Recently, Histone deacetylase (HDAC) inhibitors have become a subject of interest because of their potent anti-cancer activity. Trichostatin A has been identified as one of the most potent HDAC inhibitors. Previous attempts at synthesis have been inefficient, unreliable, and incapable of producing enantiopure product. This project intends to design a short, stereoselective synthesis that would be ideal for biological studies. The synthesis will highlight the use of Zincke aldehydes in, showing how inexpensive, easy accessible starting materials can be functionalized to generate complex molecules. Currently, the two major starting materials, a silyl enol ether, which contains the core of the molecule, and a Zincke aldehyde derivative have been synthesized. The two are to be coupled via an enantioselective Mukaiyama aldol. Next, deprotection of an acetate group, followed by loss of a secondary alcohol generate the α,β,γ,δ-unsaturated aldehyde. Finally, an oxidation and hydroxamate formation lead to the final structure of Trichostatin A.

**Focus in the Modern Eastern Armenian Sentence**

Vartan Haghverdi  
*Mentor: Teresa Griffith*

This study investigates the morpho-syntactic realization of focus structures in Modern Eastern Armenian (MEA). Focus structures are essential to resolving how conversation functions in languages, particularly how new information is introduced throughout the discourse. Although I follow Lambrecht in introducing the discourse concepts of topic and focus, my study focuses on focus at the sentence level. The data for this study come from a reference grammar and native speakers. The study examines multiple constructions, such as (in)transitive verbs, questions, negation, adjuncts, and compound verbs. It also analyzes the difference between indefinite and definite objects and how indefinite object constructions have no recourse but to focus the object. I illustrate that focused elements in MEA always raise to the preverbal position. To account for left peripheral movement, I use Rizzi’s Split CP hypothesis which provides motivation for movement as well as the necessary leftward projections that focused elements need to enter. By studying focus in MEA, we learn of the extensive role played by marked word order, potentially opening the door to a cross-linguistic pattern (e.g., Basque focuses elements in the same preverbal fashion). This study is a first step in the direction of explaining focus in MEA at the sentence level. As such it delves only into various constructions in the indicative mood, leaving irreals tenses and moods for future research.

**Democratic Leverage, Military Corporate Interests and the Ruler’s Survival: Explaining the Fall of the Suharto Regime in Indonesia and the Mubarak Regime in Egypt**

Lucas Hahn  
*Mentor: Bojan Petrovic*

Support of the military is crucial to the survival of authoritarian regimes, as dictatorships depend on coercion for their survival. Withdrawal of military support can lead to the overthrow of a dictatorship, while maintenance of that support often means regime survival. Therefore, the military’s support is one of the most important variables for predicting whether a transition from authoritarianism can even begin. Egypt under the Mubarak regime resembled the Suharto regime in Indonesia, and offered points for comparison. Both dictators were former military men who relied on the support of the military and sustained their regimes through similar methods of political control and networks of corruption. Both faced political crises with similar causes that led to their resignations, as the military withdrew its support. The interests of the militaries in both regimes became intertwined with their relationships with democratic countries, which had leverage over these interests. The Indonesian and Egyptian militaries both purchased many of their weapons from democratic countries such as the United States. Additionally, both militaries were dependent on foreign aid: the Egyptian military received direct military aid from the United States, while the Indonesian military relied on IMF emergency funds to prevent the nation’s economic collapse. As this democratic leverage made repression of protests unfeasible, the military withdrew its support for the dictator and he was forced to resign.

**Gamma Irradiation: A New Treatment for Longer Life?**

Stephanie Hammel  
*Mentor: Athan Shaka*

Naturally occurring hybrid zones may be important conduits for the transfer of alleles influencing the evolution of a species’ breeding system. To determine whether an allele for male sterility found in gynodioecious *S. salicaria* is also found in a hybrid zone between *S. salicaria* and a closely related hermaphrodite species, *S. menziesii*, crosses were performed between *S. salicaria* and plants from the hybrid zone. The appearance of females in addition to hermaphrodites in the progeny of some crosses indicated that the
hybrid and parental species share an allele for male sterility at the same locus. Rare male sterility alleles in *S. menziesii* are identical to those found in *S. salicaria* and the hybrid zone, suggesting that the hybrid zone is a conduit for the transfer of alleles affecting the evolution of reproductive systems. Lack of adaptation to wind pollination has most likely prevented the establishment of females in populations of *S. menziesii*. Male function in progeny of a presumably inbred hybrid hermaphrodite, measured as filament length and pollen production, was investigated. Filaments of progeny of the presumably inbred hermaphrodite were significantly shorter than filaments of hermaphrodites derived from hermaphroditic parents with normal male function, and progeny derived from the atypical, presumably inbred hermaphrodite produced significantly less pollen than hermaphroditic progeny of hermaphrodites with normal male function, showing that progeny of an inbred hermaphroditic parent experience reduced male function.

**Predictors of Institutional Offending among Adolescent and Young Adult Females**

Shannon Handa  
*Mentor:* Elizabeth Cauffman

Research shows that females are likely to engage in higher levels of antisocial behavior when they are exposed to antisocial peers, antisocial romantic partners, and/or antisocial parents. However, it is unclear whether the salience of these sources of influence varies across the transition to adulthood. Given that social relationships are particularly important for adolescent females, the aim of this study is to identify whether relationships with antisocial influences (peers, romantic partners, parents) are significantly more predictive of antisocial behavior for adolescent females than young adult females. To examine how antisocial behavior and antisocial influence of peers, romantic partners, and parents are correlated with females’ level of institutional offending interviews with 94 incarcerated females were conducted. Participants were 15–24 years of age (M = 18.72, SD = 1.93) and were split into two groups: adolescents (ages: 15–18; N=51) and young adults (ages: 19–24; N=43). Results indicated that none of the peer, romantic partner, or parent—antisocial behavior or influence—variables were related to institutional behavior for adult females. In contrast, adolescent females who had peers or parents who engaged in high levels of antisocial behavior were more likely to engage in higher levels of institutional behavior (r=.301, p=.040; r=.327, p=.026, respectively). In summary, these data reinforce the salience of social relationships in early-to-mid adolescence.

**Lessons from Small Arms Regulation: Potential Implications for the Regulation of Private Military Corporations**

Ryan Hang  
*Mentor:* Deborah Avant

After initially ignoring the private military industry, the international community has finally come to terms with the dangers that the growing collection of private armies pose towards international stability. Given the lack of success the international community has experienced in regards to regulating the private military industry, I turn to the international community’s recent failures in the regulation of the small arms trade to gain insight into how current regulatory approaches targeting the private military industry can be improved. Focusing on common trends and factors, I have used a comparative review of small arms regulatory literature as a lens to view prospective approaches to regulating the private military industry. I have concluded that the failures which have plagued traditional legal and diplomatic approaches to small arms regulation will inevitably recur if similarly applied to the private military industry. The lack of cooperation that sabotaged small arms regulation will inevitably persist due to the importance of the services that the private military industry offers to states. This indicates that effective regulatory approaches must independently influence the market that drives the growth of the private military industry. Specifically, I call for an examination of the potential deployment of normative enforcement measures such as accreditation systems and blacklists in conjunction with a comprehensive list of legislative recommendations. Not only are these approaches flexible, but also can integrate the energies of a wide range of international actors to overcome the intransigence of previous regulatory efforts.

**The Effects of Subjects’ Expectations of Competing Stimuli on Selective Attention**

John Harduvel  
*Mentor:* Ramesh Srinivasan

Selective spatial attention results in the enhancement of neural responses to an attended visual stimulus compared to an unattended stimulus. Electroencephalography (EEG) studies in human subjects have shown that attending to one location increases the amplitude of the visually evoked potential induced by a visual stimulus presented at that location. However, it is unknown what effect the subject’s expectation of the salience of the stimulus at the unattended location will have on the response to the stimulus at the attended location. To investigate this, subjects were cued to direct attention to one of two flickering visual stimuli in opposing hemifields while maintaining center fixation. They were told before each trial how salient they could expect the unattended stimulus to be (or told that it would randomly vary throughout the trial). We found that...
our manipulation of the salience of the unattended stimulus had an effect both on the subjects' ability to detect targets at the attended location and on the amplitude of the brains' response to the attended stimulus. Additional research will be needed to uncover the direction of this effect, but these findings may be relevant to the treatment of neurological disorders involving a deficiency in the deployment of top-down voluntary attention, such as attention deficit hyperactivity disorder (ADHD) and Alzheimer's disease.

Mitochondrial Movement in Cultured *Drosophila* Neurons

*Neema Hariri*
*Mentor: Steven Gross, Diane O'Dowd*

The cell is the basic functional unit of life, and its power source is an organelle called the mitochondrion. There is a vast amount of evidence that indicates mitochondrial movement is not only significant for cells to function, but also for cells to survive. In this project, cultured Drosophila neurons with fluorescently tagged mitochondria have been examined with a laser confocal microscope in order to image mitochondrial movement both towards (retrograde) and away (anterograde) from the cell body. Images are taken every fifth of a second and compiled into videos to be examined. It has been proposed that mitochondria can exchange components when they contact other mitochondria. This predicts that a mitochondrion will pause when encountering another mitochondrion. I evaluated the pause time and pause frequency of moving mitochondria when they were adjacent versus not adjacent to other mitochondria. Preliminary data indicate that large mitochondria move more slowly than small mitochondria, however, mitochondria pause when moving in both the anterograde and retrograde direction and there is no difference in the pause duration when they are adjacent to another mitochondrion versus a region without mitochondria. Additional assessment will be important in determining if there is any difference in pause frequency. These data do not provide any support for the hypothesis that mitochondria in these cells are exchanging material when the encounter each other. However, exchange may not require an alteration in movement dynamics and our future studies will use photo-activated fluorescent markers for mitochondrial components that will allow us to monitor potential exchange of material in real time.

Panhandling: Socio-economics, Norms, and Governing

*Lori Harris*
*Mentor: Donna Schuele*

While studies and reports have featured the life of individual panhandlers, very little is known about panhandlers working as a collective community. Seen as freeloaders and scam artists, the positive element created from the presence of panhandlers in a community is overlooked. This one-sided outlook spurs policies and laws that have led to negative impacts socially, fiscally, and constitutionally. The purpose of the research was to learn more about the subculture/community of panhandlers and the ways in which they self-govern. Using an ethnographic style of data collection, I recruited respondents by approaching panhandlers while doing business and asked for an interview. In addition, an informant introduced me to his fellow panhandlers and their community. Over several months, unobtrusive observations were made while panhandlers were doing business, off-site, and at their residence. Participating, I panhandled with community members at various locations. Qualitative analysis of field notes and interview transcripts revealed that a community of panhandlers does exist, complete with social norms, rules, enforcement, and collective efforts of support. Within this community, they call themselves “Flyers” and work together to ensure that lucrative corners continue to produce profits. For example, when fellow flyers break the rules they call the police, use black-balling methods, and even physical violence. Although some have minimum wage jobs, the income is not enough to sustain living in south Orange County. Flying helps close the economic gap, motivate individuals to shower up, humble themselves, and thank community members face-to-face for help and generosity. These results infer that instead of more laws, more understanding and community connection can provide efficient means in addressing a panhandling problem. The implications of this study support impacting the community awareness and spurring organizations to reach out to panhandlers in providing ways to make them a permanent and contributing asset to the community.

Networking and Opportunities in the Arts

* Phillip Harris*
*Mentor: Darryl Taylor*

The National Association of Negro Musicians—an organization founded in 1919—is the country’s oldest organization dedicated to the preservation, encouragement and advocacy of all genres of the music of African Americans. As an African-American student interested in pursuing a career in the classical music world, I thought it would be best to seek out the National Association of Negro Musicians Conference this summer, not just for the cultural experience of being around professionals and students who excelled in the field at a very high level, but to get a glimpse into the professional world as it relates to graduate school options and career choices. I got exposure to performances, people and a network of professionals that I would not ordinarily have access to in the typical university setting. In addition to NAM I was able to participate in the African-American Art Song Alliance conference earlier...
this year which was founded by my faculty mentor, Darryl Taylor. I was able to reconnect with people I had met from the previous summer as well as reach out to other professionals to establish a broader network while performing to help give myself exposure.

Curious Creations
Vahan Hartooni
Mentors: Garnet Hertz, Bryan Jackson

A university-funded research project can garner a web presence that can achieve the maximum number of online viewers, press mentioning, and audience participation, if it produces a series of online videos that are clear, concise, and captivating. The ability to easily transfer this skill set for producing these online videos to researchers will require a production workflow that is simple and requires little effort. To explore what form this workflow will look like I developed, from concept to production, an online video series on do-it-yourself gadget projects called Curious Creations. The content of Curious Creations required me to explain electrical engineering concepts to an audience of people who are not familiar with the concept or understand the interest surrounding it. This is analogous to researchers who try to communicate their work to a wider audience, outside of academia. Certain key aspects of the production workflow helped push the Curious Creation webisodes toward completion and improve the quality of the final video: developing the concept of the webisode through pitching; preproduction work such as a script or storyboard; a group review of an in-progress work that is moderated by an experienced online video producer. These methodologies can be used by academics to help produce their own online videos of their research.

Differentiation of iPS Cells into Insulin Producing Cells for Alginate Sheet Encapsulation
Branden Hawara
Mentor: Jonathan Lakey

Stem cells may offer an unlimited source for beta cell and/or islet transplantation needed for the growing demand of patient’s suffering with Type-1 diabetes. The focus of this project is on the use of alginate encapsulation to remove the need for immunosuppressive medications during transplant. The use of a novel alginate sheet will allow retrievability after implantation and can be placed subcutaneously, thus minimizing the surgical impact on the patient. The aim of this project is to differentiate induced pluripotent stem (iPS) cells into insulin producing cells and then encapsulate these cells within a novel alginate sheet, while not impeding on viability or function. Differentiated pancreatic endoderm or beta cells are sorted using FACS (BD FACS Aria) to create pure populations and encapsulated in alginate sheets. Cells within alginate sheet are, then, analyzed for viability (FDA/PI & Trypan Blue) and function (Static glucose stimulated insulin release test).

DUX4-Mediation of FSHD Pathogenesis
Roni Hazim
Mentor: Leslie Lock

Facioscapulohumeral dystrophy (FSHD) is a form of muscular dystrophy associated with heterochromatin loss in the sub-telomeric region of human chromosome 4q. In most cases of FSHD, the heterochromatin loss results from deletion of macrosatellite repeats called D4Z4. The heterochromatin loss is thought to allow expression of a double-homeobox transcription factor, called DUX4, that is encoded within the D4Z4 repeats. In FSHD, the DUX4 transcript is stabilized by a polyadenylation signal present in permissive haplotypes of chromosome 4q. Although FSHD myotubes have been shown to produce a stabilized DUX4 transcript, the expression pattern of this transcription factor has not been studied extensively. The goal of this study is to determine whether DUX4 is expressed in pluripotent cells of the early embryo. We used induced pluripotent stem (iPS) cells isolated from FSHD and control subjects as a model of the pluripotent stem cells of the early embryo. Using an RT-PCR assay, we demonstrated that iPS cells derived from FSHD myoblasts and fibroblasts express the DUX4 mRNA. In contrast, control iPS cells, as well as human embryonic stem cells, generally do not express the DUX4 mRNA. DNA sequencing, SNP and haplotype analyses revealed that DUX4-positive iPS cells possess at least one copy of a permissive allele, 4qA161, which is known to contain the polyadenylation signal responsible for stabilizing the DUX4 mRNA in FSHD cells. Collectively, these findings support the model of FSHD in which pathogenesis results from the expression of stabilized transcripts of DUX4.

Localization of Integrins at Excitatory Synapses Through Maturation
Elika Hefazi
Mentor: Christine Gall

Integrins are β heterodimer receptors for the extracellular matrix. Previous studies have shown that integrins are important for the consolidation of long term potentiation (LTP), which raises the question of what are the possible roles of integrin class cell adhesion receptors and their contributions to the developmental changes seen in LTP stability. The goal of this study was to test if there are changes in the localization of β1 integrin at excitatory synapses across postnatal development. Studies used dual immunofluorescent labeling of the β1 integrin and the excitatory synapse marker PSD95 to quantify, for hippocampal field CA1, numbers of synapses that also contain β1 immunoreactivity. The results shown that β1 integrin is co-localized with PSD95 at all ages examined; the inci-


deference of double labeled synapses increased across postnatal ages to peak at postnatal day 21 and then declined significantly in the adult. These results show that there are changes in the incidence of B1 integrin localization at excitatory synapses across the first three weeks postnatal that could underlie increases in the capacity for stabilization of LTP over the same period but also raise questions as to the identity and functions of integrins present at synapses at the different ages examined.

