department visit. The other findings included IUP (13%) and ND IUP (5%). None of the ABN IUP resulted in a live birth. Therefore, in women with first trimester vaginal bleeding, the likelihood of carrying the pregnancy to term appears to be related to the findings of the pelvic ultrasound performed.

Impact of Fractal Network Vascularization and Compartmentalization of Biological Absorbers on Optical Properties of Tissue

Andrew Choung

Mentor: Vasana Venugopalan

Non-invasive methods for determining tissue optical properties can provide significant information regarding structure and physiological status. However, biological tissues are quite heterogeneous, composed of a complex assembly of cells, extra-cellular matrix, and vasculature. One important issue in the field of biomedical optics is the impact of the compartmentalization of optical absorbers (such as in a vascular network) in heterogeneous tissues when recovering tissue optical properties using standard techniques that assume a homogeneous tissue. I have developed an optical phantom system in which thin microfluidic devices composed of poly-dimethyl-siloxane (PDMS) are etched with vascular networks of varying fractal dimensions. These devices were filled with equal amounts of optical absorber and submerged at a constant depth within a homogeneous liquid tissue phantom. Spatially resolved diffuse reflectance measurements were taken at source detector separations over a range of 0–10 mm using a cooled CCD camera system, in which He-Ne laser light ($\lambda=632.8$ nm) illuminated the surface of the liquid above the center of each vascular network. These results show a significant impact of fractal

dimensions of the vascular networks on the recovered optical properties. Specifically, vascular networks of higher fractal dimension (i.e., complexity), resulted in an increased attenuation of the detected optical signal. These results show strong evidence to support the idea that photons traveling through a vascular network of increased fractal dimension are more likely to be absorbed and result in a more accurate estimation of optical properties.

Memory Induction in *Aplysia californica*: Effects of Sub-Threshold Training on Subsequent Acquisition

David Choy

Mentor: Thomas Carew

Earlier studies within *Aplysia* described a variety of experimental training protocols that did not result in overt long-term memory (LTM) expression. However, these studies did not investigate the possible latent contribution of this training to future learning opportunities. Here, we explored the possibility that training, which is sub-threshold for the induction of persistent LTM, can still contribute to learning at remote time points. Despite not showing overt long-term memory 24 hours following initial training, previously trained *Aplysia* demonstrated facilitated learning in comparison to controls. Specifically, our results describe the facilitated induction of short- and intermediate-term memory, but we observed no apparent contribution to memory persisting 24 hours following training. We conclude that sub-threshold training for long-term memory does in fact induce a persistent latent memory, which can enhance subsequent learning at long-term time points.

Hygroscopicity of Ultrafine Organic Aerosol Particles

Enosh Cohen

Mentor: Sergey Nizkorodov

Ultrafine particles (< 100 nm in diameter) have unique chemical and toxicological properties due to their unusually large surface-to-volume ratio. Our studies focus on hygroscopic properties of ultrafine particles composed of mixtures of soluble salts and organic surfactants, including sodium oleate, dioctyl sodium sulfosuccinate (AOT), and sodium dodecyl sulfate (SDS). The amount of water taken up by particles at different relative humidities is used as a quantitative measure of their hygroscopicity. The measurements are done using a special instrument called Hygroscopicity Tandem Nano Differential Mobility Analyzer (HTNDMA). Ultrafine particles are first generated by an electrospray method. A certain size of particles is selected to produce monodisperse aerosol using specialized aerosol techniques. The particles are then exposed to water vapor with a controlled relative humidity. The change in particle size induced by the exposure to water vapor carries information about the particle structure. We find that particles composed of aqueous surfactants and NaCl take up differ-

ent amounts of water, depending not only on particle size but also relative amount of surfactant.

Two-Tier Requirements Documentation

Jovel Karen Crisostomo

Mentor: Thomas Alspaugh

The use of storytelling in requirements engineering has many diverse and powerful benefits—such as capturing context sensitive information—that have not been well researched. Stories are not only well understood, but they encourage others to reciprocate, spawning more stories, thoughts, and theories. I propose a two-tier requirements documentation, augmenting the requirements elicitation and documentation state of the software cycle, combining literary techniques with current documentation techniques. This would add the benefits of storytelling to contemporary requirements engineering tools. The primary inspiration for this approach is Roland Barthes's essay, "S/Z." The two-tier approach uses a similar structure in that the requirements document is broken into two parts: the story and the detailed requirements documentation. Like "S/Z," the two-tier approach breaks every story into segments, each referring to a more detailed explanation. However, instead of having the second level analyze the meaning of every story segment, as Barthes does, the proposed two-tier approach expands on each story segment to include alternative and exceptional flows that users of the software may encounter. Not only will the story level help introduce new concepts of the system to other developers, it has the potential to inspire others to find alternatives and possible additions to the documentation. I believe that creating such a requirements document will ensure that requirements are complete and understandable to a wide audience.

Contemporary and Classical Dance: Perspectives from Salzburg, Austria

Bonnie Crotzer

Mentor: Jennifer Fisher

Displacing one's self as an artist is a requirement for growth and renewed inspiration. The challenges of traveling and the effort required to practice one's art in an unfamiliar environment results in strengthened character and a broader-minded individual. For dancers, it is essential to practice our art form in new places to challenge ourselves and to learn things we would not be exposed to at home. I traveled to Salzburg, Austria to attend the Salzburg International Academy of Ballet to grow as an artist and to learn about dance opportunities I could relay to dance majors at UCI. By talking to dancers from all over the world, I was able to gain insight from the perspectives of young dancers on the international dance community. Dialog included dancers' preferences for modern, contemporary dance, or ballet; definitions of each; a dancer's perception of the

“other”; and educational background that led to individual opinions and foresight in dance for our generation. A dancer’s relationship to his/her preferred genre was influenced by the extent of a student’s education and exposure to various dance forms, their teacher’s encouragement, and their country’s cultural values. The more exposure and education a dancer had with contemporary dance or ballet, the more appreciation the dancer had for those forms. Recurring in many conversations was a decline in interest in ballet for the more mature dancers, who were in need of diversity for growth, reaffirming the necessity for new experiences. Sharing information and beliefs across cultural and language borders is invaluable for the creative life of dancers, as well as for evolution of the art form of dance.

Positive Selection Drives the Evolution of Long-Wavelength Opsins in the Butterfly Genus *Limenitis*

Cristina Cuevas

Mentor: Adriana Briscoe

Butterflies depend on color vision for a variety of behaviors such as host plant choice and mate selection; however, little is known about the evolution of this trait. We tested the hypothesis that positive selection is driving the evolution of visual pigments in butterflies by investigating the molecular evolution of the L opsin gene in *Limenitis*, a mimetic butterfly genus displaying a remarkably diverse range of long wavelength sensitive pigments. Using PCR, cloning, and direct sequencing techniques, we obtained L opsin gene data for 24 individuals of *L. arthemis astyanax* and one of *L. archippus archippus*, species with highly divergent visual pigment phenotypes. A statistical test that compares the ratio of amino acid substitutions within species versus those between species revealed a significant excess of amino acid replacements fixed between species, strongly suggesting that positive selection has driven the fixation of the divergent phenotype.