**Change in Sexual Behavior and HPV Knowledge in Peruvian Female Sex Workers following Participation in an HPV Vaccine Clinical Trial**

Omeid Heidari  
*Mentor: Brandon Brown*

Limited data exist on the effect of participation in vaccine trials on behavior change. Two hundred FSWs working in Lima, Peru received HPV vaccine in either the standard (0, 2, 6 month) or modified (0, 3, 6 month) schedule. Participants received comprehensive screening and treatment for STIs, counseling on safe sex practices, education about HPV and its vaccine, and oral contraceptives, condoms, and family planning with each visit. We assessed vaccine completion rates, change in sexual practices, and changes in knowledge about HPV resulting from participation in the vaccine trial. There were high rates of vaccine completion, 91% overall. The number of new and total clients over a 30 day period decreased significantly (p<0.001). Knowledge about HPV and related disease increased in all participant responses. All participants listed at least one preventative measure during the month seven follow up survey.

**Modern Narcocorridos in Los Angeles: A New Audience, Local Performers, and Narco Culture**

Felipe Hernandez  
*Mentor: Cecilia Sun*

This paper examines the new *narcocorrido* “drug ballad” style and culture emerging from Los Angeles, California. *Narco-corrido* is a popular subgenre of the *corrido* that developed in northern Mexico. The lyrics of *narcocorridos* celebrate the deeds of drug traffickers—drug smuggling, murder, torture, and corruption—as well as make references to specific people, events, and locations. In this paper, I first describe the traditional genre, musical structure, and traditional artists. Then I depict how new artists from Los Angeles have diverged from this. I examine the effect that *narcocorridos* have had on listeners/audience members of two age groups (15–30 and 31–60). In addition, I examine the effect that *narcocorridos* have had on musicians in Los Angeles. Finally, I look at the connection between Mexican drug cartels and *narcocorrido* artists, many of whom have received death threats. Through interviews, textual analysis, and surveys, I look at the perspective and opinion of the local musician and audience member/listener on the new style and culture emerging from Los Angeles. The musicians believe that, although, this music is a part of Mexican culture it is violent and promotes drug use and materialism. On the other hand, while the listener understands the message they enjoy dancing and listening to the music. *Narcocorridos* are dangerous, violent, and people are murdered for performing/listening to them. In the current drug world, people brutally die while others get rich, peasants work for pennies while Americans use drugs; *narcocorridos* are the factual tales of this world.

**Do Latinos Benefit from Expressive Writing?**

Janette Hernandez  
*Mentors: Belinda Campos, Eric Knowles*

Previous studies have indicated that writing about traumatic experiences can be an effective therapeutic tool for alleviating the harmful effects of trauma for European Americans. These effects, however, are not universal and have been shown not to extend to members of Asian cultures. This research examined whether the benefits of expressive writing extend to members of Latino cultures. Overall, we hypothesized that Latinos would benefit from expressive writing because Latino culture values open emotional expression for positive emotion, but not negative emotion. Expressive writing may thus provide Latinos with an acceptable way to express negative emotion, gain insight, and alleviate the harm of traumatic experiences. Latino American (n=35) and European American participants (n=13) were randomly assigned to write either about a trauma or about trivial topics for four consecutive days. All participants completed measures that tapped Latino cultural scripts, emotion expressivity, and health prior to the writing task and wore an Actigraph sleep monitor each night over the course of the study. A post-task measure of health was obtained one month after the last day of writing. All writings and Actigraph results were tested using repeated measures ANOVAs to analyze participants’ trends in insight word use and sleep across the four writing days. Results partially supported the hypotheses. Latinos showed small, but not significant reductions in symptoms one month after the last writing task and an increase in sleep efficiency over the four nights of the study. Latinos did not, however, show an increase in insight word use across the days of the study. Implications and future research are discussed.

**Lateral Load Behavior and Modeling of Low-Rise Reinforced Concrete Walls for Performance Based Design**

Luis Herrera  
*Mentor: John Wallace*

The function of reinforced concrete (RC) structural walls is mainly to impede lateral forces such as seismic loads. Due
to the importance that a structural wall has in resisting earthquake loads, it is vital to model and assess their behavior when subjected to strenuous loads. The purpose of this paper aims to validate the American Concrete Institute (ACI) code provision on determining the shear strength of RC walls. There is a particular interest in looking at shear walls with intermediate slenderness (aspect ratio 1–3). Furthermore, the influences of how the boundary reinforcement and the axial load impacts the shear strength of the RC structural walls are evaluated. Eight large-scale RC structural walls were constructed according to the ACI code and are being tested with a reversed-cyclic loading. Linear Variable Differential Transformers (LVDTs) were placed on the specimens in order to measure linear displacements on various points of the wall. Strain gauges were also installed on the reinforcing steel of the specimens. Three walls were tested in which the specimens were subjected to both load and displacement controlled tests. Specimens one and two failed under 105 kip and 165 kip lateral force, respectively, while being subjected to an axial load of 144kip (10% of their compressive strength).

Individual Differences in Rumination and Stress Reactivity
Marzena Hiler
Mentor: Sally Dickerson

Research suggests that certain situations may increase the cortisol response to psychological stress more than others. Reactivation of the stress response has been associated with negative health implications. Some individuals reactivate the stress response following psychological stressors through a process called rumination, which involves repetitive mental rehearsal of a past event. This process has been shown to increase the cortisol response following a stressor, increase negative thinking, and impair problem solving. However, who engages in rumination and why is yet to be determined. This study hypothesized that guilt and shame would increase rumination after stress, thereby increasing overall stress reactivity and recovery. Some research suggests that shame affects the physiological stress response while guilt does not. However, research in this area is limited and we are seeking a potential interaction between shame and guilt on rumination and cortisol reactivity. Preliminary analyses showed a negative correlation exists between salivary cortisol and guilt, suggesting participants with higher self-reported guilt had lower cortisol reactivity at baseline. Finally, rumination was positively correlated with shame. Final results will determine if a relationship between shame and rumination results in elevated cortisol responses. Implications of this research may be useful to determine why certain individuals ruminate and which variables interact with rumination to produce elevated stress reactivity.

Longitudinal, in-vivo Imaging to Assess Blood Flow and Oxygenation in Implantable, Prevascularized Tissues
Ryan Hingorani
Mentor: Bernard Choi

Viability assessment in implantable, prevascularized engineered tissues is often difficult since hemodynamics cannot traditionally be monitored in vivo. Due to this problem, we have employed wide field and microscopic imaging modalities to measure hemoglobin saturation and blood flow within tissues in vivo and longitudinally. Fibrin based prevascularized tissues are cultured in vitro and implanted into dorsal window chambers on severe combined immunodeficient (SCID) mice. With these dynamic imaging methods, including multispectral imaging, laser speckle imaging, and intravital microscopy, we have observed anastomosis with the host post-implantation followed by initial perfusion of the preformed vessels with highly oxygenated blood. Over time, however, flow seized in the tissue due to thrombus formation. Our findings suggest that alternate prevascularization strategies must be explored to avoid thrombus formation and promote continuous, highly oxygenated blood flow within the preformed vessels to render the tissue viable over long periods of time. This study analyzes the data generated from the dynamic imaging methods in vivo and can revolutionize the tactics utilized in creating functional prevascularized tissues.

Geometric Design of Segmented Microfluidic Perfusion Chamber
Victoria Ho
Mentor: Elliot Hui

Microfluidics is the science of manipulating small volumes of fluid. Advantages include reduced reagent consumption, faster reaction times with increased surface area, and better precision in fluid manipulation. Previously, we reported a microfluidic device that is capable of creating segmented flow over a brain tissue slice for localized delivery of different chemicals. The device is 150 µm in height and is created with soft lithography—starting with two solutions containing different chemicals, fluid streams are merged with a sharp uniform boundary between the two segments. In this new design we have reduced the angle of approach between the inlet and outlet streams with respect to the bulk flow within the device. In addition, the main chamber geometry has been changed from a square to a circle. The effect of these two additions is to provide a curved interface between the two streams within the observation portion of the chamber. We also integrated a pneumatic channel underneath the tissue chamber to apply tensile stress on the tissue sample. This integration will help us investigate the effects of delivered drugs in conjunction with physical stress.
Out of Mind, Out of Sight: Marked Bodies and the Politics of Invisibility
Asia Nichole Hodges
Mentor: Frank B. Wilderson, III

In 2005, then President Carlos Menem infamously declared that, “In Argentina, blacks do not exist, that is a Brazilian problem.” Though statistically inaccurate, if taken metaphorically, Menem was speaking the truth of racial politics in Argentina, using the very language of invisibility that shapes the political discourse on matters of race, discrimination and redress: out of mind, out of sight. But what happens when there is a black body present? Over a 10-month, participant observer, ethnographic field study, I meticulously gathered evidence of the Afro-Argentine presence in the city of Buenos Aires, in addition to documenting my own journey as a black and as a woman in a culture that lauds neither. Incorporating photo analysis, statistical data, interviews, journal entries, and the theoretical frameworks provided by scholars of critical race theory, I formulate a provocative portrait of modern Buenos Aires in a gesture of critique of the invisibility discourse.

A Joke and Nothing More: Voice, Writing, and Kundera’s Comedy of Failed Finitude
Joseph Hong
Mentor: Ackbar Abbas

Czech novelist Milan Kundera (1929-) has gained international fame through his ability to blend a modernist style with a profound cynicism to produce highly complex comedies during the dark period of Stalinist occupation in Czechoslovakia. Kundera presents characters that intrigue the reader through their complexity, malevolence, or even their simplicity. The mediums of voice and writing, the phenomena that bind these characters through linguistic communication, are thus difficult to dismiss in Kundera’s work. This project will specifically examine the voice in its tensions with writing in two of Kundera’s novels: The Book of Laughter and Forgetting and The Joke. The voice and writing as artifacts within the Kunderan text provides the materials for comedy by directing the reader towards notions of the subject. For theoretical work on voice and comedy, I will be relying primarily on Mladen Dolar’s A Voice and Nothing More (2008) and Alenka Zupancic’s The Odd One In: On Comedy (2008), respectively. Further, notions of the Kunderan subject developed by this analysis of voice and writing will ultimately call into question the political qualities of these novels. Despite the explicit political backdrops of Kundera’s work, these texts remain skeptical towards the subject’s capacity for political activism.

Engineering Affinity Reagents for the Co-Crystallization of G Protein-Coupled Receptors
Richard Hooy
Mentor: Gregory Weiss

G-protein-coupled receptors (GPCRs) play an essential role in converting extracellular stimuli into cellular and tissue functions. As with other signaling mediators, unchecked signaling through these receptors leads to disease, e.g. cancer. For this reason, GPCRs are major targets for pharmaceutical companies. Historically, rapid discovery of drugs that specifically interact with GPCRs has been difficult due to limited availability of structural data. Furthermore, efforts to produce crystal structures of GPCRs have been slowed by the receptors’ resistance to solubilization, purification and crystallization. Here, we demonstrate progress towards a co-crystallization technique that circumvents the problems associated with stabilizing GPCRs in solution and creating quality crystals. Using oligonucleotide site-directed mutagenesis and high-throughput screening via phage display we have identified several variants of ligands, stromal derived factor (SDF)-1 and viral macrophage inflammatory protein (vMIP)-II to the GCPR, CXCR4. The variants demonstrate matured avidity and bind CXCR4 with affinities that surpass their wild-type counterparts. The variants have the potential to be useful reagents for crystallization of CXCR4 and for understanding receptor-ligand interactions associated with GPCR-mediated signaling. Finally, structural insight provided by these structures will be invaluable to structure-based drug-design, potentially presenting new ways to treat cancer, and HIV-1 infection.

Asynchronous Learning: A Comparison of Knowledge Acquisition Between Traditional Conference Lectures versus iTunesU MP4 Distance Learning among Emergency Medicine Residents
Kayvon Hosseini
Mentor: Bharath Chakravarthy

Asynchronous learning has been introduced to EM education recently because of its flexibility and adaptability to generation Y learning style. This study assesses the effectiveness of using iTunesU for online EM resident lectures compared to traditional in-house conference by evaluating participants’ knowledge retention. This prospective, experimental study was conducted at the tertiary university hospital, a Level I trauma center. The participants are the 17 EM residents. One resident has been omitted, as she is one of the investigators. We video-recorded the presentations, and linked the lecturer’s associated audio. The videos were converted to an MP4 video file, and uploaded to iTunesU. The lectures are available for immediate playback on any iTunes enabled device. Knowledge retention is tested using a three-item quiz. Conference attendees submit their responses after lecture. Distance learners view the
lectures on iTunesU, and submit their responses electronically. This ongoing study started in October 2011. Upon data completion, the data will be analyzed using descriptive analysis and comparative analysis will be conducted using chi-square test. To date, 101 conference attendees’ (CA) and 10 distance learners’ (DL) responses are obtained. The average knowledge retention score was 76.95% in the CA group compared to 78.4% in the DL group.

**Analyzing the Effect of Deletion/Mutation Constructs of EFEMP1 in Glioma Cell Invasion and Anchorage-Independent Growth**

Hao Hsu  
*Mentor: Yi-Hong Zhou*

Glioblastoma multiforme (GBM) is the most common and lethal type of brain tumor found in humans. Current treatment options for GMB include surgery, radiotherapy, chemotherapy, supportive symptomatic therapy, etc. Those treatments have very limited success in eradicating GBM in patients because tumor cells are highly resilient and complex. Traditional surgery yields small success in improving patients’ survival time since GBM is highly invasive and will most likely recur after the surgery. Zhou *et al.* described that EGF-containing fibulin-like extracellular matrix protein 1 (EFEMP1) plays a significant tumor suppressor role in malignant glioma cells *in vitro* in the settings of subcutaneous (sc) and intracranial (ic) xenograft systems, however, not changing growth *in vivo*. This makes EFEMP1 a potential therapeutic agent against GBM. In contrast to *in vivo* suppression of glioma cell tumorigenicity, data from *in vitro* matrigel invasion assays show that over expression of EFEMP1 can also promote tumor invasion probably via enhancing the extracellular processing of pro-invasive matrix metallopeptidase 2 (MMP2). Therefore it is necessary to identify tumor invasion domain in EFEMP1. Armed with this knowledge, we hope that modifying EFEMP1 gene by deleting the tumor invasion region while retaining tumor suppressor region will result in better tumor suppression function and safer for patients. Dr. Zhou has postulated that modulating various functional domains of EFEMP1 may change EFEMP1 regulation of MMP2 expression and invasion. This paper examines the effect of the deletion/ mutation constructs on tumor cell invasion and anchorage independent growth.

**A Green Approach to Insect Pest Control Efforts: The Effects of Sticky Surfaces on Bedbug Locomotion**

Irvin Huang  
*Mentor: Catherine Loudon*

Bedbugs have been shooting up in numbers, not just in the United States, but internationally as well. The most common form of treatment for a bedbug infestation is with chemical pesticides, which can have harmful effects on both people and the environment. By studying bedbug locomotion in regards to sticky surfaces, the end results could potentially be applied towards improving the design of existing bedbug monitors and traps. I investigated bedbug locomotion on sticky surfaces by recording high-speed videos of bedbugs walking onto double-sided sticky tape and glue traps. I then analyzed these videos by recording when each of the six legs went up and down to create a gait diagram. These gait diagrams help to visually emphasize the difference in movement once the bedbug makes contact with the sticky surface. We have found that bedbugs are usually slowed down by the sticky surfaces, as indicated by a longer gait and deviation from the standard tripod gait. By observing how bedbugs move, we can develop and improve traps as a viable alternative to environmentally harmful pesticides.