Role of Lhx2 in Proliferation in the Dorsal Telencephalon

Bitia Cyrus

Mentor: Edwin Monuki

Lhx2, a LIM homeobox transcription factor, is expressed in the dorsal telencephalon of the developing central nervous system, and is vital for normal development of the cerebral cortex. Lhx2 knockout mutant mice exhibit a small forebrain phenotype, which was attributed to a proliferation defect of cortical precursor cells, although the mechanism of this action is not well understood. I hypothesized that precursor cells of Lhx2 knockout mutant mice undergo premature neuronal differentiation. To uncover how Lhx2 regulates neurogenesis and, more specifically, how it affects precursor cell proliferation in the developing embryonic mouse cerebral cortex, I performed immunohistochemistry on tissue sections of embryonic

mouse cortices at various developmental stages using a Tbr1 antibody that marks neurons, and used microscopy and quantifying techniques to analyze these sections. I found that Lhx2 mutants generally display thicker Tbr1 positive zones than controls. My results suggest that mutants lacking Lhx2 display premature neuronal differentiation along the dorsal telencephalon.

Cholinergic Nicotinic Mechanisms of Anesthetic-Induced Amnesia

Bobby Dahlin

Mentor: Michael Alkire

This study aimed to help elucidate mechanisms of propofol-induced amnesia. Anesthetic-induced amnesia might be mediated via interactions with either GABAergic or cholinergic receptors. Here, we test the latter. The drug SIB-1553A is a novel selective nicotinic acetylcholine agonist. Memory was assessed *in vivo* at 24 hours using the inhibitory avoidance model in rats. Rats were given sham-surgery or bilateral cannula implantation into their basolateral amygdala (BLA) prior to inhibitory avoidance training. Separate groups of sham rats were either given a pre-training injection of saline or a sedative dose of propofol (25 mg/kg/IP), followed by either a post-training injection of vehicle, nicotine, or SIB-1553A. Implanted rats underwent a pre-training injection of saline or propofol, followed by a post-training BLA infusion of nicotine or vehicle. Rats given a post-training systemic injection of nicotine showed a significant memory enhancing effect. Post-training systemic injections of SIB-1553A failed to affect memory performance or to block propofol’s amnesic effect. However, intra-BLA infusions of nicotine did block the amnesic effect of propofol. I propose that differences in receptor specificity between nicotine and SIB-1553A account for these findings, and that interactions within the BLA are important for understanding the effects of anesthetics on the memory consolidation processes.

Analysis of Secondary Organic Aerosol Particles

Mark Paul Dailo

Mentor: Sergey Nizkorodov

Secondary Organic Aerosol (SOA) particles are produced in the atmosphere as a result of oxidation of volatile organic compounds by O₃, OH, and NO₃. In this project, we are interested in investigating the properties of SOA formed at different humidities, NO_x content, and ozone concentration. We generate these particles by reacting d-limonene vapor and ozone in a Teflon chamber. The particle size distribution is measured using a scanning mobility particle sizer (SMPS), or the particles are collected on glass fiber filters for further analysis. The particles are extracted into dichloromethane and analyzed using both UV/Vis and infrared spectroscopy. Infrared spectra give us insight

as to what functional groups are present in the aerosol, and UV/Vis spectra indicate whether the SOA absorb light at atmospherically relevant wavelengths ($\lambda > 295$ nm). After these initial studies, we use a photochemical cell coupled to high-sensitivity laser absorption spectrometer to study their photochemistry. Photolysis of limonene SOA in the tropospheric actinic region ($\lambda > 295$ nm) readily produces formic acid as a gas-phase product, and we are interested in how the presence of NO_x will affect this result.

Sino-Japanese Relations: The East China Sea Conflict

Kim Ngoc Danh

Mentor: Caesar Sereseres

The uninhabited Senkaku Islands in the East China Sea are located between China and Japan. There is diplomatic tension between the two countries in deciding how to exploit the islands' gas reserves and which islands belong to which country. This study analyzes existing literature to better understand the constructs that influence Sino-Japanese tensions over gas exploration. Personal observations gained through the UC EAP Studying Abroad Program at Peking University are also incorporated. Currently, both countries have agreed to resolve the conflict through joint development in the disputed area, but they disagree on where cooperation should take place. Sino-Japanese relations are moving to a new stage in diplomatic relations and economic cooperation. China's attitude towards Japan currently favors cooperation and stresses the importance of China's economic relationship with Japan and the need to drop radical anti-Japanese sentiments. Japan has formally admitted to wartime aggression and expressed deep remorse and apology. The Chinese government and public give high credit to Japan for these statements. My research aims to determine: (1) how the Senkaku Islands fit into the development of more cooperative relations between the two countries, and (2) the significance of this issue in the broader bilateral relations. Research shows that a cooperative relation between China and Japan is probable in the near future. This diplomatic *rapprochement* implies that China wants to avoid diplomatic problems with Japan, since it will need to focus on internal issues—including the 2008 Beijing Olympics, the 2010 Shanghai World Expo and Taiwan-related issues—in the coming years.

The International Pharmaceutical Industry and the Treatment of AIDS

Linda Danh

Mentor: Caesar Sereseres

Current UNAIDS/WHO statistics show that 38.6 million people worldwide are affected by the AIDS epidemic. Studies show that only 1.65 million people are receiving antiretroviral treatment, while 6.8 million people are in immediate need of these life-saving drugs. This research is designed to examine the reason behind the severely insuf-

ficient treatment of AIDS and its relationship to the international pharmaceutical industry. I have compiled and examined literature on the role, responsibilities and rights of the pharmaceutical industry and the status and treatment of AIDS. Patents legally reward the advanced development of drugs for pharmaceutical giants internationally. But they have become an ethical issue in treating the needs of patients, and many reports claim that they are the major barrier for AIDS treatment. Research suggests patents of essential medicines directly affect the lack of access to anti-retroviral drugs due to significantly inflated drug prices. These patents have even led to threats of trade sanctions and lawsuits against Third World countries for using compulsory licenses to produce these necessary drugs. Currently, the best treatment for AIDS is the triple treatment "cocktail," which is too expensive for an individual to sustain. The price of this treatment, multiplied by the millions of people in need, creates an insurmountable problem for countries like South Africa. This research shows that various factors influence the treatment of AIDS, with the pharmaceutical patents directly controlling the availability and distribution of such drugs.

Effect of Cigarette Smoke Condensate on Fibroblast Cell Viability and Induced Apoptosis in Organotypic Skin Models

Belinda Dao

Mentor: Brian Wong

Past studies have strongly linked cigarette smoking and tobacco use to malignant diseases in multiple organs of the human body as well as to increased health risks. Although it has been acknowledged that smoking contributes to premature skin aging, the effects of cigarette smoking and tobacco use on the human skin still remain relatively unclear. This study seeks to assess fibroblast cell viability and induced apoptosis in organotypic tissue-engineered artificial skin models (RAFTs) after exposure to cigarette smoke condensate (CSC). RAFTs were constructed using a neonatal cell line and exposed to 0 and 50 $\mu\text{g}/\text{mL}$ of CSC for a 14-day period. Cell viability and apoptosis were assessed using a fluorescence dye system and TUNEL system, respectively, and imaged using confocal microscopy. Manual counts of live, dead, and apoptotic cells were completed to quantitatively assess cell viability and apoptosis. Results indicated no immediate cell death after CSC exposure, but progressive cell death ensued after day 7. Fibroblasts in CSC-exposed RAFTs also underwent apoptosis in a time-dependent manner. These findings agree with past work on RAFT contraction, suggesting that a high dose of CSC produces a cytotoxic effect on fibroblasts and that apoptosis is one mode of cellular response. Cigarette smoke condensate, therefore, appears to deleteriously affect fibroblasts in RAFT skin models.