**A Cross-Ethnic Study of Physical Intimacy and Relationship Quality in Romantic Couples**

Justin Huft  
*Mentor: Chuansheng Chen*

Intimacy plays an important role in romantic relationships. However, until recently, there has been little research done investigating the correlation between physical intimacy—closeness in touching and/or sexual behaviors with another person—and overall relationship satisfaction. Literature indicates that there may be a positive association between various forms of intimacy (e.g., emotional, sexual or physical, intellectual) and relationship satisfaction. To learn more about the complex role intimacy plays in relationships across ethnicities, we examined: (1) whether East Asian (n=55), Hispanic (n=21), and Caucasian American (n=24) college students differed in levels of sexual and non-sexual physical intimacy; and (2) how ethnicity moderated the association between sexual/non-sexual physical intimacy and relationship well-being in 76 romantic couples (n=152). Couples came into the laboratory together and completed self-reports of satisfaction with sexual and non-sexual physical intimacy, frequency of sexual and non-sexual physically intimate behaviors, relationship satisfaction, and relationship commitment via online questionnaires. Results showed that, although ethnic groups did not differ in frequency of either sexual or non-sexual intimacy, there were ethnic differences in levels of satisfaction with sexual intimacy (e.g., intercourse) (Asians < Hispanics), but not non-sexual physical intimacy (e.g., affectionate behaviors). There were also ethnic differences in the strength of the relationship between sexual intimacy and relationship satisfaction (Hispanics < Caucasians). These differences could be due to cultural differences in sexual communication and the relative importance of sexual intimacy in romantic relationships within each ethnic group. Findings could inform couples therapists and individuals about the specific needs of ethnically diverse couples.
Shakespearean Figurations of the Gift
Erin Hughes
*Mentor: Julia Lupton*

Though not often paired together by Shakespeare scholars, *A Midsummer Night’s Dream* and *Othello* both challenge the notion of “selfish gifts” that currently dominates gift theory (the interdisciplinary study of gift-exchange relationships) and gift-theory approaches to Early Modern literature. This model treats gift exchange as a negotiation of power in which the giver places the recipient in a position of debt by imposing on him or her the obligation to reciprocate. By emphasizing the creative power of the recipient in gift exchange as well as the vulnerability involved for both giver and recipient, *A Midsummer Night’s Dream* and *Othello* resist this model and open up a reinterpretation of the dynamics of gift exchange focused on the idea of inner giftedness. As the two plays demonstrate, at stake in gift exchange for both giver and recipient is the affirmation of inner giftedness—a valued particularity of skill, virtue, or potential to contribute—and it is from this negotiation of inner giftedness which both the creative power and the vulnerability of giver and recipient derive. Heavily influenced by, but also moving away from, classical and biblical visions of individual giftedness, in which inner gifts of skill or virtue were seen as originating from a divine source outside the self rather than the creative power of the individual, *A Midsummer Night’s Dream* and *Othello* dramatize the shift to a more individualized sense of gifted interiority through scenes of material gift exchange.

The Effect of the Norris-LaGuardia Act on Strikes and Wages
Yvonne Hui
*Mentor: Gary Richardson*

In the years 1920 to 1940, we see low wages and record highs for unemployment as well as a surge in strike activity. Strikes are often a worker’s only tool to bargain for higher wages or better working conditions with their employer. Prior to the 1930s, the government often stood on the side of business, helping break strikes that were brought to court. Government began to take a more proactive stance toward not only the economy, but labor relations as well during the time of the New Deal legislation, an example being the Norris-LaGuardia Act. This study examines the relationship between real wages and strikes before and after the Norris-LaGuardia Act. The results reveal that strikes had no effect on wages before the act, but had a positive effect after the act.

Making the Byline: Marguerite Higgins and her Contribution to Transnational Reporting
Colleen Humfreville
*Mentor: Alice Fahs*

Marguerite Higgins, making a name for herself in the so-called “man’s world” of journalism, came face to face with historical events that could otherwise only be experienced through the paper-thin, ink-ridden pages of the New York *Herald Tribune*. By looking at her articles produced during both WWII and the Cold War—after her initial emergence into the international scene in the fall of 1944—the piece focuses on how she establishes her own narratorial authority within the texts. These articles are then compared to her writings in her memoirs for the same experiences. During WWII, it becomes clear that while Higgins omits herself from her articles as much as she can, she fills the reader in on her experience writing the story in her memoir. In the Cold War, initially these two accounts matched up, but as the situation worsened and Higgins became more pessimistic about the termination of Soviet power, her own writings soon reflect a more negative outlook on the “new” Poland and its government. This does not mean that she is anti-Communist. It is important to note that this opinion arose out of experience in two wars, with Higgins being a firsthand observer to the fall of Poland to Communist forces through their repressive strategies. Thus, it would be simplifying the case to say that she was simply anti-Communist, against the political ideology, their beliefs, and their tactics; rather, she became critical of the actions conspiring around her as she gained more experience in war reporting.

Visual-Motor Adaptation to Left-Right Reversed Visual Input
Melanie Humphrey
*Mentor: Alyssa Brewer*

Polymorphisms in the BDNF and dopamine genes may predict different capacities for visual-motor learning and motor map plasticity. In this study, we investigate potential differences in cortical plasticity in subjects with either one BDNF or one or more of five dopamine genetic polymorphisms by studying the effects of short-term adaptation to left-right visual input reversal on visual-motor task performance. Firstly, subjects completed visual-motor questionnaires and gave blood for genetic screening of the BDNF and the five dopamine polymorphisms. Secondly, subjects completed one hour of baseline visual-motor testing while wearing control goggles with a field of view restricted to match the experimental goggles. Lastly, subjects wore experimental goggles that left-right reversed visual input for a second hour. In both conditions, subjects completed two visual-motor tasks, Reaching and a Walking Maze, and one control motor task, Finger Tapping. The Finger Tapping task showed no difference in performance
between the BDNF wildtype val66val and the val66met polymorphisms during both conditions, as expected for a pure motor task. Performance on the Reaching and Walking Maze tasks worsened for all subjects during the altered visual input condition compared to the control condition. The subjects with the BDNF val66met polymorphism performed worse during the altered visual input condition and showed more rapid improvement than those subjects with the wildtype val66val genotype, indicating a difference in neural plasticity between these two BDNF polymorphisms. Using the current analysis, no significant difference was found among the five dopamine genotypes in any of the tasks.

**Identification of Potential Serodiagnostic and Subunit Vaccine Antigens by Antibody Profiling of Toxoplasmosis Cases in Turkey**

*Chris Hung*

*Mentor: Li Liang*

Toxoplasma gondii is an intracellular parasite that is capable of infecting any endothermic animals, including humans. The infection primarily targets those who are immunosuppressed, such as fetes and HIV patients. Women who develop acute toxoplasmosis during pregnancy are at risk of transmitting the infection to the fetus which may lead to fetal damage. Current diagnosis of recent infection by serology is complex, and often requires test by an experienced toxoplasmosis reference laboratory using a panel of serologic and molecular tests. To identify antigens with potential for improved diagnosis, we probed protein microarrays displaying the polypeptide products of 2,700 Toxoplasma exons with well-characterized sera from Turkey. The primary goal was to discover antigens that are unique between the acute- and the chronic-phase patients, especially to those chronic patients who are still presenting detectable Immunoglobulin M (IgM), which is usually predominantly secreted during the acute infection. A sera collection composed of negative, acute, chronic, and IgM persistent chronic from Turkey was used to probe the microarray chips for both IgM and IgG subtypes. After statistical analysis, there are 31 differentially reactive antigens found for IgG antibody and 55 differentially reactive antigens found for IgM antibody. All these antigens can discriminate acute from IgM persistent cases with the p-value less than 0.05. In summary, all these antigens can be considered as sera diagnostic candidates. Further investigation is needed to confirm and validate our findings.

**Electromechanical Reshaping of ex vivo Porcine Trachea**

*Syed Hussain*

*Mentor: Brian Wong*

The trachea, or the airway leading to the lungs, is a cartilaginous anatomical structure particularly prone to stenosis as a result of trauma and intubation. In previous experiments, electrical current or the application of voltage over a period of time has been known to significantly reshape cartilage tissue. Electro-mechanical reshaping or EMR may be used to “reform” or reshape aforementioned traumatic cartilaginous trachea. Several *ex vivo* porcine tracheas were used for this study. Each porcine trachea contains approximately 25 to 30 tracheal rings. Tracheal rings or cross-sections of the airway were harvested and cut at the overlap region to maintain the entirety of each ring. The natural concavity of the ring was reversed around a piece of cork. A pair of cathodes and anodes was pierced through the cartilage at a distance of 3mm apart and current was applied. The sample is allowed time to rehydrate. The results or degree of shape change were quantified via the use of pictures before and after EMR. The difference in the degree of curvature was measured for different parameters and compared. Results show that reshaping the tracheal airway is possible. The parameter of 5V 3min produced almost double the degree of reshaping when compared to 3V 3min. This presents valuable opportunities to reshape airway in humans using a minimally invasive and traumatic method.

**Engineered Collagen-Fibroblast Tissue: Its Image Analysis on Prestress**

*Kenji Ikemura*

*Mentor: Steven George*

An asthma attack triggers the lining of the airway to swell, which reduces air flow into the lungs. An attack can damage the bronchioles in the lungs causing them to be susceptible to another attack. Our question is how were the bronchioles modified to become vulnerable for another asthma attack? To answer this question, we have focused on a mechanical property known as prestress that is intrinsic in a healthy bronchiole. Prestress is a tension that is built in the tissue to resist stress from the outer environment. A hypothesis was made that prestress was lost or diminished in the bronchioles of patients who are vulnerable to asthma attack. To understand this property further, a tissue engineered model of bronchioles was developed from collagen and human lung fibroblast cells. This engineered tissue was successfully able to possess the property of prestress. Furthermore, micro scale observations were made using imaging technique known as second harmonic generation. These images revealed the collagen fibers in the engineered tissue. Images were then analyzed using autocorrelation. We have found that tissues with prestress had a highly uniform orientation of collagen fibers while tissues without prestress had random networks of collagen fiber. The significance of this finding is that if asthma is caused by loss of prestress, it may be possible to diagnose whether a patient is susceptible to an asthma attack or not by imaging its bronchioles rather than taking a biopsy.
Undergraduate Research: Managing the Future

Correlation of Actual Alcohol Consumption with Computerized Self Reported Alcohol Consumption in Trauma Patients
Bryan Imayanagita
Mentors: Cristobal Barrios, Allen Kong
Alcohol related injuries are a large group within the Emergency Department trauma patient population. The relationship between alcohol and trauma has been well known within the emergency department but no study has shown the relationship between alcohol and trauma within the inpatient population. Trauma patients, which included inpatient trauma, were given the Intervention questionnaire as part of their hospitalization at University of California, Irvine Medical Center in order to assess their alcohol dependency based on their responses to the questionnaire. The purpose of this study is to determine if there is a correlation between the reported alcohol consumption by the Computerized Alcohol Screening and Intervention tool and actual alcohol consumption. The Alcohol Use Disorders Identification Test Score from the questionnaire was correlated with the Injury Severity Score, blood alcohol concentration, and length of stay of 1,336 trauma patients. Regression analysis indicated that injury severity score did not have a significant correlation with predicting dependency among trauma patients. Blood Alcohol Concentrations was one of the greatest indicators of injury, with positive blood concentration patients having a 13.5 times greater risk of dependency. The findings suggest that actual alcohol consumption is a good predictor of dependency and there is a correlation with the score from the self administered computerized alcohol screening intervention tool.

Palladium Extraction with 5-(4-methylphenyl)-1,3,4-oxadiazole-2-thiol in Nitric Acid
Oliver Jan
Mentor: Mikael Nilsson
Nuclear fission during nuclear power generation cycles allows for the probability for precious metals such as palladium to be formed. This project focuses on the liquid-liquid extraction of palladium(II) using 5-(4-methylphenyl)-1,3,4-oxadiazole-2-thiol (MPOT) in 1-octanol using simulated nitric acid media conditions analogous to actual spent nuclear fuel. MPOT was proposed as the organic extracting reagent to take advantage of soft electron coordination with palladium metal from nitrogen and sulfur sites, with this behavior characterized from previous literature. To fully understand the extraction behavior, it is necessary to test for extraction efficiency by determining distribution ratios by varying ligand concentration as well as varying the acidity of the aqueous phase. Distribution ratios will be calculated using high purity germanium detection methods after neutron activation analysis at the UCI TRIGA reactor. This research will help the economic viability of nuclear energy and will allow for an alternative source of strategic metals for future usage.

Carbon Monoxide Emission from Impinging Diffusion Flames
Maribel Jaquez-Nunez
Mentor: Derek Dunn-Rankin
Surfaces heated by flames impinging on them are very common and widely used in industrial applications, including welding, glass shaping, metal melting, indoor cooking and heating. An important parameter for controlling the efficiency of an impinging flame is the heating height, which is related to combustion incompleteness. When combustion is incomplete, the combustion process is thermally inefficient and it releases unwanted products such as carbon monoxide (CO). Incomplete combustion of impinging flames results from interruption of the flame chemistry during quenching. Therefore, finding a relationship between heating height and flame efficiency can lead to better completion of the chemical reaction during burning. This experiment consists of an axisymmetric jet flame that is impinged with horizontal (90º) flat plates. The metal plates under flame impingement have various temperature distributions in the radial direction from the center of the flame. Finding an optimal heating height that produces minimal CO emission is an essential task. Current results have shown that as the impinging height decreases CO emissions increase. Therefore, this study examines the temperature distribution with different impingement heights to the flame, and then compares the heating height and carbon monoxide emissions.

Does Neighborhood Level Violence Predict Children’s Antisocial Behavior?
Amanda Jara
Mentor: Candice Odgers
The neighborhoods that children grow up in are believed to have far reaching effects on their mental health and behavior. The majority of prior research has focused on how neighborhood-level poverty influences children’s development, with less attention paid to the features of poor neighborhoods that may transmit the effects of poverty to children. In this study, we combined measures of street-level neighborhood violence collected in collaboration with the CrimeMappers project with multiple measures of neighborhood settings (e.g., poverty, neighborhood problems, safety, and social cohesion) to capture the local neighborhoods of the 2,232 children in the Environmental-Risk Longitudinal Twin Study. More specifically, we: (1) characterized the amount of crime and violence that children are exposed to each month in their local communities, (2) tested whether neighborhood violence predicted children’s antisocial behavior (as rated by mothers and teachers), and (3) tested whether the effect of
neighborhood violence on children’s antisocial behavior held after controlling for family and neighborhood-SES as well as exposure to violence in the family. Preliminary results indicate that neighborhood level violence has robust effects on children’s behavior and suggest that children’s growing up in poor neighborhoods may experience a cumulative effect of family and neighborhood violence. Results of this study are positioned to aid our understanding of how exposure to violence and poverty in local communities may influence children’s lives.

The Effect of Changes in Production on Employment before, during, and after the Great Depression
Mildred Jara

Mentor: Gary Richardson

The high unemployment rate during the Great Depression is one of the most lingering memories of the 1930s, not only because of its high levels, but also because of its long-term persistence. The recovery phase of the Depression mildly ameliorated the high unemployment levels through the introduction of new firms and plants, but employment levels still remained low despite a recovering economy. Using industrial production and factory employment indexes from the Federal Reserve Bulletin this study seeks to discover whether changes in production affected employment differently during the 1920s, the 1930s and the late 1930s in nine prominent manufacturing industries of the United States. Linear multivariable regression using Ordinary Least Squares (OLS) are run in order estimate the employment elasticities with respect to output of nine manufacturing industries in the U.S. during periods of expansion (1920s and late 1930s) and contraction (1930s). Findings show that the relationship between changes in production and employment varies throughout the business cycle. More specifically, employment elasticities are larger during times of economic expansion than during contractions. In fact, the correlation between employment and output was close to zero during the recovery phase of the Depression indicating a jobless recovery.

Self-Identification among Multiracial and Multiethnic Latinos
Briana Jex
Mentor: Cynthia Feliciano

To address the current gap in research about ethnic identity, this study examines how multiracial and multiethnic Latinos self-identify. In addition, this study examines whom multiracial/multiethnic Latinos would be open to dating. Twenty-eight in-depth semistructured interviews were conducted with multiracial/multiethnic Latinos who are current or recent graduates of two-year or four-year colleges or universities. I examined how factors such as higher education experiences, exposure to their ethnic cultures, communities they resided in, phenotype, and language influenced how they self-identified and whom they were willing to date. In this study, I found most respondents strongly identified with pan-ethnic terms (whether to self-identify ethnically or racially) and asserted specific ethnic identities based on their parents’ or grandparents’ countries of origin, especially the respondents who were currently enrolled or had graduated from a four-year university. Respondents used pan-ethnic terms and their specific racial/ethnic groups interchangeably. I found multiracial Latinos were more likely to identify racially as Latino/Hispanic while multiracial Latinos would racially identify as Latino/Other race (i.e., Latino/Black or Latino/White). Multiracial Latinos struggled more in how they self-identified based on their phenotype and ability to speak Spanish or other languages. Multiethnic Latinos self-identified based on their ability to speak Spanish and their exposure to the several Latino cultures they belonged to. Results from this study show that multiracial/multiethnic college educated Latinos are less likely to date outside of the racial/ethnic groups they belong to. This study suggests that phenotype, language, exposure to one’s cultures, and college experiences influence how multiracial and multiethnic Latinos self-identify and whom they find desirable to date.