The Inculcation of Democratic Values in California's Education System

Valerie Dao

Mentor: Mark Petracca

A recent criticism of the education system is the inclination for school curriculum to overemphasize subjects covered in high stakes testing, which inhibits the dissemination of qualitative information, particularly in the study of civics. The education system is a major vehicle in political socialization; democracy would not be robust in any country without a working political culture conducive to democratic values and practices. As a result, education plays a major role in the sustenance of the democratic government and way of living. Democratic education should allow students to develop critical thinking skills that would enable them to become active participants in society through engaging in civic-minded activities. This project analyzes the extent to which California's state curriculum addresses and implements the study of civics by comparing the state curriculum and national standards. Data gathered and analyzed suggests that the California curriculum is weak, in comparison to other states, in the education of democratic citizenship.

The Rehnquist Court: Democratic Implications of a Countermajoritarian Institution

Valerie Dao

Mentor: Mark Petracca

The possible role of public opinion in the decision making process of the Supreme Court has long engaged scholars to question the democratic implications of the judicial institution. One prevalent school of thought questions the legitimacy of the substantial policy-making power that an independent Supreme Court wields over the democratic masses through its use of judicial review. This project examines the ideological correlation between major Supreme Court decisions during the Rehnquist Court era and corresponding public opinion through a time series analysis. Evaluation of the data gathered leads to the conclusion that, though the relationship is weak, the Court is mainly in congruence with the American public.

The California Community College System: Latino Student Transfer Patterns to the University of California

Judy De La O

Mentor: Caesar Sereseres

The state of California boasts the largest community college system in the United States. One hundred nine campuses serve as a gateway for millions of Californians who desire to go on to an institution of higher education. Today, the California community colleges are heavily populated by students of color; in particular, Latino students make up approximately 40% of the total population. Yet

Latinos are the least likely group to transfer to University of California campuses. This can be attributed to the growing educational inequalities of California's public schools. For example, out of 46 Latino high school graduates, 17 go to a community college, and only one transfers to a four-year institution. This study, through a series of interviews with U.C. faculty and surveys of Latino community college students within the Los Angeles area, seeks to understand the factors that account for the low transfer rates of Latino community college students to the University of California. Findings suggest that Latino students would prefer to transfer to a U.C. campus, but the lack of information on how to transfer prevents them from doing so. Thus, aggressive recruitment by the University of California, and a renewal of the Master Plan would increase Latino transfer student rates into the U.C. campuses. This study will contribute a greater understanding of ways to increase University of California enrollment for California's fastest-growing population.

Investigating the Effective Use and Limitations of Internet-Based Rating for Facial Beauty Projects

Zlatko Devcic

Mentor: Brian Wong

Historically, the rigorous study of facial beauty requires using a numerical rating scale to assess facial portraits. These ratings are then compared with quantitative numerical measurements of linear and/or angular physical measurements of the face. The goal is to identify correlations between the dimensions of various facial measurements and the facial rating scale. While this approach is the current research standard, it is limited by the considerable time and effort required to recruit raters. To overcome these significant logistical challenges, we conducted a pilot investigation on the potential use and limitations of a Web-based method to rate facial portraits. Eighty faces were registered on a commercial facial rating Web site, and we monitored their average rating score versus the number of raters over a three-week period. During that time, an average of 900 evaluations were obtained for each face, a ten-fold increase over typical numbers used in previously published studies using traditional approaches. The analysis of the average beauty scores, using regression analysis and T statistics, showed that this Web-based approach is reproducible and as reliable as the traditional approach, which relies upon a much smaller and predetermined group of raters. In addition, the Web-based approach enables researchers to obtain demographic information on the raters, which can be used for further analysis. By quickly and efficiently increasing the total rater count ten-fold, Web-based rating is a useful tool for reducing sampling bias and ameliorating the logistical challenges associated with traditional focus group rating sessions.

Are Bacteria in Drinking Water More Susceptible to Antibiotics than Bacteria from Unsanitary Environments?

Daniel Diamond

Mentors: Luis Mota-Bravo & Toai Nguyen

The effectiveness of antibiotics is critical to combat disease-causing bacteria. However, more strains of bacteria are becoming resistant to antibiotics, which is a serious problem in the control of bacterial infectious diseases. The objective of this study is to isolate and characterize strains of bacteria from sanitary (drinking water) and unsanitary (soil and urban river) environments to compare their levels of resistance to antibiotics. Seven antibiotics from diverse classes were tested: Rifampin, Linezolid, Colistin, Polymixin B, Sulfisoxazole, Nitrofurantoin, and Trimethoprim. The bacterial isolates were collected from soil, an urban creek in Southern California, bottled drinking water, and ice from fast food restaurants. Ninety-seven bacterial isolates were collected, characterized by Gram staining and shape, and tested for their resistance to the seven antibiotics by disk diffusion susceptibility testing, according to the standard methods of the Clinical and Laboratory Standards Institute (CLSI). The percentage of resistance found to each antibiotic are as follows: Rifampin(51.5%), Linezolid(56.7%), Colistin (22%), Polymixin B (12.5%), Sulfisoxazole (49.5%), Nitrofurantoin (38.5%), and Trimethoprim (38.5%). More than 30% of the isolates tested were resistant to five of seven antibiotics tested. Resistance to an antibiotic was found to be independent of the resistance to other antibiotics. A higher incidence of resistance was found in isolates from sanitary than unsanitary conditions for four antibiotics. No differences were found in resistance between Gram (+) and Gram (-) isolates.

Physiological and Psychological Outcomes Associated with Childhood Risky Family Exposure

Leah Dickenson

Mentor: Sally Dickerson

A long-standing and well-supported connection exists between abusive childhood experiences and adverse mental health outcomes in adulthood. The literature is not as clear, or as extensive, however, on associations between adverse, but not necessarily abusive, childhood family environments and adult outcomes. Physiological mechanisms may account for some of the adult outcomes in maltreated children. This study, which has been informed by the Risky Families model, compared objective physiological measurements and self-report measurements of stress reactivity with prior exposure to a Risky Family (defined as non-nurturant, conflict-ridden, cold, and/or neglectful). 120 undergraduate students underwent an acute, socially-evaluative laboratory stressor; heart rate, blood pressure and salivary cortisol were assessed during baseline, stressor

task, and recovery. Self-reported family history and mental health measurements were collected from all participants. Exposure to a Risky Family was associated with poorer mental health outcomes and different patterns of stress reactivity compared with non-Risky Family counterparts.

Offenders with Co-Occurring Disorders: Treatment and Recidivism

Jenni Dillman

Mentor: Susan Turner

In 1999, 16.2 percent of prisoners in the United States suffered from mental illness. In 1999, over three quarters of inmates in state prisons could be characterized as drug involved. Little is known about the proportion of offenders suffering from both a serious mental illness and a co-occurring substance abuse disorder (COD offenders). Research has indicated that COD offenders are at higher risk for recidivism than mentally ill, substance abusing and non-disordered offenders. This study examined the size of the COD population in California, how treatment is currently being received by them compared to mentally ill and non-disordered offenders, and the rate at which they recidivate compared to mentally ill and non-disordered offenders. A random sample of 900 offenders paroled from California correctional facilities in 2004 was selected from official record data maintained by the California Department of Corrections and Rehabilitation. Two analyses were performed. The first analysis assessed treatment dosage as a function of mental health status of the offender (mentally ill, co-occurring disorders or non-disordered). A second analysis examined the recidivism rates of offenders as a function of mental health status and treatment dosage. The results indicated that mentally disordered and COD offenders receive higher dosages of treatment than non-disordered offenders. Mental health status was a significant predictor of recidivism; however, when treatment dosage was taken into account, mental health status was no longer a significant predictor of recidivism.

The Effect of TGF β 2 on Collagen Synthesis by Lung Fibroblasts Embedded in Collagen and Fibrin Gels Using Multiphoton Microscopy as a Non-Invasive Tool to Detect Second Harmonic Generation of Fibrillar Collagen

Bao Dinh

Mentor: Steven George

An *in vitro* 3-D tissue-engineering model of subepithelial fibrosis was created and imaged with multiphoton microscopy (MPM) as a non-invasive tool to investigate factors that affect the fibrotic process. This model was tested with the cytokine transforming growth factor β 2 (TGF β 2), which was hypothesized to induce fibrosis in the physiological range of its concentration. To confirm this hypothesis, 3-D engineered tissues with normal human lung

fibroblasts (NHLF) seeded in collagen and fibrin gels were treated with different doses of TGFβ2, cultured, and imaged with MPM to detect the second harmonic generation (SHG) signal generated by collagen. The average SHG intensity and attenuation of SHG signal in the tissues were quantified. The production of collagen affected by TGFβ2 in collagen gels and fibrin gels was confirmed with a collagen assay on cultured tissues as well as 2-D NHLF culture. The results showed that, for the range of TGFβ2 from 50 pg/ml to 400 pg/ml, as the concentration of TGFβ2 increased the production of collagen also increased; however, as the concentration exceeded 2 ng/ml, the production of collagen tended to plateau and then decrease. This trend confirms previous TGFβ2 dose studies. Therefore, the results, which were obtained from the mean SHG intensity and attenuation coefficients closely correlate with collagen assay results, suggesting MPM is a reliable non-invasive tool to study the effect of different of cytokines that induce fibrosis as well as inhibit this process.

Prospective Estimates of Assortative Mating for *Brassica rapa* (Wild Mustard), *Heterotheca grandiflora* (Telegraph Weed), *Datura stramonium* (Gypsum Weed), and *Eschscholzia californica* (California Poppy)

Tram Do

Mentor: Arthur Weis

It has been long suspected that assortative mating for plant species occurs when there are variations in flowering time (FT), through which plants with early FT selectively mate with other plants with early FT and plants with late FT selectively mate with other plants with late FT. The intensity of assortative mating for *Brassica rapa* (Wild Mustard), *Heterotheca grandiflora* (Telegraph Weed), *Datura stramonium* (Gypsum Weed), and *Eschscholzia californica* (California Poppy) in the marsh were unknown. Therefore, we statistically estimated the intensity of assortative mating of the four plant species using the prospective correlation between the mates, a method published by Weis and Kossler in 2004. This method estimated the number of opportunities to exchange pollen between the pollen recipient plant (mother) and pollen donating plant (father) based on how many days their flowering period overlapped and how many flowers they produced in that flowering period. From the statistical estimation, the *Datura stramonium* and the *Eschscholzia californica* appeared to have low potential for assortative mating, while the *Brassica rapa* and the *Heterotheca grandiflora* appeared to have substantially higher potentials. The differences between low assortative mating and higher assortative mating were due to the generally higher rate of flower production in the latter two plant species.

A Source Monitoring Study of the Illusory Correlation Effect in Advertising

Kathleen Donnelly

Mentor: William Batchelder

The illusory correlation effect is the tendency to have more negative impressions of a smaller group of people than a larger group, despite the fact that there has been exposure to equal proportions of positive and negative group attributes. Past research has explored the illusory correlation effect using a source monitoring memory procedure. Source monitoring refers to the ability to discriminate the source or origin of information that is in memory. The illusory correlation effect occurs when negative attributes are falsely remembered to be about the smaller group. The objective of the study is to examine whether the illusory correlation effect also takes place in product advertisement. Participants were students taken from the Social Sciences human subject pool. They first studied a series of negative and positive statements about two fictitious hotels. There were eighteen positive statements and eight negative statements for the first hotel and nine positive statements and four negative statements for the second hotel, thereby equating the proportion of positive to negative statements. Participants then read these old statements along with new positive and negative distracter statements excluding the hotel name, and for each statement they indicated whether they had read the statement before and which hotel they thought the statement was referring to. There was evidence that the illusory correlation effect occurred because negative statements were more likely than chance to be attributed to the hotel with the fewest number of statements. Additional evidence for the effect came from preference choices and trait ratings.

European Identity and Community Involvement Through Trade, Travel and Language

Anthony Duff

Mentor: Wayne Sandholtz

Over the last fifty years, Europe has collaboratively worked towards collective goals and thus moved Europe from a history of destructive wars to one of peace and prosperity. With such cooperation between European countries, one wonders if its people can, similarly, come together and form a collective group based on a European identity. Though European Identity can be argued to be a result of several things, I will focus on the role of social interaction between European citizens, specifically in trade, travel and international communication. Trade is involved with the transfer of goods, services and technology that serves as a bridge that brings those normally isolated into the European community. Secondly, Europeans have continued to expand their proficiency in other European languages, making communication easier among different European linguistic groups. Lastly, travel allows European citizens to

experience life in other countries within Europe, which promotes commonalities between different European groups and helps dispel negative stereotypes. Together, trade, travel and language have enabled Europeans to continue to expand relations outside of their own nations and become culturally aware of other European cultures and languages. It is through this social interaction that European citizens can create international associations with other members of European nations and allow them to develop a European identity.

Thoracic Duct Sealing: A Comparative Study

Erick Russell Elchico

Mentors: Geoffrey Box & Ralph Clayman

During surgery, the lymphatic vessels are often encountered and sealed to prevent potential complications. Despite this, little has been reported about how well different laparoscopic electrocautery devices actually seal the lymphatic vessels. In this study, the Ligasure V, Gyrus Trisector, Harmonic Scalpel, EnSeal, and standard monopolar scissors were compared qualitatively through pathological assessment and quantitatively through burst pressure testing of porcine thoracic duct, the largest lymphatic vessel. All devices except the monopolar scissors were able to consistently seal the duct. The vessels sealed by the EnSeal and Harmonic devices were found to have significantly higher burst pressures than those sealed by the Ligasure ($p < .05$). However, it is important to point out that the burst pressures from the ducts sealed by Ligasure still greatly exceeded the normal pressures found in the lymphatic system. More data points may reveal differences between other devices but there is little motivation to pursue this further since all devices have been found to be clinically effective.