Accuracy of Breast Density Segmentation Techniques in X-Ray CT and 3D MRI: A Gold Standard Comparison
Travis Johnson
Mentor: Sabee Molloi

Breast density is, behind age, the second leading risk factor for the development of breast cancer in women; however, there is currently no generally accepted quantitative measure of this characteristic. The projective nature of mammographic images makes density measurements difficult; three dimensional imaging techniques are needed for accurate quantification. Density is often determined from segmentation algorithms, but without an established method for comparison, it is difficult to determine the accuracy of these classifications. In this study, chemical decomposition is used as the gold standard. Forty post-mortem breast tissue samples with masses varying from 136g to 2330g were imaged with three-dimensional MRI and a cone beam x-ray computed tomography (CBCT) system before being decomposed into water, lipid, and protein. The MR images were segmented with an FCM based bias field correction algorithm: coherent localized intensity clustering (CLIC). For the CBCT images, a simple “by-hand” single energy thresholding (SET) method and an FCM based algorithm (FCMChen) were applied. Simple linear regression analysis was performed for each technique. The segmentation techniques all show a good correlation with the gold standard values from decomposition. The R-squared value of this fitting is 0.93 for SET, 0.92 for FCMChen, and 0.88
for CLIC; however, the fitting parameters were significantly different in each case. Therefore, each segmentation technique tested can accurately differentiate between samples of different density; but, for a given system and clustering technique, a calibration data set may be required to interpret the results faithfully as a quantitative measure of breast density.

**Specificity of FTY720 for Nutrient Transporters**

*Yoosun Joo*  
*Mentor: Aimee Edinger*

FTY720 is a sphingolipid-based drug that is a potential anti-cancer drug because it selectively starves cancer cells by down-regulating nutrient transporters. In this study, the selectivity of FTY720 for nutrient transporters was evaluated by determining whether FTY720 also affects trafficking of the epidermal growth factor receptor or the transferrin receptor. To measure the change in surface proteins over time, fluorescence-labeled biomolecules, such as antibodies or receptor ligands, were used in tandem with flow cytometry to measure changes in surface protein levels over time. The results show that while 4f2 is down-regulated by FTY720 treatment, it is unclear whether EGFR is down-regulated because of the poor resolution of the assay. The results also show that FTY720 does not increase the endocytosis of the transferrin receptor, but may block its recycling. Thus, this paper presents a partial answer to why FTY720 causes a bioenergetic crisis in cancer cells by suggesting that the drug causes a rapid down-regulation of some nutrient transporters while blocking the recycling of other cell surface proteins.

**Effects of Laser Micro-Irradiation on H3S10 Phosphorylation of PTK2 Mitotic Cells**

*Samir Kabbara*  
*Mentor: Michael Berns*

The intent of this study is to determine the effect of laser micro-irradiation on H3S10 phosphorylation in mitotic cells. Histones are proteins that are essential for DNA condensation. As such, the modifications of histones play an important role in signaling events for cell cycle progression as well as transcription and replication. Phospho-Histone H3 (phH3S10) begins to be detected in S-phase and reaches its peak in mitosis. For this reason this histone modification has been described as a mitotic marker. The goal of this research project is to determine the kinetics of Histone H3 on Serine 10(H3S10) phosphorylation in rat kangaroo cells (Potorous tridactylus/ PtK2) in mitosis. This study will be performed by irradiating PtK2 cells using different femtosecond near infrared (NIR) 800 nm Ti:Sapphire laser intensities in order to see whether they will retain the histone modification or whether an accelerated loss of H3S10 will occur after irradiation. We will also study the level of phH3S10 retention or loss in naturally occurring and laser induced lagging chromosomes. Damaged irradiated cells will also be stained for known double strand break markers and repair proteins (Ku) to determine whether there is retention or loss of the “mitotic mark” within the damaged regions of the cell. Initial results demonstrated that sites of cells irradiated at high intensity, along with naturally occurring and laser induced lagging chromosomes, showed retention of pH3S10 compared to rest of the chromosomes in the cell. It is concluded that laser micro-irradiation does have an effect on phH3S10 in mitotic PtK2 cells.

**Designing a Novel Approach to Measure and Select for Advanced Cardiac Endurance in Drosophila melanogaster**

*Ashley Kadakia*  
*Mentor: Michael Rose*

The specific aim of the proposed experiment was to construct a device (cardio cage) that was designed to compel a population of *Drosophila melanogaster* to maintain constant motion until exhaustion in hopes of testing and selecting for advanced cardiac endurance. Such a device would make it possible to study cardiac function using fruit flies as a research model. The cardio cage prototype is capable of exhausting the majority of individuals in a population within an hour. However, more work is needed to increase the cardio cages effectiveness in coercing the entire population to exhaustion.

**Prophylactic Low Molecular Weight Heparin Dosing in High Body Mass Index**

*Tamana Kaderi*  
*Mentor: Cristobal Barrios*

Patients in the ICU are at a higher risk for the development of DVT due to multiple factors, including immobility. Anticoagulants such as LMWH have become common protocol in hospitals to prevent the rate of DVT. While standardized dosing of patients with a normal BMI has been developed, there is little research on patients with BMI considered obese. We hypothesize that patients with BMI>30 given standard dosing of LMWH who still developed DVT are likely under-dosed. This is a retrospective study categorizing 1,457 patients with either BMI>30 or BMI≤30 who received prophylactic LMWH and had correctly drawn anti-Xa levels. The occurrence of DVT was also measured with some possible confounding factors. There was a higher rate of DVT in patients with BMI>30 compared to BMI≤30. Approximately 86% of patients with BMI>30 who had prophylactic LMWH with timely drawn anti-Xa levels had too low of a trough value. These findings suggest that the implementation of a higher dosing protocol of LMWH for obese patients at risk for DVT may be necessary.
The Effects of Rule Accessibility on Moral Judgments
Hannah Kang  
*Mentor:* Peter Ditto

A large body of studies points to the idea that a perception of a factual outcome is often aligned with personal attitude and belief of the issue. Also, many studies have provided evidence that moral rules that are cognitively more accessible can affect moral judgment. Based on the existing body of literature, this study investigates the relationship between cognitive accessibility of moral rules and the perception of the cost and benefit of the outcome. By understanding how moral judgment can be affected by the accessibility of a moral rule, it will help to resolve disagreements in moral and political issues. The studies consist of participants from various background recruited at the University of California, Irvine, and participants in each study were randomly assigned to two conditions with contrasting moral rules. The studies were in survey format, which tested the hypothesis that cognitive accessibility affects the cost and benefit analysis of the outcome. The data analysis was conducted using the Statistical Package for the Social Science (SPSS). Several problems that need to be resolved include measuring subtle changes in judgment, and any potential incompatibility between manipulation in cognitive accessibility and measurement of the effect. The subject area needs further investigation and understanding.

Aircraft Control via Moving Masses
Khizar Karwa  
*Mentor:* John Garman

Aircraft control is usually done using control surfaces on the tails and wings. These surfaces are adjusted to produce forces and moments about the center of gravity of the aircraft, which results in achieving the desired orientation of the aircraft. However, during gusty conditions the control surfaces may be ineffective due to the bad airflow conditions. For small-size UAVs with low inertia moving a mass such as moving the propulsion battery of the aircraft will be sufficient to control the orientation of the aircraft. This moving mass will replace the need for the control surfaces, which produce drag on the plane and are easily damaged in service. Various mass actuation methods were tested and it was determined that stepper motors were most suitable due to the low system weight and the fast actuation speed. The first prototype for this system is being sized to fit the mass actuation system. The first prototype will be manufactured and tested by the end of the spring quarter.

Propulsion Performance Optimization Using Current Limiting
Khizar Karwa  
*Mentor:* John Garman

The propulsion systems of UAVs encounter a large range of conditions throughout their flight envelopes. Large current draw occurs on takeoff, where the torque is highest, and high engine speed is desired during high speed cruise. High battery voltage is required for achieving high engine speed. However, the high battery voltage will cause a very large current draw on takeoff. As a consequence, propulsion systems are sized for takeoff conditions if there is a current limit due to a fuse in the system or the current limit of the system components. In this project a microcontroller was used to ensure that the current drawn by the motor did not exceed a set value. Normally the motor controller varies the voltage of the battery across the motor based on the command signal from the radio transmitter controlled by the pilot. The current limiting system uses the signal from the radio as the desired current to be drawn and dynamically controls the voltage across the motor to match the flight conditions. On takeoff, where low engine speed is sufficient to provide high torque and high thrust, the controller limits the voltage applied across the motor below the maximum battery voltage. During cruise or high speed flight, the controller allows more or even all of the battery voltage to be applied across the motor. This ability to draw the maximum current allowed from the propulsion system ensures that the components are used at their normal operating conditions.

Relationship Between Maternal Age, Paternal Age, Prematurity, Birth Weight and Autism
Patil Kavarian  
*Mentors:* Christy Hom, Ira Lott

Autism is a developmental disorder that appears in the first three years of life, and affects the brain’s development of social and communication skills. The intent of this study is to examine if there is a relationship between autism and advanced maternal age (≥35 years of age), advanced paternal age (≥35 years of age), prematurity (gestational age <33 weeks), and low birth weight (<5.5 lbs). For this study, medical and clinic records for 470 patients seen in the UCI Medical Center Neurodevelopmental and Behavioral Clinic between June 2007 and June 2011 were reviewed in order to collect information about the following variables: maternal age at the time of the patient’s birth, paternal age at the time of the patient’s birth, patient’s birth weight, and patient’s gestational age. Our study did not find a significant association between autism and parental age; however, we did find that patients’ gestational age and birth weight were significantly associated with the incidence of autism, but not in the direction that we hypothesized. Premature babies were less likely to have autism than babies born at
33 weeks gestation or beyond. Similarly, we found that low birth weight was associated with a lower incidence of autism. Therefore, our analysis demonstrated that prematurity and low birth weight were related to a lower incidence of being Autistic. The underrepresentation of autism in children with a history of prematurity and low birth weight may in fact be due to their classification under other, more severe neurological disorders, resulting in a diagnosis other than autism.

**N-glycan Branching in Immunosenescence**  
Khachik Khachikyan  
*Mentor:* Michael Demetriou

Immunosenescence is a term that describes the association of aging with a decline in the function of the immune system. This contributes to the decreased immune response to vaccination and infection observed in the elderly. Previous studies in mice have shown that increased N-glycan branching prevents T cell hyperactivity. However, it is unclear what role N-glycan branching plays in immunosenescence. To address this question, I used flow cytometry to examine and compare the levels of branching in the naive and memory CD4+ T cells of young and old mice. I found that memory T cells have higher levels of branching than naive CD4+ T cells regardless of the age of the mouse. However, old mice had higher levels of branching than the young mice in all T cell subsets studied. This supports the suggestion that N-glycan branching levels on T cells increase as mice age. This increase might work along with other factors to reduce the normal function of the aging immune system. Further studies are required to further explore the role of branching and T cell aging.

**Talking, Walking, Teaching: The Roles of Anthropomorphism in Children’s Literature**  
Victoria Kim  
*Mentor:* Julia Lupton

The prevalent use of anthropomorphism in children’s literature is significant in our collective understanding of human beings and human nature. The act of storytelling in itself is a reflection of communal experiences, distinctly human emotions, and cultural perceptions. However, this use of animals in the place of humans for the instruction of our youth is problematic. For one, the representation of talking, clothed animals complicates the relationship with real animals. Moreover, the enthusiasm in which children readers adopt anthropomorphism is countered by our innate desire to distance ourselves from anything remotely animal-human divide that necessitates a deliberate use of anthropomorphism for moral lessons into a mutual convergence that facilitates understanding between humans and animals. Anthropomorphism embodies diverse roles so that the relationship between animals and humans is not separate and stagnant, but rather an interaction that is in active conversation with one another.

**The Effect of Particle Size on Folding Pattern of Langmuir Monolayers**  
Akihisa Kodama  
*Mentor:* Michael Demetriou

Langmuir monolayers are a single layer of amphiphilic molecules on the surface of an aqueous subphase. When this monolayer is compressed, the molecules are forced closer and closer together until it collapses and some of monolayer forms folds into the aqueous subphase, creating a 3-dimensional structure. Experiments have shown that SDS-DODAB monolayers have reversible folds. However, the addition of particles can affect the folding behavior of the monolayer. In the experiment reported on here, particles with diameters of 1 µm, 0.5 µm, 0.1 µm, and 20 nm were deposited on a SDS-DODAB monolayer. A surface-pressure vs. area isotherm and a fluorescence microscope were used to analyze the folding patterns of the monolayer. It was found that the 1 µm and 20 nm beads cause the monolayer to fold reversibly, similar to pure SDS-DODAB but the 20 nm beads cause it to fold at a lower surface pressure. The 0.5 µm and 0.1 µm beads cause the monolayer to fold irreversibly; even when the monolayer is expanded, the folded structure remains. It was concluded that the SDS-DODAB coats the beads in this size range instead of unfolding. This research can be used to understand the behavior of pollutant particles interacting with the lung surfactant in our lungs and further our understanding of the causes of some respiratory diseases.

**Precursor Up-Regulation and Protease Effects on the Production of Polyketides in Yeast**  
Marc Kryger  
*Mentor:* Nancy Da Silva

Polyketides are valuable pharmaceuticals and bio-renewable industry chemicals that can be synthesized in the yeast *Saccharomyces cerevisiae*. In this study, the effects of up-regulation of native metabolic precursor pathways on the synthesis level of the model polyketide 6-methylsalicylic acid (6-MSA) were investigated. Two different promoter systems, *P_{PGK1}* and *P_{ADH2}* were used in the
engineered host strains. Additionally, production levels in strain BY4741 and protease-deficient strains were compared, revealing an improvement in 6-MSA production in the absence of the proteases PEP4 and PRB1.

Developmental Effects and Systemic Response to Hypoxia during the Neonatal Stage
Michele Kunde
Mentors: Gregory Adams, Kenneth Baldwin

Inflammation contributes to the detrimental effects of multiple chronic illnesses, including childhood obesity and asthma. The intent of this study is to discover a way to mimic the systemic response found in children with these chronic diseases, and to find an explanation on a molecular level for this response to eventually find ways to reverse their negative effects. We tested the effects of hypoxia on neonatal rats by placing them in a chamber that controls oxygen levels. We expected a systemic inflammatory response, similar to that which is seen in obese or asthmatic children. This response did occur in the hypoxic neonatal rats, making our model successful in creating a condition in rats that emulates that of asthmatic or obese children. This model will be useful in determining ways to combat the negative symptoms of these two major childhood afflictions.

Collagen and Elastic Fibers’ Ultrastructure and Composition of Decellularized Porcine Extracellular Matrix
Anh La
Mentor: Steven George

Decellularization of intact tissues provides an instructive 3-D extracellular matrix (ECM) that can enhance cell proliferation, migration, and adhesion. The decellularized ECM must be able to provide the mechanical and chemical cues similar to that of the intact tissues. Removal of cells in intact tissues can cause a disruption in ECM. Because collagen and elastic fibers make up the main structural proteins in ECM, we are studying the ultrastructure, composition, and mechanical properties of those fibers in a porcine heart tissue during and immediately following the decellularization process. Image analysis of the fibers ultrastructure is being compared to the direct mechanical and chemical tests to show whether noninvasive measurement could be achieved. The tissue was imaged by two-photon microscopy before decellularization, after perfusion with Trypsin, and after perfusion with TritonX-100 solutions. The images were analyzed by ImageJ to measure the diameter, area fraction, and aspect of ratio for the fibers. Biochemical assays were used to confirm the fibers content. Indentation tests give additional insights into the ECM structures by analyzing the tissue stiffness. The results show that the fibers’ area fraction and diameter decrease over time. This correlates with a gradual drop in fiber content and tissue mechanics during the decellularization process, which is consistent with the loss of cell and tissue integrity. Noninvasive measurement of ECM is able to provide information about the change of the fibers properties that show similar trend in biochemical assays and indentation test.

Computational Study of the Mechanisms of Oxidation of Aliphatic Sulfides and Aliphatic Sulfoxides by Dimethyl dioxi rane
Julie La
Mentor: Fillmore Freeman

There is much speculation among scientists concerning the mechanisms for the stepwise oxidation of sulfides to sulfoxides and of sulfoxides to sulfones by dioxiranes. The greatest aspect of the reaction is the ability to transfer oxygen to a variety of compounds under mild experimental conditions. In order to elucidate the mechanisms, the dioxirane oxidation of aliphatic sulfides has been studied using CCSD (T) and QCISD(T) with the cc-pVTZ basis set. The hybrid density functionals B3LYP, B3PW91, and PBE1PBE with 6-311+G(d,p) basis set were also used. The oxidation mechanism includes the breaking of a 3-member ring to form a bond with aliphatic sulfur compounds. This reaction creates sulfoxides and can be further oxidized to sulfone. By studying the structures of the transition state along with the reactants and products suggests the nucleophile in the first step is the sulfide. The second oxidation was observed to be slower than the first from comparing the respective activation energies of the two oxidation reactions. From the calculated energy differences of HOMOs and LUMOs showed no significant correlation with the Taft substituent constants. Preliminary results suggest that both mechanisms may be concerted.