Statistical Analysis of Large Scale EEG Data with Application to Brain-Computer Interfaces

Myra Fabro

Mentor: Zoran Nenadic

Acquisition of large scale volumes of experimental data is one of the possibilities for technological advances in brain imaging and expansive data storage systems. Electroencephalography (EEG) is a type of brain imaging technique that can be approached from different physical properties, but is characterized as a temporal signal that is spatially distributed. The difficulty lies within analyzing these large scaled spatio-temporal signals. Even a small number of trials or experiments produces high-dimensional data. To systematically analyze such information, the entire dataset should be brought down to the scale of more significant data samples. This involves a process known as feature extraction, which associates the features that are most relevant to what we are searching for in the data. Determining these features, such as which class

(left, right, etc.) of visual simulation or signs correspond with motor movement or activity, is the basis for the ultimate development of brain-computer interfaces or artificial intelligence. The method proposed for this research is based on Principle Component Analysis (PCA) techniques. Rather than using PCA on the entire dataset, each class is analyzed separately to extract more accurate results. This method creates more useful features than other techniques by filtering out the sparse data and results in efficient classification of the EEG signals.

Screening Potential Anti-Aging Drugs in *Drosophila melanogaster* Using DNA Microarrays

Jeffrey Felgner

Mentor: Mahtab Jafari

In developed countries, aging is the single most important risk factor in human disease, and it is presumed that an understanding of the aging process will lead to the development of therapies to slow or reverse aging (i.e. promote "antiaging"). Recent advances in aging research have revealed many biochemical pathways that influence lifespan in a number of different well-known model species, such as mice, fruit flies, and nematodes. In turn, this has offered helpful clues in identifying pathways for pharmacological intervention. Pharmaceuticals such as pioglitazone, a common anti-diabetic, have been implicated in mimicking caloric restriction effects by increasing insulin sensitivity. Recent studies have provided evidence that pioglitazone decreases mortality in *Drosophila melanogaster*, but the molecular basis for pioglitazone mediated lifespan extension is not understood. Consequently, this project investigated the differential patterns in gene activity resulting from pioglitazone induced *Drosophila* using DNA microarrays. We report that feeding *Drosophila* pioglitazone throughout the aging phase showed a significantly altered pattern of gene expression between experimental and control groups. The extended lifespan observed in pioglitazone-fed flies may have resulted from this altered physiological state.

Acousto Optic Spectrometer Automation

Owen Finch

Mentor: Henry Lee

Spectrometry and spectroscopic methods have applications in many fields such as chemistry and astronomy. An Acousto Optic Tunable Filter (AOTF) has been used to create a compact all-fiber spectrometer with .01 nm resolution. The process to determine an unknown wavelength using this Acousto Optic Spectrometer is lengthy and involved due to a large amount of necessary human interaction. By automating the process using a Motorola HC11 microcontroller in conjunction with an Analog Devices AD9834 Numerically Controlled Oscillator (NCO), the feasibility of the Acousto Optic Spectrometer as a portable instrument can be realized.

Dance Festivals and Professional Opportunity

Ann Fischer

Mentors: El Gabriel & Caesar Sereseres

“Dance Festivals and Professional Opportunity” is a paper in which I have examined how attending an international dance program enhances a dancer’s career. The purpose of the research is to open a dialogue among dancers that questions whether attending summer dance festivals is worth the expense of energy and money. I evaluate two programs, the Salzburg International Ballet Academy and the Impulstanz (out of Vienna). I found that attending these two dance festivals is a great investment of time and energy for international exposure to amazing dance instructors as well as amazing young dancers. Getting in shape is one of the many perks that come along with dancing in these programs. What I found was that, aside from the great experience, the aim of the instructors is not to make available professional connections or even recommendations, but to offer a good experience for young dancers. Summer dance festivals are great money making tools for instructors and dance institutions, and at the same time are attractive to young dancers who are looking for a fun summer experience and a chance to travel. As for UCI students looking for professional experience or connections, the festival dance programs in Austria will not enhance a future dance career beyond the good training they offer.

Nrf2 Transcription Factor Knockout Decreases Pup Viability and Body Weights

Victoria Flores

Mentor: Ulrike Luderer

Nrf2 is a transcription factor that binds to the antioxidant response elements of genes that it regulates. Nrf2 is responsible for the regulation of antioxidant genes, several of which are a part of the Phase 2 detoxification process of polycyclic aromatic hydrocarbons, such as benzo(a)pyrene (BaP). Humans are exposed to the carcinogen, BaP, through daily activities. It has been proven that BaP initiates ovarian tumors in mice, but the mechanism of tumor formation in the ovaries is unknown. We hypothesize that if mice deficient in Nrf2 have a decreased ability to detoxify reactive metabolites of BaP, they will have an increased susceptibility to BaP-induced ovarian toxicity resulting in DNA damage and ovarian cancer. Nrf2 heterozygous animals were mated. Fourteen days after litters were born, they were genotyped using PCR. Knockout Nrf2 and wild-type female mice were injected i.p. on day 28 with 0, 2, or 50 mg/kg BaP and were sacrificed seven days later. Body weights were significantly lower in male and female knockout animals. Ovarian weights were not significantly affected by genotype or BaP treatment. Genotyping data shows that we had two times as many female wildtype animals compared to knockout, while the male ratio was

equal, suggesting Nrf2 may be more involved in female viability. We do not know if fewer female knockout pups were born or if females died prior to birth. Ongoing studies are investigating ovarian and testicular effects of BaP treatment in Nrf2 knockout versus wildtype animals.

Differences in Sources of Social Support for Students with Immigrant Parents and U.S.-Born Parents

Marissa Fortuno

Mentors: Samuel Gilmore & Joy Pixley

The college experience can be a stressful time for young adults. Previous research shows that social support can act as a protective factor to stress and may help to guide both academic success and overall well-being. It was hypothesized that U.S.-born students whose parents were born in foreign countries (second-generation) would feel more different from their parents than those whose parents were born in the U.S. (third-generation). If second-generation respondents perceived more difference with parents, it was expected that they would perceive less social support from their parents compared to third-generation students. Therefore, second-generation students would be more likely to turn to friends and/or formal means of support. Extensive questionnaires on relationships, stress, and support were completed by 150 UCI students. It was found that, compared to third-generation students, second-generation students do feel less similar to their parents and are less likely to open up to their parents about their problems. However, second-generation students are also less likely to feel they can talk to friends about their worries, or to seek formal support from counselors, psychiatrists or other professionals. Rather than substituting one form of social support for another, second-generation students appear to be getting by on less support, despite the finding that they report as many sources of stress as third generation-students. This has negative implications for the success of students born of foreign-born parents, and suggests that they may benefit from a variety of targeted support programs and interventions.

Hydrogen Fuel and its Effects on Miniature Combustion Engines

Chris Frantz

Mentor: Derek Dunn-Rankin

The gasoline powered internal combustion engine (ICE) has existed for over a hundred years. The problem with the ICE and its dependency on petroleum is that the world is having a more difficult time obtaining the oil to produce the gasoline that fills our cars. Another challenge with conventional petroleum combustion is the level of hazardous byproducts that emerge as air pollutants. One possible approach to reducing the fuel consumption and emissions of ICE is to enhance the combustion process using hydrogen. This is already being practiced by several automotive

companies, including Ford and BMW. However, strategies for using hydrogen as a potential fuel are still fairly new. Implementing hydrogen enhancement into a miniature RC engine and testing its effects on a smaller scale has not been reported. This project concentrates on using hydrogen as an additive to the fuel supply, not a complete replacement, to maintain the advantages of liquid fuel volumetric energy density and ease of handling, while taking advantage of the high reactivity and wide flammability limits provided by hydrogen. The addition of hydrogen can improve combustion speeds and allow the engine to run fuel lean. Leaner burning decreases hydrocarbon emissions and emissions of carbon monoxide and oxides of nitrogen. Preliminary analyses suggest that the proper proportion of hydrogen and liquid fuel in the miniature RC engine could theoretically allow it to run in excess of 25% longer than the standard mini RC engine.

East Indian Civic and Political Engagement: The Mystery

Roshni Gandhi

Mentor: Mark Petracca

Political theory on activism notes that citizens who fall under certain factors are more probable to participate in the political and civic realm. Dominant political theorists explain that factors such as money, education, time, and civic skills are a part of the causal chain that leads to heightened political activity. Model minorities such as East Indians have a higher likelihood of participating in the civic and political realm under this theory. However, despite being educated, having advanced occupations, and being of high socioeconomic status, East Indians fall short in both civic and political realms. The goal of this study is to explain the political, cultural, social, and religious aspects that affect the low incidence of civic and political engagement in this community. When surveyed, members of the Southern California East Indian community mostly named lack of respect for politics as one of the main reasons for their not participating. Lack of trust for the subject matter of politics is very cultured within their community. It is apparent that the community does not feel that politics are crucial or essential to their American citizenship or personal growth. In essence, a possible reason for why this phenomenon occurs is the fact that East Indian Americans have cultural mindsets that prevent them from being politically involved. An explanation for why this phenomenon occurs can induce positive change for this community.

Second-Site Mutations to G142S alpha-Tubulin Rescue Oryzalin Dependency in *Toxoplasma*

Lakshmi Ganesan

Mentor: Naomi Morrissette

Toxoplasma gondii is an obligate intracellular parasite that can cause brain inflammation and affect the heart, liver and eyes in immune-compromised individuals. It also serves as a model organism for related parasites such as *Plasmodium*. Dinitroaniline compounds such as oryzalin selectively inhibit parasite but not vertebrate (human) microtubule, and may provide insight for the development of new anti-parasitic drugs. When mutagenized parasites are selected for oryzalin resistance, they reveal that a diverse group of point mutations to alpha tubulin decreases drug sensitivity. Parasites bearing the G142S mutation are resistant to 1 microMolar oryzalin and require the presence of this dinitroaniline to survive. The G142S point mutation is located deep in the core of alpha-tubulin. We hypothesize that the mutation increases tubulin subunit affinity to hyperstabilize microtubules. When G142S parasites are grown in the absence of oryzalin, they have a greater than 20% rate of overt replication defects, and we suspect that additional parasites have defects in chromosome segregation to make the line oryzalin-dependent. By growing this line in the absence of oryzalin, we have selected for spontaneous mutations that correct the G142S defects. We predict that in addition to identifying revertants that restore the G residue at position 142, we will also identify other point mutations in alpha-tubulin that interact with S142 to correct for its deleterious effects on tubulin function. We predict that these second site mutations will decrease or eliminate oryzalin resistance.

The Policing of Music Piracy

Alessandra Garbagnati

Mentor: John Dombrink

Although the Internet has revolutionized the way the world accesses information and communicates, it has also brought about new avenues for crime. Among these is online music piracy. Several years after the Recording Industry Association of America started filing lawsuits against file sharers, the problem remains. This study sought to examine the current status of music piracy through interviews with those responsible for the policing of music piracy and those working in the music industry. Unlike previous studies, which tended to focus on music piracy from the perspective of the consumer, this one examines the issue through the lens of those creating the music, who tend to have the greatest stake in this problem, as well as those responsible for the policing of music piracy. At this time, the two tactics being used to target music piracy are legal action and education. All participants agreed, however, that the most promising methods of tackling online music downloads is through legitimate business models,

such as iTunes. Finally, although some participants were more optimistic than others, there was a general consensus that it would be some time before online music piracy could be limited to a more controllable level.

Heidegger and Hölderlin Revisited

Alexander Gardner

Mentor: Andrzej Warminski

The project will examine the relation between Martin Heidegger's philosophy and the poetry of Friedrich Hölderlin. Heidegger's engagement with Hölderlin's poetry is worth researching because it marks a distinct point of intersection between the categorically separated fields of philosophy and literature. Heidegger has said that his philosophical thinking "stands in direct relation to the poetry of Hölderlin." The questions posed by this statement will be of primary interest for this research. How are we to understand the relation between an autonomous system of philosophical thought and the structure of meaning generated by Hölderlin's poetry? Similarly, how will we understand the transmission of ideas between philosophy and literature, and do these traditionally separated pursuits actually become synonymous when stripped down to their essential purpose for being?

Prevalence and Extent of Dyslipidemia and Goal Attainment for Lipids

Heli Ghandehari

Mentor: Nathan Wong

While levels of LDL-C continue to decrease due to widespread use of statin therapy, HDL-C and triglyceride levels show little to no improvement. We evaluated the extent of control of LDL-C, HDL-C, and triglycerides, as well as overall lipid control among U.S. adults. Data was obtained from adults in the National Health and Nutrition Examination Survey 2003–2004, a nationally representative cross-sectional survey of the non-institutionalized civilian U.S. population. Our analysis focused on prevalence, treatment and control rates of dyslipidemia for individual as well as combined lipid levels, stratified by gender, age group, ethnicity, and the presence of comorbidities such as CVD, diabetes and MetS. Overall goal attainment for LDL-C was 76.7% (n=2833, 126.0 million), HDL-C 73.2% (n=2882, 128.4 million), and triglycerides 73.6% (n=2873, 128.0 million). Prevalence of those at goal for multiple lipid levels fell to 57.9% for HDL-C and triglycerides and 48.2% for all three lipids. Combined control rates varied little with gender, decreased with age and were highest amongst non-Hispanic Blacks. Only half of CVD and diabetes patients who were at goal for LDL-C remained at goal for all three lipids; in persons with metabolic syndrome, while LDL-C goals were reached in 70.6%, only 8.9% were at goal for LDL-C, HDL-C, and triglycerides. In addition, many persons with dyslipidemia, despite being on treatment, were

still not at goal for all lipids. While three-fourths of individuals were at goal for LDL-C, HDL-C and triglycerides individually, only half show control of overall dyslipidemia with optimal levels of all three lipids.