Is Early Maternal Employment Related to Theory of Mind and School Readiness in Children with Autism Spectrum Disorder?
Lesley Lai
Mentor: Wendy Goldberg

Although considerable research has examined the association between maternal employment and child outcomes in typically developing (TD) children, less is known about this relationship in children with Autism Spectrum Disorders (ASD). In the TD literature, maternal employment has been found to have a both positive and negative association with child development and school readiness, depending on the outcome under examination. One of the major features that characterize individuals with ASD is their lack of awareness of their own and others’ intentions in social situations. This impairment in social cognition has been linked to a deficit in theory of mind (ToM), or the ability to infer the mental states of others, such as their feelings and beliefs. The goal of this study was to examine the as-
sociations among history of early maternal employment, ToM, and school readiness in children with ASD. Children were administered a battery of theory of mind tasks and the Developmental Indicators for the Assessment of Learning. Because children with ASD display impairments in cognitive functioning and social and communicative abilities, results are expected to indicate a negative relationship between: (a) history of early maternal employment and ToM in children with ASD, and (b) history of early maternal employment and school readiness in children with ASD. The findings from this study should be of interest to families and professionals who provide counsel and support to parents of children with ASD.

**Pixel VGA: Repurposed Electronic Waste**

Nicholas LaJeunesse  
*Mentor: Garnet Hertz*

As a result of rapid technology change, low initial cost, and planned obsolescence, approximately 250 million functioning TVs, VCRs, cell phones, computers, and CRT monitors are discarded each year in the United States. Pixel VGA serves to reuse these discarded computer monitors by transforming them into large video wall systems for use with artistic, architectural, and interactive applications. We found that through recent advances in do-it-yourself and open source electronics we could engineer custom video driver hardware for computer monitors at less than $10 per monitor. Using a familiar micro controller (Arduino) and a computer monitor tester (Tiny VGA) we designed and built a custom interface capable of controlling 60 computer monitors. This interface produced single color images on each monitor with each monitor’s color and color alternating frequency dependent on a preprogrammed script. This interface was easily adaptable to different monitors and different monitor arrangements resulting in an inexpensive and aesthetic light installation. These light installations have applications in low resolution video wall displays, ambient light displays, and interactive public art displays.

**Pharmacological Profiles of L-stepholidine on Different Subtypes of Dopamine Receptors**

Melanie Lam  
*Mentor: Yan Zhang*

L-stepholidine (SPD) is a tetrahydroprotoberberine (THPB) alkaloid isolated from the Chinese herb *Stephania*. SPD was the first compound possessing dual actions on brain dopamine receptors, while eliciting partial D1 receptor agonist activity while antagonizing D2 receptors. Therefore the potential role of SPD in the treatment of drug abuse and psychotic disorders has recently received more attention. In this study, we characterized the pharmacological profiles of SPD on different subtypes of dopamine receptors D1, D2, D3, D4 and D5. In this study, the cloned dopamine receptors D1, D2, D3, D4 and D5 were transfected in human embryonic kidney-293T cells, individually. Intracellular calcium changes of these dopamine receptor-expressing cells upon SPD treatment were monitored by Flurometric Imaging Plate Reader. The results showed that SPD has high affinity to these dopamine receptors. SPD can stimulate D1 and D5 receptor while blocking D2, D3 and D4 receptors. This study on the pharmacological effects of SPD will help us understand the acting mechanism of SPD in the brain and explore different dopamine receptors related biological functions.

**Neural Stem Cells Genetically-Modified to Express Neprilysin Reduce Aβ Pathology in Alzheimer Transgenic Models**

Daniel Lan  
*Mentor: Mathew Blurton-Jones*

Short-term neural stem cell (NSC) transplantation improves cognition in Alzheimer disease (AD) transgenic mice by enhancing endogenous synaptic connectivity in the absence of any effects on the underlying beta-amyloid (Aβ) and neurofibrillary tangle pathology. However, the long term success of cell based approaches may require combinatorial approaches that also modify disease pathology. Accordingly, we genetically-modified murine NSCs to stably express and secrete the Aβ-degrading enzyme neprilysin (sNEP). *In vitro* examination of sNEP-expressing NSCs confirmed that this approach enhances Aβ-degrading activity without altering the multipotent phenotype of NSCs and that sNEP expression protects NSCs from Aβ-induced toxicity. To determine whether sNEP-expressing NSCs can also modulate AD-pathogenesis *in vivo*, we performed transplantation studies using a well characterized transgenic model of AD, 3xTg-AD mice. Aged transgenic mice were transplanted unilaterally with sNEP-NSCs versus control-transfected NSCs. After three months, stem cell engraftment, neprilysin expression, and AD pathology were examined. Our findings reveal that stem cell-mediated delivery of NEP provides marked and significant reductions in Aβ pathology in 3xTg-AD transgenic mice. Remarkably, Aβ levels are reduced not only in the hippocampus and subiculum adjacent to engrafted NSCs, but also within the amygdala and medial septum, areas that receive afferent projections from the engrafted region. Taken together, our data suggest that genetically-modified NSCs could provide a powerful combinatorial approach to not only enhance synaptic plasticity but to also modify underlying AD pathology.
ADHD Symptoms, Negative Mood, and Academic Nonattendance: the Role of Social & Interpersonal Difficulties
Benjamin Latham-Bryman
Mentor: Larry Jamner
Adolescents with ADHD experience more negative mood, more difficulty interacting with their peers, and poorer school attendance compared to their non-ADHD peers. It is not entirely clear what the dynamics between these attentional, affective, and social factors are, or how combinations of these factors may predict certain academic outcomes for adolescents with ADHD. This study aimed to explain, in part, why teens with ADHD are at increased risk for school non-attendance. Participants (n = 522) were high school students in Orange County who completed a battery of surveys, including the Barratt Impulsivity Scale (BIS) and the Measure of Attentional and Behavioral Styles (MABS). Using an electronic diary, participants were prompted every 30 minutes during waking hours to rate their location, activities, social partners, moods, and whether they were hassled over eight four-day sessions during their high school careers. It was hypothesized that those with more ADHD symptoms would experience more hassles and negative affect, and spend less time with friends, which in turn would predict decreased school attendance. Preliminary findings indicate that, although there is a positive relationship between ADHD symptoms, as measured by the BIS, and hassles (r = .09, p < .05), and between the BIS and several affective measures, school attendance was not significantly associated with either the BIS or MABS scales. Post-hoc analyses will examine individual differences in certain components of ADHD (e.g., impulsivity, poor planning, inattention), and their associations with social interaction, school attendance, and experiences of hassle and negative affect.

High-Throughput Inhibitor Screening of the Potential Virulence Factor, RipA, from Yersinia pestis
Yama Latif
Mentor: Célia Goulding
The causative agent of the bubonic plague, *Y. pestis*, still poses a global threat. Therefore, a deeper understanding of the bacteria’s pathogenesis is desired. The *rip* operon, which comprises *ripA, ripB*, and *ripC* genes, has been shown to be essential for the intracellular proliferation of *Y. pestis* within its host’s activated macrophage. Previously, we have structurally and biochemically characterized the protein encoded by the *ripA* gene. RipA belongs to the family I CoA transferases, and has a preference for butyryl-CoA, which led us to propose its role in producing butyrate, an anti-inflammatory, to lower nitric oxide levels in macrophages. Here, we present high-throughput screening of RipA using the entire library from the National Cancer Institute (NCI) Diversity Set II. Differential scanning fluorimetry, which quantitatively measures the thermal stability of protein-ligand interactions, revealed compounds that enhance the stability of RipA. These compounds are currently being investigated, using an HPLC-based assay, for their ability to inhibit RipA function. We have also co-crystallized RipA with the NCI compound 83318. These new findings along with continued research will provide us with an enhanced insight into *Y. pestis*’ pathogenesis and may lead to the development of future broad-range therapeutics.

Investigating the Change in Women’s Lip Size by Measuring Frontal Views of Faces from Vogue Magazine
Lauren Law
Mentor: Brian Wong
Traditionally, quantitative approaches in defining lip size have been limited to studying photographs from the present. Often times, facial aesthetic studies use images from current media or from human subjects. The overall change in lip size has not been exclusively investigated, and comparing surface area of lip sizes over time is critical to determining a trend. Our study aims to project outside the scope of current lip attractiveness studies and focus on determining the overall trend in lip size over the past 60 years. A total of 138 Vogue magazines were reviewed and images from selected years meeting a defined set of inclusion criteria were analyzed. Image J software was used to make surface area measurements of the top lip, bottom lip, and interpupillary distance, which was used to normalize the data. Averages of these data were taken for each year and displayed showing very weak linear correlation for each of the variables. Likewise, an ANOVA analysis was tested showing significance in the means for each year with p-values 4.68E-06, 1.21E-06, 3.54E-05 for the top lip, bottom lip, and top compared to bottom, respectively. Linear Regression plots and ANOVA analysis showed that there is a difference in the means of lip size over the years for each of the variables, but statistical methods were not able to further determine the change.

Debugging with JTag
Julian Lawrence
Mentor: Ian Harris
Man’s dependency on embedded systems (computers designed for specific functions) has been continuously increasing, and the more our technology improves the more we trust them in our everyday lives. When we put this much trust in our devices we want some assurance that they are working properly. With so many devices out there we want a universal way to interface and test our device. Fortunately most systems today use the Joint Test Action Group (JTag) debug port, IEEE 1149.1 Standard Test Access Port and Boundary-Scan Architecture, which allows us to interface with the embedded system. We preformed
undergraduate research: managing the future

Progress towards the Asymmetric Hetero-Claisen Approach to Welwitindolinone B
Bonnie Le
Mentor: Kenneth Shea

The welwitindolinone alkaloids, isolated from Australian soil samples, have been found to have antifungal and anti-cancer properties, as well as reversing multiple drug resistance. One member of this family, Welwitindolinone B, is of interest due to the complexity of the structure and because its biological properties remain unknown. To synthesize the carbon skeleton of Welwitindolinone B, we are employing a type 2 intramolecular Diels–Alder cycloaddition. A key intermediate in the synthesis is an oxindole Diels–Alder reaction precursor. A single stereocenter in this intermediate would set the stereochemistry of the entire molecule providing access to an enantiopure Welwitindolinone B. I am developing an asymmetric hetero-Claisen approach for the synthesis of the oxindole intermediate, which would set the stereochemistry of the oxindole C3 stereocenter. Using a model system, I found that a similar oxindole can be synthesized by condensing a nitro compound and a monosubstituted ketene. Using these results, I have taken the method on to a racemic synthesis of the oxindole precursor of the Welwitindolinone B carbon skeleton. Since the nitro-compound addition is amenable to asymmetric induction, this study establishes a potential asymmetric route to Welwitindolinone B.

Self Assembly of Gold Nanoparticles into Uniform Nanoarrays via Diblock Copolymer Micellar Lithography
Daniel Kha Le
Mentor: Regina Ragan

Surface enhanced Raman spectroscopy (SERS) is an area of great interest because it has the ability to enhance Raman scattering up to $10^9$ times, effectively enhancing signals to the point of single molecule detection. Signal enhancement is due to the effect of surface plasmon resonance in tandem with closely spaced nanoparticles to create localized regions that enhance the signal given off when a laser beam excites an electron in a molecule, which then emits a photon characteristic of its vibrational mode. Current techniques involving e-beam lithography to form nanostructures is cumbersome and expensive. Here, we explore a more cost effective method of forming uniform nanoarrays by using an ability of polystyrene-block-poly-2-vinylpyridine, a diblock copolymer, to form into spherical micelles, which in turn, act as a nanocarrier carrying gold from a gold salt, hydrogen tetrachloroaurate hydride, to form a hexagonal array of nanoparticles. The nature of the ordering is due to the spherical micelles spontaneously ordering themselves with the lowest Gibbs free energy, and thermodynamically, hexagonal packing is the preferred arrangement. Using a technique known as doctor-blading, we experiment with forming a monolayer of micelles carrying the gold nanoparticles. By removing the polymer via oxygen plasma, we see the gold nanoparticles in a uniform array dictated by the micelles. By using micellar nanolithography, we can create a uniform domain of nanoparticles cheaply and efficiently. Our future work involves cross-linking reactions between Au nanoparticle arrays and gold nanoparticles in colloidal solution to achieve nanoparticle clusters with close inter-particle spacing for SERS.

The Role of Social Support in the Relationship Between Internet Use and Depression
Phuong-Khanh Le
Mentor: JoAnn Prause

Excessive Internet use is categorized as a type of behavioral addiction that has often been associated with depressive symptoms. Study findings differ in how Internet use influences the risk of depression. Therefore, factors that may explain the gap in literature deserve a closer look. The purpose of the study is to examine the role of social support in the relationship between Internet use and depression among college students. Students are one of the most vulnerable groups to Internet addiction due to frequent exposure to the Internet for academic, entertainment, and social purposes. The importance of this study is to find a possible intervention or treatment for Internet addiction in the student population. Participants were asked to complete an online survey collecting information on their demographic characteristics, internet usage, depressive symptoms, and perceived social support. Preliminary findings showed that the more time spent online, the higher the depression score ($r = .142, p = .042$). Furthermore, while higher Internet addiction score was significantly correlated with higher depression score ($r = .422, p < .001$) and lower perceived social support ($r = -.256, p < .001$), higher depression score was associated with lower social support ($r = -.419, p < .001$). This indicates that people who are highly dependent on the Internet tend to lack social support in real life, and thus, display more depression. The moderating and mediating effects of social support on the relationship between different levels of Internet addiction and depression will be examined through further analysis.
Crystallization of a Dye-Decolorizing Peroxidase, DyP, from Mycobacterium tuberculosis

Vincent Le

Mentor: Celia Goulding

Mycobacterium tuberculosis (Mtcb), the causative agent of tuberculosis (TB), infects approximately one third of the world’s population. TB is one of the leading killers among infectious diseases. Like other intracellular pathogens, iron acquisition is a major requirement for Mtcb pathogenesis, thus making novel proteins involved in iron acquisition potential targets for anti-TB pharmaceuticals. The Goulding lab has identified a heme-acquisition system in which a heme-degrading enzyme, MhuD, facilitates iron acquisition from heme via cleavage of the tetrapyrrole ring. We propose that a secondary mechanism exists in Mtcb by which Mtcb Rv0799c (DyP) releases iron from heme without cleavage of the tetrapyrrole ring, resulting in accumulation of protoporphyrin IX (PPIX). The aims of this project are to determine: i) heme- and/or PPIX-binding of DyP; ii) stoichiometry of heme- and/or PPIX to DyP; and iii) to crystallize DyP in heme-, PPIX-, and unbound form. To address this, we expressed and affinity-purified DyP to crystallize DyP in heme-, PPIX-, and unbound form. To determine: i) heme- and/or PPIX-binding of DyP; ii) stoichiometry of heme- and/or PPIX to DyP; and iii) to crystallize DyP in heme-, PPIX-, and unbound form. Heme and PPIX binding was assessed via absorbance spectroscopy, observing Soret maxima at approximately 402 nm and 406 nm for heme- and PPIX-bound DyP, respectively. Heme titrations into unbound DyP were performed to determine stoichiometry, resulting in a 1:1 protein to heme ratio. Unbound DyP and heme-DyP have been used to set up sparse-matrix crystallization screens. Crystal growth has been observed and rigorous optimization of crystal conditions is currently underway.

A Three-Dimensional Microvascular Gas Exchange Unit for Carbon Capture

Y Le-Ho

Mentor: Aaron Esser-Kahn

The capture of carbon dioxide from mixed gas streams such as flue gas requires materials with increased capacity for gas exchange. High efficiency systems already exist in the form of vascularized lung tissue. Herein we report a technique for the synthesis of a three-dimensional microvascular gas exchange unit capable of removing carbon dioxide from flowing gas created using a previously reported Vaporization of a Sacrificial Component (VaSC) technique using polydimethylsiloxane (PDMS) polymer and poly lactic acid (PLA) fibers. A solution of monoethanolamine was used to capture the carbon dioxide. A pH sensitive dye was used to observe the color shift visually and UV-Vis spectroscopy was used to quantify the color change. Initial studies were completed on two- and three-dimensional hexagonal patterns. Additional patterns with increased hierarchy and fiber count were designed based on mathematical models on close packing of circles. The increased channel count required redesign of the original tuning board to accommodate and properly tension the individual fibers. A new board was fabricated with 36 tuning pegs, 30 additional pegs compared to the initial version, and was capable of accommodating the increased fiber count. The study shows tighter packing and placement of the channels increased the capture rate of carbon dioxide.