Evidence that Neural Stem Cells Are Located the Ependymal Layer of the Mammalian Adult Brain and Are Activated by Injury

Gregory Gilmore

Mentor: Peter Bryant

Contrary to what was believed for many years, it has now been well established that neurogenesis occurs in the adult mammalian brain. Although neural stem cells have been isolated *in vitro*, their exact location *in vivo* has not been determined. In our study, we used a Parkinson's rat model with a combination of injury by treatment with 6-Hydroxydopamin, followed by growth factor stimulation by treatment with transforming growth factor-alpha, to determine the location of neural stem cells. Coronal sections of the rat brains were labeled via Immunohistochemistry with markers of mitosis, asymmetric cell division, and proliferation and differentiation. Cells in the ependymal layer were labeled by mitotic markers indicating that these cells undergo mitosis. In addition, several markers of asymmetric cell division, a characteristic of true stem cells, were expressed asymmetrically in the ependymal layer, and not in the underlying subventricular zone. Lastly, BrdU a marker of proliferation was shown to be incorporated into cells in the ependymal layer that appear to give rise to progeny in the subventricular zone. This suggests that neural stem cells are located in the ependymal layer, which has possibly been overlooked because these cells are slowly dividing and only activated under certain conditions.

Transnational Gangs and Human Security: Mara Salvatrucha's Transformation from the Los Angeles Barrio to Latin America

Mynor Godoy

Mentor: Caesar Sereseres

Starting as a barrio gang in Los Angeles, made up of immigrant youth fleeing the civil wars in Central America, *Mara Salvatrucha* has now grown and spread across thirty-three U.S. states and five countries. The proliferation of this street gang started when the U.S. began to deport thousands of refugees in the 1990s, some of whom had criminal records. The character of traditional street gangs, their criminal activity, and the scale of violence quickly transformed as returnees who had become specialists in urban gang life connected with existing gangs in a region still recovering from years of social unrest. Homicide rates are rising along with gang membership (which is now estimated at over one hundred thousand), but there has yet to be a complete understanding of the real significance of this threat. The goal of this project was to determine both

whether *Mara Salvatrucha* was a cohesive transnational organization and substantial threat to government, and the social contexts in which it threatened human security. This qualitative research documents how transnational gangs have incorporated technology into crime, their means of internal organizational/social communication, and how their international structure facilitates and sustains their organization. In researching this emerging phenomenon, I have had opportunities to visit Washington D.C. and Guatemala twice this past year to talk with public officials, U.S. Embassy personnel, and citizens, and to experience the realities of the problem. In Guatemala, where weak governance has segregated communities and led to security privatization, transnational gangs are the most significant threat.

Rapid Hair Cell Regeneration in Zebrafish (*Danio rerio*) Larvae Following Exposure to Neomycin

David Gold

Mentor: Matthew McHenry

Unlike humans, the zebrafish is capable of regenerating hair cells during early stages of its development. In both humans and zebrafish, these hair cells serve as sensory receptors to changes in fluids; they are found in the cochlea of the former and in neuromasts in the lateral line of the latter. Previous studies have looked at the developmental pathways that take place during neuromast formation, but few studies have looked at how the regeneration process affects behavioral patterns. In this study, zebrafish embryos were exposed to neomycin, which destroys hair cells. Their response to changes in water flow were recorded every two hours for the following 32 hours as their hair cells regenerated. High-speed videos were taken to carefully study when fish first began responding to pulses in the water and how quick the response was. The results of this study suggest that individual zebrafish larvae have a wide range of initial response times after neomycin treatment. Additionally, the first response was generally very slow (20–70 milliseconds), but within two hours this response rate jumped back to normal (under 3 milliseconds). This suggests that, during hair cell regeneration, a threshold value is achieved, followed by rapid behavioral changes in zebrafish larvae to respond to water flow.

Factors that Contribute to Traditional Latina/o Undergraduate Students' Persistence

Robert Gomez

Mentor: Leticia Oseguera

Latinas/os are the fastest growing minority group in the United States, but they obtain among the lowest graduation rates at four year universities. Research indicates that Latinas/os experience greater insecurity regarding their ability to complete their academic work. In addition Latinas/os with negative university environments were associ-

ated with non persistent patterns. However, there is currently a minuscule amount of research on Latina/o undergraduate persistence patterns. At this time, only a small portion of Latinas/os make up the individuals in institutions of higher education, and the U.S. Census Bureau predicts that in future years, more Latina/o youth will be in schools than other racial groups. The goal of this study was to determine certain traits or self-beliefs about traditional university students that help them succeed in obtaining a university degree. The study examined the relationship between persistence patterns to gender, acculturation level, and college self-efficacy. The results determined that individuals with positive persistent patterns demonstrated higher perceptions of familial support, college self-efficacy, and acculturation.

Macro Perspectives on U.S.-Mexico Relations and the Security, Prosperity, and Partnership Agreement

Edward Gonzales

Mentor: Caesar Sereseres

September 11, 2001 negatively affected all of North America; the U.S. suffered from insecurity, whereas Mexico and Canada suffered economically from the restricted flow of goods and people due to lengthy border inspections at points of entry. Cross-border trading was reduced by 11.6% from September to December of 2001. Security measures and agreements were enacted, one of which was the Security, Prosperity, and Partnership (SPP) agreement signed by Canada, the U.S. and Mexico in March of 2005. The basis for SPP is security and partnership for the prosperity of the region. This presentation is an introduction to the current political and psychological effects of the SPP, along with the effects of other post-9/11 border measures on U.S./Mexico relations. The questions that will be discussed are: (1) whether border security between the United States and Mexico is negotiable; (2) whether Mexico has a choice when the United States decides to raise fences; (3) how the use of technology—such as sensors, thermal, and biometrics—for securing the borders has affected the relation; and (4) whether North America's global economic competitiveness is at stake. I will conduct interviews and attend hearings and conferences in Washington D.C. and Mexico City as I continue this project. Preliminary findings from the literature suggest that bilateral decisions in U.S./Mexico border security are rare, especially those that involve construction of physical borders; however, bilateralism exists when decisions are made on the application of technology for security purposes. This will lay the macro foundation for studies on post-9/11 security measures and their effects at the regional and community level.

Pre-Combustion Water Injection on Miniature Combustion Engines

Evan Gorski

Mentor: Derek Dunn-Rankin

Pre-Combustion Water Injection is the process of injecting a finely atomized water spray directly into the intake chamber to significantly cool down the air charge entering the cylinders and the inside of the combustion chamber. This cooled-down induction charge thereby increases the mass of air that reaches the cylinder. The additional mass of the air allows for stronger combustion and more power in each engine cycle. This process has been used successfully in the racing industry to produce more power with better fuel efficiency. The process of using water essentially captures some of the wasted heat emitted by the engine and effectively uses it to its advantage. In this project, the benefits of cooling are studied on a miniature four-stroke combustion engine, from which a small-scale analysis can be performed without risk. The experiment was created to compare and analyze the overall efficiency of the motor with varying degrees of atomization, water flow rates, and types of injectors. Further analysis investigated whether the normal cooling fins could be eliminated with the use of water injection on these air-cooled motors. The research, though far from complete, shows that water injection does not produce improvements for motors on a small scale without the proper fuel and ignition tuning to achieve the theoretical benefits.

Localization, Association, and Regulation of Essential Mitotic Protein HEC1

Ryon Graf

Mentor: Wen-Hwa Lee

Rapid cell division and irregular mitotic dynamics are common in cancerous cells, making the processes that are involved with microtubule and kinetochore dynamics to be of great interest to basic research. Increased expression of genes and proteins essential for mitosis is also common in many cancers. One such protein is HEC1 (Highly Expressed in Cancer). Hec1 is highly expressed in rapidly dividing cells and localizes to kinetochores and centrosomes during mitosis. Hec1 inactivation leads to severe abnormalities in chromosome dynamics during mitosis and to cell death; however, the exact means of Hec1 regulation and association remain mysterious. The goal of the project was to determine a mechanism for the localization patterns and kinetochore dynamics of Hec1 due to regulation by Aurora Kinase and Nek2 Kinase. This was done by inducing several key mutations into the polypeptide sequence, in an effort to elucidate the exact mechanisms for Hec1 phosphorylation and localization inside the cell during mitosis. The Lee Lab created several mutant versions of Hec1 with various single base pair changes or key deletions in the protein sequence. The mutants were tagged with a

green fluorescence emitting protein and cloned into a retroviral vector. Once the associated retroviruses were produced, normal and cancer cell lines were infected. The cells were grown on slide cover slips, which were subsequently fixed, then stained for DNA and Gamma Tubulin. The localization of the various Hec1 mutants were then visualized using fluorescent light microscopy, and the implications due to the selected mutations were analyzed.

The Aristocracy of the Lumpenproletariat: The Hobo Wobbly as the Vanguard of Revolution

Sean Graham

Mentor: Vicki Ruiz

My research explores the confluence of the hobo, a “floating” laborer who migrated from job to job on freight trains, and the Industrial Workers of the World (IWW), a militant, radical labor union founded in 1905 that believed the “One Big Union” of all producers could appropriate the nation’s industries and administer the economy for the benefit of the working class. The hobo Wobblies, as IWW members christened themselves, forged their notion of revolution in the crucible of rough, physical labor, hard traveling, and the brutality of everyday life. IWW organizers who aimed to enlist the hobo in the project of revolution—and hobo Wobblies themselves—recreated the IWW in the image of the hobo subculture. During an era in which reformers sought to solve the “problem” posed by a large population of “rootless” men, the Western IWW attempted to mobilize the hobo subculture for revolution. The discourses in the IWW’s literature, however, reveal a conflicted understanding of the hobo. On one hand, the Western IWW conceded that the hobo—womanless, homeless, and steeped in squalor—was an unfortunate victim of modern industry. The hobo was, they lamented, a “slave”: the hobo’s tramping throughout the country in pursuit of work was interpreted as “the search for a master.” But, as utopian realists who propagated their fantastic millenarian visions of the Cooperative Commonwealth, while concurrently preaching an anti-idealistic doctrine of “Might Makes Right,” the hobo Wobblies nevertheless imagined themselves as being the vanguard of revolution.

The Impact of Contextual Effects on Repetition Priming

Matthew Grilli

Mentor: Michael Rugg

Repetition priming, a phenomenon that manifests as an increase in accuracy and speed of processing for previously viewed stimuli, serves as an indicator of implicit memory in behavioral studies. In tests of implicit memory, previously encountered information promotes improved performance in a seemingly unconscious manner. This priming effect is not well understood. Previous research demonstrates that perceptual attributes of a stimulus, such as size constancy

and color of object, affect repetition priming. One important question that remains is whether background context effects may also influence repetition priming. In this experiment, subjects viewed objects superimposed on naturalistic background scenes. They judged the size of the object to be smaller or larger than a shoe box in a study and test phase. In the study phase, subjects made size judgments to trials of unique objects paired with background scenes. In the test phase, old objects from study were paired with four types of backgrounds: the original background from study, an old background from a different study trial, a new background, or a gray background. The test phase also included new trials with objects superimposed on three types of backgrounds: an old background from study, a new background, or a gray background. Using response times and accuracy, this study investigated repetition priming for different object and background combinations. Results indicated a highly significant repetition priming effect. The contextual manipulation, however, did not modulate this repetition priming effect.

Computational Modeling to Identify Ligands for the Steroid and Xenobiotic Receptor

Wei (Shirley) Guan

Mentor: Bruce Blumberg

Polychlorinated biphenyls (PCBs) are ubiquitous environmental contaminants that are linked to a variety of adverse health effects. 209 PCB congeners exist and differ in the number and position of chlorine atoms. We previously showed that some highly chlorinated PCBs are antagonists of the human steroid and xenobiotic receptor (SXR) but agonists of its rodent ortholog. SXR is a key regulator of xenobiotic response that mediates the breakdown of endogenous steroids, dietary components and xenobiotic chemicals. Because rodents are the primary pharmacological and toxicological model organisms, the identification of PCBs as antagonists of human SXR but activators of the rodent receptor has important implications for molecular pharmacology, toxicology, and risks associated with exposure. Based on our previous study, we generated a computational model to predict which PCBs bind to SXR and discriminate agonists from antagonists. Of the PCBs that have not been empirically tested, the model predicted that PCBs 69, 115, 116, 129, 185, 194 and 205 would bind to SXR. Of these, PCBs 129, 194 and 185 were predicted to be antagonists whereas the activity of the others could not be discriminated. We found PCBs 69, 115, 116 and 129 to behave as antagonists towards human SXR. In contrast, PCBs 185, 194, and 205 were SXR agonists. These results validate the use of the computational model and enable its future refinement.

Automating the Interface with Nano-Electronics

Phillip Haralson

Mentor: Philip Collins

Over the past decade, the size of electrical components has constantly been shrinking. This has posed a difficult problem for researchers, because it requires imaging these components at ever higher resolutions. With the current research being done on nano-scale electrical components, also known as molecular electronics, it has now become necessary to image devices down to a single nanometer. The problem is that these devices are on much larger silicon chips; thus, testing and imaging this new generation of electrical components requires imaging nanometer-scale objects over much larger millimeter-scale areas. Typically this imaging is done manually with an Atomic Force Microscope (AFM); however, this is a very time consuming process that requires constant attention. To reduce the time spent imaging, samples are first electrically probed to determine regions of interest. However, it is still necessary to image the samples afterwards. Therefore, I created a program in LabVIEW that interfaced with the Pacific Nanotechnology Nano-R microscope to automate much of this process. Now a user can load a sample into the AFM and start the program. It automatically performs all of the necessary adjustments and images any combination of the devices on a single chip, based on the electrical probing done previously. This automation, when combined with electrically probing samples, is a satisfactory solution to the problem of characterizing these modern molecular electronic devices.

Can Jazz Dance Be Art? A Critical Study of Jazz Dance (1950–Present)

Jennifer Harbison

Mentor: Jennifer Fisher

When a dance audience thinks of “jazz dance,” they most often conjure images of Broadway: flashy production numbers, widespread jazz hands and light entertaining subject matter fitting to the musical comedy stage. What is not known is the potential for jazz dance to be performed on the concert stage and, more importantly, to be at the same professional level as ballet or modern dance. This study focuses on how jazz dance has evolved into a reputable concert dance form through the teachings of Matt Mattox and Luigi and Gus Giordano over the last fifty years. Jazz dance is a purely American dance form that demonstrates the complex cultural history of the U.S. Using examples of jazz dance performed by Gus Giordano Jazz Dance Chicago, River North Chicago Dance Company and students at UCI, it can be demonstrated how jazz dance is evolving to fit not only the merging styles of the concert dance world, but also the many global cultures that have helped shape American art going into the 21st century. After viewing these examples of jazz dance and researching current