The Relationship Between Gender and Job Dissatisfaction

Allison Lee

Mentor: Judith Treas

Traditional gender stereotypes assume that men place a higher value on traits such as a high income, job prestige, and opportunities for advancement, while women value the importance of their job, whether they help others, and flexible hours. There has been a shift from factory labor to service-centered jobs, an increase in labor force participation of women, and greater educational attainments and entry into higher status jobs for women. It is important to reexamine whether these variables differ by gender, because gender differences in job dissatisfaction can affect management policies, leadership styles, and incentives. The goal of this study was to examine whether overall job dissatisfaction has changed over time and whether gender differences have narrowed or widened. Analyzing data from the General Social Survey in 1989, 1998, and 2006, ordinary least squares regressions indicate that the overall level of dissatisfaction has remained the same between employed men and women. Controlling for age, education, year, prestige, sex, as well as interaction effects, sex is not statistically significant. Because some sociologists focus on looking for inherent differences between men and women in the work place, this may create the idea that there are differences. Examination of the data indicates that sex does not correlate with job dissatisfaction as previous studies have suggested.

Automated Variable Ordering for Self-Stabilizing Java

David Lee

Mentor: Brian Demsky

Modern software is becoming increasingly complex, resulting in more bugs and errors in critical systems, such as flight controls. A single error could break the program, putting lives in danger. Rather than attempt to find and fix all bugs, self-stabilizing Java guarantees that, should an error occur, the program will eventually leave that error state and return to normal operations. This means that the system will never fail and prevents any potential disasters. In order to always exit the error state in self-stabilizing Java, the data flow must be non-cyclical. This way, erroneous data will eventually leave the program and the program can continue working properly. With larger programs, it becomes incredibly difficult to find this data flow. I developed a system that automatically finds and displays the...
flow by looking at the structure of the program and the context in which each variable is used. The overall data flow of the program is pieced together from lower scale data flow behavior in specific circumstances. Although some preliminary tests have been done, further testing is needed to evaluate the system. In addition, there was insufficient time to complete the project. Although the method has been designed, it has yet to be implemented. If implemented, my system will ease self-stabilizing Java programming. Designing this system has also deepened my understanding of compilers, while giving me a greater appreciation for the variety of computer tools and their uses.

The Effects of Attentional Modulation on Motor Control Measured Through Handwriting
Francis Lee
Mentor: Charles Wright

Previous research has used handwriting to assess motor control in Alzheimer’s patients. Wright et al. (1999) showed that that despite similar looking letters, fine motor control was impaired with increased cognitive load in Alzheimer’s patients as opposed to age-matched normal controls. Using a similar handwriting paradigm, we compared handwriting produced using dominant and non-dominant hand across conditions designed to modulate attention. We modulated attention by providing different levels of visual feedback as well as providing a secondary task. Differences between the conditions were assessed with novel measurements strategies, resulting in a variety of different performance parameters characterizing each trial. An analysis of the different performance parameters shows how varying visual feedback changes handwriting between the dominant and the non-dominant hand. We explore the implications of translating this paradigm to best derive a normative measure for medical purposes.

Elemental Nutrient Ratios in Southern California
Jeanette Lee
Mentor: Adam Martiny

The Redfield ratio is the atomic ratio of carbon, nitrogen and phosphorus found in marine phytoplankton. The Redfield ratio consists of a carbon to nitrogen to phosphorus ratio of empirically 106:16:1 which is assumed to be constant. C:N:P ratios in phytoplankton are indicators for studying seasonal variation of phytoplankton. My work involves isolating the concentrations of carbon, nitrogen and phosphorus in seawater to create a C:N:P ratio. The objective of this study was to examine two questions: What is the seasonal variation in C:N:P ratios? And, Are they different from the standard Redfield ratio? To examine these questions, I collected 34 samples from Newport Beach Pier weekly for three months during winter. Particles were filtered from seawater to analyze the C:N:P ratio in surrounding waters. Particulate phosphorus in the cells is measured through a spectrometer, along with soluble reactive phosphorus in seawater surrounding phytoplankton cells. Particulate organic nitrate is reduced from nitrate to nitrite through a copper-cadmium column. The results for the mean concentrations for particulate organic carbon were 42.86 μmol/L, particulate organic nitrogen was 7.82 μmol/L and particulate organic phosphorus was 0.52 μmol/L. My ratios ranged from 66:09:01 to 150:19:01 with a mean of 88.80:11.2:01. The average ratio mean was lower than the Redfield ratio of 106:16:01. This study suggests that water in the coastal regions of Southern California has lower elemental nutrient ratios during the winter. Further studies during other seasons will be necessary to conclude whether seasonal variation influences the nutrient ratio.

Investigating Rhodiola rosea’s Mechanism of Action Through Dietary Restriction and the Target of Rapamycin
Kevin Lee
Mentor: Mahtab Jafari

The root extract of Rhodiola rosea has been found to be a promising anti-aging botanical, as it has been shown to increase lifespan and improve health in adult Drosophila melanogaster. However, its mechanism of action has yet to be discovered and understood. Dietary restriction (DR) is the most robust method for extending lifespan and improving health in model organisms. The target of rapamycin (TOR) complex has been strongly implicated in the action of DR. This complex is involved in a multitude of cellular processes and, in particular, transcriptional regulation incorporating inputs from cell stresses, growth factor stimuli, and energy and nutrient states. As a result, we hypothesize that R. rosea may also act to mimic DR, possibly by perturbing the TOR pathway. We examined the action of R. rosea in relation to dietary restriction by varying dietary yeast concentrations in the fly. In general, fly lifespan increases as dietary yeast content decreases, and the action of a compound that mimics DR is minimized as dietary yeast content decreases. Inhibition of TOR also decreases sugar and fat levels in the fly. We found that R. rosea extends lifespan independently from dietary yeast content, extends lifespan when TOR is inhibited, and has no effect on fly sugar and fat content. These results suggest that R. rosea acts by a mechanism independent from that of DR and TOR.

Trakinas
Jaque Lenhard
Mentor: Lisa Naugle

This piece is in homage to Mariana Piardi, who was called Trakinas by some of her select friends. After her death last year, I began analyzing how fragile one’s life is. On a daily basis, people seem to pass by their lives without realizing how precious each moment and each day is, and often
tend to take their lives for granted. This piece deals with my own analysis of how to make each moment special, and how to interact with each other in order to fully understand the meaning of friendship. I also explored the concept of picking out, in the sense of picking our own path, making our own decisions, and standing strong in our position towards what we decide to pick and choose in our lives. During my research in Spain last summer, I was able to clearly understand some of my personal choices, and how they related to my expressiveness towards others. I also took the opportunity of sharing special moments with as many people as possible, living each day to the fullest and never just merely getting by, because we never know when will be the day that we might make the wrong decision, and end up compromising something as precious as our own lives.

The Influence of Gender Perceptions on Latina Ethnic Identity Development
Denise Leon
Mentor: Maria Estela Zarate

Today, the face of college campuses is changing as recent studies by the Pew Hispanic Center indicate a twenty-four percent Hispanic college enrollment spike from 2009 to 2010. Furthermore, Latinas outnumber Latinos in higher education by more than half, as estimates of fifty-seven percent of Latino/a college students are female. Despite the growing number of Latinas on college campuses, Latinas do not see their identity reflected among academia. The purpose of this project is to understand the factors that influence freshmen Latina students’ self identification and how this self reported identity develops over their years in college. This study focuses on the process of identity development as well as the intersecting factors of gender and ethnicity. The identities of Latinas may consist of combinations of new gender roles as well as traditional cultural roles passed down from their families. Little research specializes in understanding the influences of Latina ethnic identity development and more is needed to understand how Latina undergraduates perceive themselves, in order to help college institutions create a better environment reflective of Latinas in college. A cross-sectional study is used to examine the identification process of ten Latina undergraduates who are either in their first, fourth or fifth year of college. Latina students reported more positive views towards feminism. Many also perceived gender stereotypes in relation to their identity as Latinas, for instance to fulfill their role in the home and college was seen as a way to breakthrough from these stereotypes.

Effect of Genetic Amyloid Beta augmentation on Alzheimer’s Disease Pathology in Mouse Model of AD
Lisa Leung
Mentors: David Cribbs, Vitaly Vasilevko

Abeta accumulates in the brain in the form of amyloid plaques, which is a major feature of Alzheimer’s pathology. Previous studies have suggested that the accumulation and aggregation of Abeta peptides lead to detrimental effects in diseased brains including inflammation, neurofibrillar tangles, and neuronal loss. The effect of genetic addition of familial Dutch and Iowa mutations of amyloid beta to mice already expressing human Abeta and tau proteins on amyloid pathology and inflammatory status in animal models of Alzheimer’s Disease was analyzed. Connections between amyloid beta load and inflammation in the pathology of Alzheimer’s type were established. Amyloid precursor protein (APP) transgenic (Tg) named APP/TgSwDI and triple transgenic mice (3xTg) were crossed and resulting offspring were aged to 26 months. Mouse brain tissue was analyzed for amyloid plaque load, microglial and astrocytes activation markers using immunohistochemistry and followed by Image J analysis. APP concentration and glial activation status were determined by Western blots. Based on our immunohistochemical data, we found that amyloid plaque load and glial activation increased in 3xTgxDI mice compared with DI or 3xTg controls. The Western blots analysis showed increased levels of APP and astrocyte activation marker as well. As we expected, genetic amyloid beta augmentation in mouse models of AD slightly increased amyloid plaque load and inflammatory processes in genetically double crossed mice. The increase in pathology was additive of the pathologies coming from these two mouse models. Amyloid beta genetic augmentation proportionally increases inflammatory processes in the AD mouse model.

Using EEG Recordings of Covert Shifts of Spatial Attention to Signal Intended Direction
Alvin Li
Mentor: Michael D’Zmura

The goal of this study is to investigate the electroencephalographic (EEG) dynamics of sustained covert spatial attention. Covert shifts of spatial attention are those that are made in the absence of overt movements of the eyes, head, or body. Prior work shows that paying attention to something one is not looking at directly can be used to signal intended direction in a single dimension. We recorded EEG from subjects as they directed and held attention in one of nine directions varying in both left-right and up-down dimensions for 750ms. We found significant (p < .005) differences in mean voltage and in the energy found canonical frequency bands over central-left parietal electrodes at 355–371ms and 543–551ms after attention shift.
for up vs. down and left vs. right respectively. Results suggest that EEG can be used to determine the direction in which a person is attending covertly.

**Performance Profiler for Tilera Bare Metal Environment**

Michael Li  
**Mentor:** Brian Demsky

This project programmed a performance profiler for the Tilera Bare Metal Environment (BME) to assess the performance of parallel garbage collection on the Tilera TILEPro64 chip. The BME is a hypervisor for running performance sensitive or custom OS code. The profiler was programmed primarily with C tailored to Tilera’s BME. The profiler has the ability to track four separate measurements simultaneously per chip, such as cache hits and general memory accesses.

**Engineering Superhydrophobic Surfaces via Tunable Parameters to Increase Air-Trapping Condition**

Jessica Lim  
**Mentor:** Michelle Khine

Superhydrophobic (SH) surfaces, surfaces that exhibit extreme water repellency, have many interesting and useful applications due to self-cleaning and non-stick properties. These surfaces display contact angle (CA), the angle between the solid surface and liquid/vapor interface, greater than 150°. The wettability of a surface is affected by its chemical composition and geometrical structure. Current methods used to generate SH surfaces produce heterogeneous surface structures and often require chemical surface modifications (CMS) that degrade over time. We present a method for tuning the geometrical surface structure to increase hydrophobicity without CMS. Important geometrical parameters, such as the feature’s diameter, spacing, and height, are photolithographically patterned and oxygen plasma etched into polyolefin (PO) film. PO is a shape memory polymer that shrinks by 95% its original surface area, enabling an increase in the aspect ratio of the patterned surface structures. This creates smaller feature sizes with taller pillars. After the PO film is patterned, it is shrunk and molded in polydimethylsiloxane, where its water CA measurements are taken to determine the hydrophobicity. We hypothesize that SH surfaces can be optimized from tuning the previously mentioned geometric parameters. Preliminary data shows that decreasing feature diameter results in a more hydrophobic surface. We are able to fabricate homogeneous SH surfaces across the entire surface. Further research into optimal aspect ratios of surface structures is required to make more robust and increasingly hydrophobic surfaces. However, these initial findings present a potential application as a surface coating for medical implants, microfluidic devices, vehicle coatings, etc.

**The Psychosociocultural Analysis on Undocumented Latina/o Students’ Academic Persistence**

Estefanía Lopez  
**Mentor:** Jeanett Castellanos

Undocumented university students present a unique and exceptional sub-sample of the larger population of undocumented youth because of the extraordinary challenges they face in pursuing higher education. These unique educational challenges exist in the midst of the additional stigma of being an undocumented young person. A sizeable amount of the current literature details undocumented students’ navigational experiences through societal barriers, prejudice, and drawbacks, very little research exists on undocumented youth’s internalization of their stigmatized undocumented identity and this identity’s impact on academic persistence. This study examines the psychosociocultural factors that contribute to academic persistence among undocumented students in higher education. Particularly, this study considers the psychological concerns, social support systems, and cultural factors of undocumented students’ experiences in postsecondary institutions. Using a qualitative design, the researcher conducted ten semi-structured interviews with AB540 students between the ages of 18–25. Data collection for this study is ongoing. Preliminary findings suggest that the most prevalent psychological concerns involve financial constraints and apprehension for future job placement, the strongest social support is granted by family and friends, and culture has a strong bearing on how AB 540 students experience the university environment. Findings can lead to policy development and/or change, which could potentially help facilitate undocumented student persistence in higher education.

**Hmong Social Organization**

Bao Lor  
**Mentor:** John Liu

Previous research indicates that the Hmong are a homogeneous community based on the fact that they share a common culture. However, not much research has been conducted on the social organization of clans and subclans that creates a division among the “homogenous community.” The ideology of clans and subclans is important to the Hmong social organization because they determine how a community functions together. The goal of this study is to understand the differences within the Hmong community in California by studying its social structure and ability to maintain its clans and subclans. In order to understand the Hmong social organization, interviews have been conducted with Hmong of the first generation, 1.5 generation, and second generation living in America. While Hmong individuals in Santa Ana, California showed more commitment at the clan level, individuals in Sacramento, California demonstrated a stronger bond at the
subclan level. This is due to the fact that Santa Ana has a smaller Hmong community than Sacramento, limiting their ability to have established subclans. This is important because it shows that, depending on the size of a Hmong community, the clan and subclan become essential for the people at different levels. These results provide strong evidence that Hmong social organizations depend upon the context in which they operate, like the size of their community.

**International Legal Regimes on Intellectual Property and Biodiversity**

Scott Lorenzen  
*Mentor: Anthony Smith*

Biodiversity conservation is being increasingly threatened by the globalization of Western intellectual property rights, which have been expanded to stimulate private sector investment in agriculture and other areas of biotechnology. This paper links a string of U.S. Supreme Court cases granting firms the right to patent various forms of life, to multinational agribusiness firms that were instrumental in shaping the TRIPS agreement, to the impact of those rights on biodiversity. Many biotechnology patents are granted for seeds engineered to increase crop yields through the mechanism of recombinant DNA. The introduction of novel life forms into ecosystems is detrimental to biodiversity; genetic material can escape cultivation, change habitat dynamics and reduce the number of plant and animal species in those environments. However, multinational agribusiness firms have enormous economic interest in securing global markets for their genetically modified seeds. While intensive farming has had significant negative impacts on the environment, international laws governing biodiversity conservation do not approach the comprehensive protections granted for private firms in defense of their creations. The main findings of this paper demonstrate how IPRs are being used at the expense of the environment and the developing world, and why regulatory policies favoring biodiversity should be used to weaken property rights like those in TRIPS.

**Tumor Cell Migration in 3D Collagen Matrix**

Becky Lu  
*Mentor: Michelle Digman*

In cancer metastasis, tumor cells enter the blood stream and later exit the blood stream to foreign tissue where they grow and proliferate in the process of extravasation. The ability of cells to migrate within the extracellular matrix and reorganize collagen structures as it exits the blood stream depends on its cellular property and the properties of the matrix. Since primary tumors are three-dimensional, extravasation is difficult to study but with Multiphoton Microscopy we can begin to understand how invasive tumor cells migrate. In this present study, breast cancer cells and Chinese hamster ovarian cells (MB231 paxillin-eGFP, CHO K-1 alpha-5 integrin) grow in collagen gel which represents the microenvironment of living tissue. I transfected the cells with fluorescent tagged proteins and analyzed the cell’s focal adhesion using Multiphoton Microscopy (MPM) as an imaging technique to characterize its migration in the collagen gel of specific stiffness. Results show through varying collagen concentrations that collagen fibers should be of a certain diameter to allow the cell’s sensors to grasp to thick fibers and to adhere to the plate. Such results allow for better understanding of tumor cell dynamics in living tissue.

**Identification of Potential Agonists and Antagonists for Dopamine Receptors Using Traditional Chinese Medicines**

Tracy Lu  
*Mentors: Olivier Civelli, Zhiwei Wang*

Dopamine receptors are G-protein coupled receptors (GPCRs), a large and diverse class of the transmembrane proteins that upon activation exert transduction pathways and cellular responses. Dopamine receptors are subcategorized into D1-like receptors and D2-like receptors, which activate or inhibit a second messenger cascade through the GPCR, such as cAMP. There have been several D1-like receptor agonists that are being used to treat hypertension. The D2 gene has been shown to be involved in schizophrenia, posttraumatic stress disorder, movement disorders and migraine. The objective of this study is to make stable cell lines, which can be used in the FLIPR (Fluorometric Image Plate Reader) to screen for agonists and antagonists of the dopamine receptors. The D1 and D2 receptors were cloned into plasmids with pcDNA3.1/zeocin vectors to generate stable cell lines in HEK293 cells together with G215. The stably transfected cells were then selected for after treatment in medium that contained zeocin and Geneticin. The stable clones are selected based on their efficacy and potency to the dopamine treatment. The preliminary screenings have been established and the D1 and D2 stable cell lines have been successfully created. Tests have been done with fractions of traditional Chinese medicine that resulted in potential agonists and antagonists to the D1 and D2 receptors. Future experiments must be carried out in order to identify the specific chemical(s) responsible for the activation or inactivation of the dopamine receptors.

**Perfecting the Art of Transportation: Urban Structure within Los Angeles Film**

Kimberly Lucas  
*Mentor: Julia Lupton*

Urbanism is a school of thought generally associated with the Social Sciences or Engineering. Yet, a city’s urban structure and design is incredibly influential on the narra-
stes it creates. In Los Angeles, the urban structure, which is defined by its roads and freeways, is more than images and motifs within LA films, but becomes an integral part of how the film is constructed. To begin, we look at a variety of LA films, which all use the freeway as a metaphor of the city itself, a device through which the city communicates itself to its audience. Then, we see that how the different interpretations of Los Angeles roads as either public or private space heavily influences the outcome of the city, a device through which the city communicates itself to its audience. Not only does the film mimic the structure of the city, but it depicts how the city uses its roads and freeways to push its inhabitants together, forcing on them the interactions they miss by not living in a modern, centralized city. The urban structure of Los Angeles is not only a central part of the films which take place in its city limits, but influences the quality of its inhabitants’ lives.

The Effects of Diet on Amylase Gene Expression
An Ly
Mentor: Donovan German

A common observation in nutritional physiology is that herbivores have elevated activities of the starch-degrading enzyme amyrase in comparison to their carnivorous brethren. This has been observed in all taxa tested to date. However, it remains unclear how herbivores achieve this end: do they simply express a single amyrase gene at high levels, thus giving them more starch-degrading capacity with many molecules of a single amyrase isoform, or, do they express multiple different amyrase isoforms with different substrate affinities? The goal of this project is to compare the amyrase genes being expressed in prickleback fishes (family Stichaeidae) that have different diets, ranging from strict carnivory, to omnivory, to strict herbivory. Amyrase genes were amplified from four prickleback species using specific primers, and were cloned into TOP10 chemically competent cells using a cloning kit. Sequencing from the clones (in progress) suggests that there may be at least four sequence variants in the herbivores, indicating that they may be expressing multiple amyrase genes, or at least different splice variants. The significance of these different variants will be explored in future projects.

Safavid Iran and the Rise of Religious Legitimacy in Shi‘i Islam
Arman Majidi
Mentors: Touraj Daryaee, Bojan Petrovic

The goal is to discuss the contributions made to the modern Iranian state by a tribal order that transformed into a religiously legitimate governing body, whose fall created the environment for religious leaders to become political, thereby creating the foundation upon which the current Iranian regime relies.

Progress Towards the Total Synthesis of (–)-Stenine
Victor Mak
Mentor: Kenneth Shea

(–)-Stenine is one of 139 alkaloids isolated from the Ste-mona family of plants that display biological activity. They are used in East Asian countries as homeopathic remedies for pertussis, tuberculosis, bronchitis, and other respiratory ailments. The objective of this project is to complete the most expedient synthesis of (–)-st enine to date, thereby laying a framework for the synthesis of the remaining 20 members of the stenine group that contain the same pyrrolo[1,2-a]azepine core. The azepine-2-one core is synthesized diastereoselectively using the type 2 N-acylimino intramolecular Diels–Alder reaction. Selective hydrogenation of the resulting cycloadduct followed by reductive N–O bond cleavage and intramolecular Diels–Alder reaction provides an advanced tricyclic intermediate towards the total synthesis of (–)-stenine.

Translation Initiation Function in Self-Cleaving Ribozymes
Mahyar Malekan
Mentor: Andrej Luptak

HDV-like self-cleaving ribozymes have been found to serve various roles in the retrotransposon cycle, including the promotion of translation initiation. To test the function of ribozymes in translation, DNA plasmids are constructed to contain the ribozyme sequence upstream of a luciferase sequence. The luciferase is used as a reporter gene to determine whether the preceding ribozyme is able to initiate translation. The ribozymes are tested both in vitro with rabbit reticulocyte lysate and in vivo by transfection into Droso- phila S2 cells. After translation, luciferin is added to the samples and the reactions are photographed with a light sensitive camera. Luciferase catalyzes the oxidation of luciferin to produce light; thus, the amount of light produced by each reaction is directly proportional to the amount of luciferase produced by ribozyme-driven translation. Four sequences were examined for translation activity: a type II hammerhead ribozyme, a type III hammerhead ribozyme, an HDV-like ribozyme found in an RTE retrotransposon in the African mosquito Anopheles gambiae, and, as a negative control, a simple stem loop. The hammerhead ribozymes were not expected to drive translation; however, a significant amount of luciferase was produced in these reactions. The HDV-like ribozyme in A. gambiae and stem loop translation reactions produced very little light.

Undergraduate Research: Managing the Future
Super-Resolution Imaging Reveals Functional Relationship between Inositol Trisphosphate Receptors and Myosin IIA

Austin Mandoyan
*Mentor:* Ian Parker

The purpose of this study was to develop a greater understanding of the clustering of inositol trisphosphate receptors (IP3R) and the role that myosin IIA proteins play in facilitating such clustering. N-butyl toluene sulfonamide (BTS), an inhibitor of myosin-actin binding, was used to study the relationship between IP3R and myosin. Using calcium imaging and super-resolution imaging techniques known as SCCaNR and STORM, myosin was shown to have two distinct effects on IP3R. When the interaction between myosin and IP3R was disrupted, the fluorescence intensity of Ca2+ signals mediated by IP3Rs (puffs) was significantly reduced, and IP3R clusters were more motile. Thus, myosin IIA altered both IP3R cluster formation and IP3R activity.

The Search to be Normal: Clinical, Pharmaceutical and Social Influences on the Experience of one’s Menstrual Cycle

Shadia Mansour
*Mentor:* Michael Montoya

The construction of a defined “Premenstrual Syndrome” (PMS) and negative perceptions on menstruation have pathologized changes experienced by women in relation to their monthly menstrual cycle. Rather than noted “symptoms” or changes women experience being a mere indicator of the onset of one’s menses, they have been used as a sign of an illness needing medical attention. As PMS is classified as a medical condition in clinical and pharmaceutical settings negative views on menstruation have been adopted. In turn, a woman may embody these perceptions. A woman embodying these negative views may have a negative effect on her menstrual cycle and changes that may or may not take place. This study explores the ways in which the menstrual cycle is addressed in clinical, pharmaceutical and social domains and how these approaches influence a woman’s view of her cycle and changes associated with it. Fifteen individual women were interviewed for approximately one hour. The interviews showed that these three influences do have significant and distinct impacts that have created a stigmatized culture around menstruation. This culture consists of varying ideas of a “normal” menstrual cycle by each of the three domains. Participants in the study compared themselves to perceived “norms” which developed into negative views of their cycle if it deviated from the norm.

Fuel Control Analysis for Ion Propulsion System on UCISAT-II

Sean Marquez
*Mentor:* Benjamin Villac

UCISAT-II is a cube satellite project composed of an electric propulsion system, a cutting-edge feature proposed for UCISAT-II, which plays an important role in changing the attitude dynamics of the spacecraft. Design implementation for controlling a fuel line to the ion thrusters requires analysis on the fluid dynamics of the fuel propellant as well as an understanding of its overall contribution to thrust force for a high voltage colloid thruster. Previous studies that have implemented the use of colloid thrusters for attitude control for a small-scale satellite include JPL’s ST7 spacecraft, which consisted of a relatively high priced piezo-transducing micro-valve and a compressible bellows fuel tank for fuel control. For the purposes of an undergraduate design project, it is of interest to design a...
mechanism that emulates the same functionality but for an affordable price. In this study, a fluid analysis for a steady, incompressible, laminar flow through a straight circular tube of constant cross section, also known as Poiseuille flow, was assumed. Three different fuel controller design systems were investigated. The resulting down selected design consisted of a pinch valve mechanism that could be accomplished using low outgassing Teflon tubing that would interface with a 20-micron inner diameter capillary tube and high torque micro-servo motors. Further study would require the design and assembly of a custom vacuum chamber for actual hardware testing.

Crosslinking Analysis by Site Directed Mutagenesis on the Polyketide Synthase Product Template Domain and Acyl Carrier Protein
Delsy Martinez
Mentor: Sheryl Tsai
Polyketide synthases (PKS) are multi-domain enzyme complexes that synthesize natural polyketide products of biological importance which can have anticancer and antibiotic properties. The Acyl-Carrier Protein (ACP) domain tethers and channels biological intermediates throughout the entire iterative biosynthetic cycle by relying on specific protein-protein interactions. The Product Template (PT) domain is responsible for aldol cyclization and aromatization of a polyketide in its active pocket site. The objective of this study is to analyze selective crosslinking between the PKS PT of Colletotrichum lagenarium (PKS 1) and PKS ACP of Gibberella fujikuroi (PKS 4). This will provide insight into multi-domain interactions which will clarify how the PT interacts with the ACP. We hypothesized that mutations of specific active site residues in the PT domain will result in a loss of crosslinking. Site directed mutagenesis was employed to determine which amino acid residues of PKS 1 PT are essential for crosslinking and ACP domain recognition. Crosslinking assays were conducted for analysis of the mutants generated. As of right now only two mutants, H274A and H274D have been shown to be unessential for crosslinking due to the fact that the crosslinking of PT and ACP is still observed.

The Stereospecific Nickel-Catalyzed Cross-Coupling of Protected 1,3-diols
Luisruben Martinez
Mentor: Elizabeth Jarvo
Polyketides are natural products of great importance in medicine. Therapeutic agents such as cholesterol lowering statins are based on the polyketide family. Many polyketides contain tertiary carbon stereocenters in a 1,3 relationship with an alcohol or functionalized oxygen. Installation of this functionality is difficult because of a limited number of efficient synthetic methods. This project involves the construction of tertiary carbon stereocenters using transition metal catalysis. A method has been developed to cross-couple alky Grignard with acetonide-protected 1,3-diols using nickel as a catalyst. A notable feature of this reaction is that the starting material rather than a chiral ligand determines the stereochemistry of the product. The optimization and scope of this reaction will be presented.

Effects of the Kinase Inhibitor DW12 on the Phosphoproteome of BaF3 Cells Overexpressing PIM-1 Kinase
Jacob Matson
Mentor: Paul Gershon
The goal of this project is to understand the effects of a novel kinase inhibitor and potential anti cancer drug, DW12 on the global phosphoproteome of cells overexpressing PIM-1 kinase. PIM-1 kinase is implicated in several cancers and potentially responsible for tumor aggressiveness, increased metastasis, and chemotherapy drug resistance. Protein from three groups of cells, control, PIM-1 overexpression and PIM-1 with DW12 were digested to peptides and isotopically labeled for relative quantitation, then mixed and subject to three forms of phosphopeptide enrichment prior to mass spectrometry analysis. The experiment successfully identified 5,215 unique phosphorylated peptides from 4,446 unique phosphorylated proteins containing 9,444 unique phosphorylation sites. Relative quantitation ratios show that DW12 decreased overall phosphorylation relative to the other cell groups.

Relationship Between Parenting Styles and Self-Esteem in Attention Deficit/Hyperactivity Disorder
Wah Wah Maung
Mentor: Timothy Wigal
Children with attention deficit hyperactivity disorder (ADHD) are likely to have lower self-esteem than those without ADHD. Parental discipline styles can be one of the risk factors which contribute to self-esteem problems, but there has been little research provided regarding family discipline style and global self-worth in those with ADHD. Data were collected from 96 ADHD and 48 Local Normative Controls (LNCG) at 24 months, 36 months, 6 years and 12 years during the Multimodal Treatment Study of children with ADHD (MTA) follow-up study. The Harter self report was used to assess global self-worth and Alabama Parenting Questionnaire (APQ) was used to measure parental discipline. It was predicted that appropriate discipline would increase children’s global self-worth as they age. Results indicated a modest significant relationship at 6- and 12-year follow-ups suggesting that inconsistent discipline and patterns of global self-worth are related. ADHD diagnosis, ethnicity, and age/time were all found to have distinct self-esteem trajectories. Hispanics tended
to exhibit low self-esteem and parents are likely to use inconsistent discipline compared to Caucasians and other ethnic groups.

Prioritizing World Principles: A Sectoral Analysis of World Polity Ties
Aaron McCullough
Mentor: David Frank

Ties to the world polity—the network of states, transnational corporations, and international organizations—are consequential for all kinds of outcomes, but these ties are variably distributed. Beckfield finds that inequality in ties across the entire spectrum of INGO (international non-governmental organization) sectors remains high as a function of wealth, world-system position, and civilization type. I expand upon Beckfield’s work by applying his analysis to the following five INGO sectors: law, psychology, women’s rights, environmental, and LGBT. Membership data from the Yearbook of International Organizations were collected on 14 organizations from the LGBT sector and 25 organizations from the other four sectors for the years 1965 through 2005. Using a random-effects panel regression model, I find that tertiary enrollment has a larger effect on INGO memberships than GDP per capita in all sectors except the LGBT sector. In line with a conflict-centered model of world polity theory, this finding suggests that nation-states maintain their dominance in the global arena by way of culture.

Proof in the Pictures: Understanding the Roles of Visualization and Diagrams in Mathematical Practice Through Diagrammatic Euclidean Geometry
Paul McEldowney
Mentor: Jeremy Heis

This project examines the extent to which diagrammatic Euclidean geometry is refuted by historical objections that diagrammatic inference is unreliable and unrigorous. Testing the claim that visualization plays a nonessential part of mathematics, such an examination reveals epistemic and methodological roles of visualization within mathematical pedagogy and research. I argue that objections about reliability can be responded to by pointing out the communal regulatory aspects that govern diagrammatic inference, and by appealing to the structure of our visual system. With respect to rigor, I argue that many of the objections regarding gaps in reasoning can be responded to through a deeper examination of how diagrams behave as inferentially engaged components of a proof independent of the text. While worries about gaps in reasoning make up only part of diagrammatic geometry’s problem of rigor, the practice’s lack of rigor does not entail a preclusion of its practice. This can be seen by looking at the 17th-century algebraization of geometry. Even if diagrammatic geometry faced issues of rigor, mathematicians have historically responded to such issues by applying another mathematical theory. However, such responses did not act as refutations, but as attempts to improve the original practice. Using diagrammatic geometry as a base case, this project aims to outline a way in which mathematicians should feel comfortable in incorporating visual methods in principle, even if such methods are not entirely rigorous.

Modulation of Cardiopulmonary Depressor Reflex in Nucleus Ambiguous by Electroacupuncture: Role of Opioid Neural Pathways
Tyler McGlasson
Mentor: Stephanie Tjen-a-looi

We know that the stimulation of cardiopulmonary receptors with phenylbiguanide (PBG) yields a reflex depression of both heart rate and blood pressure. This pathway is mediated by nucleus ambiguous (NAmb) in the medulla and parasympathetic cardiac neurons of the brainstem. This study investigated the neurotransmitter mechanisms that are used during electroacupuncture (EA) on the PGB-induced hypotension and bradycardia. We hypothesized that one of the ways the stimulation of EA modulates the effect of PBG is through opioid modulation in the NAmb. Anesthetized and ventilated cats were studied during repeated stimulation with PBG or cardiac vagal afferents while low frequency EA (2 Hz) was applied at P5-6 acupoints overlying the median nerve for 30 min and NAmb neuronal activity, heart rate and blood pressure were recorded. Microinjection of kainic acid into the NAmb impaired the PBG-induced depression of heart rate from -60±11 to -36±11 beats/min. Likewise, EA reduced the PBG-induced depressor and bradycardia reflex by 52 and 61%, respectively. Cardiac vagal afferent-evoked preganglionic cardiac activity in the NAmb was reduced by EA for about 60 min. Blockade of opioid receptors using naloxone reversed the EA-related modulation of the evoked cardiac vagal activity by 73%. Similarly, naloxone reversed EA modulation of the negative chronotropic responses from -11±5 to -23±6 beats/min. Thus, EA at P5-6 decreases PBG-evoked hypotension and bradycardia as well as the NAmb PBG sensitive preganglionic cardiac vagal output through opioid neurotransmitter systems.

Effects of Nutrient Stress on Cells Lacking the TSC2 Protein
Ryan McMonigle
Mentor: Aimee Edinger

Normal functioning cells cope with a lack of extracellular nutrients by becoming quiescent and initiating autophagy. However, cancerous cells have re-engineered themselves to ignore regulatory checkpoints for growth, which causes them to attempt to grow in the presence of inadequate extracellular nutrients. Treating cancer by limiting cellular access to extracellular nutrients, thereby allowing cancer-
ous cells to essentially destroy themselves, is an area of active research. The TOR kinase is an important driver of growth that is activated in many cancer cells. Loss of the negative regulator of TOR, TSC2, leads to a syndrome in humans characterized by benign tumors. I hypothesized that cells lacking the TSC2 protein would mimic cancer cells and be more susceptible to nutrient stress than TSC2 wildtype cells. Surprisingly, TSC2-/- MEFs had a survival advantage over TSC2+/+ MEFs in response to nutrient stress. The insensitivity of TSC2-/- MEFs to nutrient stress was accompanied by maintained TOR signaling in contrast to the loss of TOR signaling in wildtype cells. One response to nutrient deprivation is the up-regulation of nutrient transporter proteins. TSC2-/- MEFs exhibited a much larger increase in cell surface nutrient transporters in response to nutrient stress than the TSC2+/+ MEFs. TOR signaling was required for this up-regulation leading to the conclusion that the survival advantage of TSC2-/- MEFs is due to a hyperactivation of mTOR that allows them to rapidly up-regulate surface nutrient transporters when exposed to low nutrient conditions.

Recantation Across Abuse Types
Nancy Mendoza
Mentor: Jodi Quas

Much of what is known about children disclosures and recantation of claims of child maltreatment has been gleaned from studies examining sexual abuse. This study has investigated patterns of recantation across three types of abuse: physical abuse, sexual abuse, and exposure to domestic violence. The study further analyzed differences in recantation rates based on victim demographics (e.g., age, gender) and case characteristics (e.g., presence of corroborative evidence). The sample included 112 case files of substantiated allegations of maltreatment, with alleged victims ranging from four to nine years old. Results revealed higher recantation rates in sexual abuse cases than in physical abuse or exposure to domestic violence cases. There was no statistical significance found in regards to recantation rates and case characteristics. It can be concluded that recants can occur in substantiated abuse and recants can be possible influenced by corroborative evidence and child demographics. These findings can be of importance for social service workers and authorities in understanding how victim claims occur and have implications for legal professionals charged with investigating maltreatment cases.

The Effects of Varying Oxygen Conditions on Tumor Cell Behavior
Nicole Mendoza
Mentor: Steven George

Hypoxia is the oxygenation state that is below the physiological norm for a given tissue. Although previous studies provide evidence that hypoxia plays a critical role in tumor progression, efforts are still being made to create in vitro models of hypoxia-induced tumor angiogenesis. Developing these models requires an in depth analysis of the effects of different oxygen concentrations on tumor cells. The goal of this study was to investigate the effects of oxygen tension on human colon cancer cells in two-dimensional (2-D) and three-dimensional (3-D) cultures. It was found that the tumor cell’s response varied depending on incubation under conditions of physiological hyperoxic (20% O2), physiological normoxic (5% O2), or physiological hypoxic (1% O2) conditions, and that this response was additionally dependent on culture dimensionality. In both 2-D and 3-D systems, the tumor cells experienced the same overall symptoms of distress, where cell proliferation and viability decreased with decreasing oxygen levels. Interestingly, hypoxic tumor cells were found to have different migrating behaviors in 2-D compared to 3-D culture. Numerous scratch assays on tumor cell monolayers demonstrate virtually no migration, while tumor cell spheroids in a fibrin gel reveal noticeable migration, especially in response to hypoxia. This discrepancy suggests that studies that attempt to model the tumor response to hypoxia in 2-D environments, alone, are not adequate. The 3-D system provides a more physiologically relevant environment that may offer different, and more accurate, conclusions. The results from this study will help set the groundwork for creating an accurate in vitro model of hypoxia-induced tumor angiogenesis.

UCI’s Undergraduate Law Forum Journal: Patent Protection for Dielectric Mirroring Technology
Heriberto Meza
Mentors: Sherilyn Sellgren, Caesar Sereseres

If a device or a process is found to be “fundamentally similar” to a patented method, process or device, it may be held liable for infringement under the doctrine of equivalents. If a device or a process is found to be “fundamentally similar” to a patented method, process or device, it may be held liable for infringement under the doctrine of equivalents. This project focuses on a specific form of ion beam sputtering and dielectric mirroring technology. Careful examination of the technology and relevant case precedents reveals that the U.S. Supreme Court may have applied the doctrine of equivalents in a questionable manner.

Structure-Function Relationship of Mycocerosic Acid Synthase in Mycobacterium tuberculosis
Nathan Mih
Mentor: Sheryl Tsai

Tuberculosis is a deadly disease, infecting about one-third of the entire world. The highly contagious bacterium, Mycobacterium tuberculosis (Mtb) is responsible for this disease. The main reason Mtb is such a difficult pathogen to fight lies in the construction of its waxy cell envelope, which allows Mtb to be resistant to many antibiotics and numerous other treatments, and also able to remain dormant in
humans for years until the immune system is compromised. Polyketide synthases (PKS) and fatty acid synthases (FAS) are responsible for biosynthesizing many of the cell wall components and it has been found that almost 10% of Mtb’s genome encodes for these proteins. My research focuses on crystallizing the structure of mycocerosic acid synthase (MAS), a type I iterative PKS that synthesizes mycocerosic acid which is a major component of the cell wall. Discovering the structure of this protein will allow up to better develop drugs to fight TB. We have currently tested numerous crystallization methods and are in the process of refining results. Using x-ray diffraction on a refined crystal will then allow us to elucidate the structure of MAS.

Centromeric Re-replication is a Potent Inducer of Aneuploidy
Juan Miranda  
Mentor: Joachim Li

Eukaryotic DNA replication is controlled by many mechanisms to prevent re-replication, and deregulation of said mechanisms is known to lead to cell death. This lethality is presumably due to genomic instability; however, direct evidence supporting this hypothesis has not been shown. We hypothesize that the re-replication of a centromere will disrupt that chromosome’s mitotic segregation and generate aneuploidy. To test this we conditionally induced localized re-replication of CEN9, the centromere of Chromosome 9 (Chr9). We followed the distribution of the Chr9 during cell division using a color reporter that indicates the number of Chr9 copies in the cell; cells with no copies are white, one copy pink, and two or more copies red. After inducing transient re-replication of CEN9 we plated individual cells and allowed them to grow into whole colonies. Most cells properly distributed one copy of Chr9 to each daughter cell (1:1 segregation) to generate pink colonies, while missegregation of Chr9 to one daughter cell and none to the other (2:0 missegregation) generate red/white sectored colonies. Preliminary results show an increase of 2.05% in white sectored colonies, indicative of a chromosomal missegregation event. We confirmed that the white portions of the sectored colonies had a lowered copy number of Chr9 demonstrating that centromeric re-replication is a potent inducer of aneuploidy.

Metabolite-Induced Change in Self-Scission of Ribozyme Found in F. prausnitzii
Roya Mirilavessaji  
Mentor: Andrej Luptak

Through the advent of structure based searches, many new self-cleaving ribozymes have been discovered across multiple species though the function of most of these newly discovered ribozymes is a mystery. One ribozyme, from the anti-inflammatory commensal human gut bacterium Faecalibacterium prausnitzii, was discovered 106 nucleotides upstream of the phosphogluconase mutase (GlmM) start codon with an additional partial copy downstream, suggesting it may play a role in the regulation of GlmM expression. In other words, this ribozyme may also be a riboswitch, a gene regulating RNA. The glucosamine-6-phosphate activated ribozyme (glmS ribozyme), found in bacteria, also doubles as a riboswitch by controlling gene expression via self-cleavage in response to changes in concentration of either the substrate or product of the GlmM protein, glucosamine-1-phosphate and glucosamine-6-phosphate respectively. We propose that the concentration of one of these glucosamine phosphate isomers will affect the cleavage rate of the F. prausnitzii ribozyme in a similar fashion to that of the glmS ribozyme. The F. prausnitzii underwent cotranscriptional kinetics assays in order to test the effect of the metabolite on kinetic rate. Preliminary data suggests that the metabolite may slow cleavage rate, but further experiments will need to be conducted before in vivo studies can be done to confirm that this effect on cleavage will facilitate regulation of the GlmM gene.

Combinatorial Games: The Game of Chomp
Verenice Mojica  
Mentor: Sarah Eichhorn

Previous research has demonstrated that the game of Chomp has a winning strategy for the first player; however, the construction of the strategy has not yet been found. The purpose of this project is to attain possible patterns that will help in the construction of the general winning strategy for any board size. In order to attain these patterns, an adaptive learning program was developed which provided the P-positions and opening winning moves of the game. The patterns in the data allowed for the formation of two conjectures referred to as the Opening Winning Move Conjecture and Constant Row Value Conjecture.

Cell Clustering Using Shape Context
Allison Mok  
Mentors: Ernie Esser, Fredrick Park

Given a set of boundary points from a 2-D image, we consider a descriptor in which the shape context captures the distribution of those points relative to each other. We have applied the shape context descriptor to cancer cell images. Using the shape context, we clustered a list of cancer cell images into groups having similar shapes. To do this clustering, we used the K-means algorithm. Additionally, we implemented a cell context descriptor by gathering information about the different intensity values. To do so, we divided the cell into polar rectangles and, in each rectangle, we measured the intensity by counting the number of times the cell concentration hit a certain value. We kept track of this with histograms which taken together was our
cell context descriptor. This applied concepts from mathematics, computer science, and biology in helping quantify early stage cancer cell images. For future work, through this shape and cell context descriptor, we hope to provide a method of distinguishing cancer cells by means of digital image processing. Afterwards, we intend on combining the contextual and shape information to help further cluster the possible types of cancerous cell images.

From Test Tube to Nursery: Micropropagation of Bird of Paradise (Strelitzia reginae)
Mason Montoya
Mentor: Franz Hoffmann

Advances in plant tissue culture have provided a basis for the successful in vitro micropropagation of many horticultural plant species, making them more widely available at a lower price. Bird of paradise (Strelitzia reginae) is a popular ornamental plant whose natural mechanisms of propagation are too slow and low yielding to meet the current commercial demands. Micropropagation would greatly contribute to overcoming the limitations this species poses to the horticultural and landscaping industry. However, the feasibility of micropropagation was questioned for more than 30 years due to Strelitzia’s recalcitrance to tissue culture. We succeeded in overcoming the multiple obstacles posed by this species and, after six years of work and several undergraduate research projects, can finally report the establishment of mass-propagated plants under nursery conditions. We used dissected embryos from seeds to successfully induce the formation of multiple shoots on a culture medium containing 0.2 mg/L of the synthetic plant hormone thidiazuron (TDZ) as well as several measures to reduce oxidative stress to the cultured tissues. However, seeds are scarce and embryos genetically different from the mother plant. Thus, the use of somatic tissue is more efficient and leads to true clonal propagation. We dissected meristems from elite plants and, initially unsuccessfully, tried to induce multiplication with traditional hormonal treatments and culture techniques. The use of charcoal-supplemented medium and the surgical splitting of the primary shoot led to the production of multiple clones derived from vertically split shoot apices. This application of meristem splitting has not been reported before.

Quantifying Dental Pulpal Vitality with Laser Speckle Imaging
Cameron Moore
Mentor: Bernard Choi

With 1.4 million oral injuries per year, many dentists may be performing unnecessary procedures because of the varying degree of damage to the pulpal of teeth. The pulpal of the tooth is a direct indicator of the overall health of the tooth, and if enough damage is done then the potential for a root canal is highly increased. The current “hot and cold” test is commonly used to diagnose the health of teeth. This is done when the dentist applies certain chemicals that create a hot and cold sensation, and then asks the patient how their discomfort changes with varying the degree of the “hot and cold.” With so many oral injuries per year, a more reliable method that can be measured is needed to aid dentists in accurate diagnosis. Measurements of blood flow in the pulp of the tooth are a more reliable indicator of the health of the damaged tooth. Our preliminary data suggest that use of non-invasive laser speckle imaging techniques; provide quick and reliable measurements of blood flow in the lab. To integrate laser speckle imaging into a clinical tool, our approach is to evaluate the use of lower-cost, commercially-available oral cameras to see if our laboratory findings can be duplicated. We propose ultimately to develop a prototype laser speckle imaging system using an oral camera, to enable dentists to diagnose injured teeth without any discomfort.

Playing for Immunity: The Construction of the Narrative on Survivor
Jeremy Moore
Mentor: Victoria Johnson

The question of what makes television “watchable” is brought to the forefront in an exploration of how watershed reality television show Survivor creates an engaging narrative each season without scripted characters and events. To obtain these narratives, the producers of Survivor must carefully construct each element of their show to appeal to a contemporary, widespread American audience. The plot itself is contingent upon the show’s competition, which references American capitalism and the fetishization of the individual. The exotic settings reference the classic natural and adventurous themes that have enjoyed timeless success in literature, and the appropriation of tribalism unknowingly reifies Edward Said’s concept of Orientalism. The characters (contestants) are edited and presented based entirely upon appealing to the audience, as evidenced by the season in which contestants were labeled as good or evil based not on their actions in the game but by modern conceptions of gender roles. These components describe how Survivor should be viewed—not just as a television show but as a piece in the larger field of humanistic inquiry, with concrete links to popular literature written both before and after its debut. To reduce the show’s success to simple voyeurism would be an academic mistake. Instead, the construction of a reality show that allows for such engaging narratives must itself be studied to understand what constitutes a watchable program in contemporary America and, in turn, what that reflects about our society.
Echo Park and Urban Cultural Identity: The Cultural Politics of Urban Space in the Face of Gentrification
Christian Morales
Mentor: Samuel Gilmore
Gentrification in Echo Park has redefined the way residents identify themselves and the city. The transformation of property values and neighborhood landmarks and demographics are the most powerful contributors to the reshaping of a city’s identity. The purpose of this research is to explore the multiple dimensions of urban cultural identity through the various perspectives of those who have experienced the city’s changing identity from a primarily working class neighborhood to a center point for emerging artists and musicians. Urban cultural identity is defined by the values, attitudes, social processes, and shared cultural understandings that are shaped by an informant’s resident status or association to Echo Park. This study includes in-depth interviews with long-term residents to frequent city visitors, as well as participant observations from neighborhood council meetings and other community events. The results demonstrate that urban cultural identity represents a continuum of insider-outsider distinctions. Longer-term residents’ urban cultural identity is ascribed by a variety of factors including neighborhood approval, survival methods, socio-economic status, and definitions of respect. Many of these constructs overlap and vary, but they all represent the complexities of urban development caused by neo-liberal housing and business policies and resistance to urban transformation.

Increased Detection of Alcohol Consumption and At-Risk Drinking with Computerized Alcohol Screening and Brief Intervention (CASI)
Felipe Moreno
Mentor: Shahram Lotfipour
The objective of this project is to assess the effectiveness of alcohol screening using Computerized Alcohol Screening and brief Intervention (CASI) compared to alcohol screening by triage nurse during Medical Screening Examination (MSE) in the ED. Retrospective review of the CASI/MSE database from January 2008 through December 2009, from a tertiary level I Trauma ED, was performed. Inclusion criteria included age ≥18, and completion of both the MSE and CASI. We analyzed the database by comparing age, gender, primary language (English, Spanish), and Alcohol Use Disorders Identification Test (AUDIT) scores using McNemar’s analysis. Data was available for 5,835 patients. CASI showed a statistically significant increase in detection of at-risk drinking over MSE across all ages, gender, and primary language. MSE found 2.5% at-risk drinkers while CASI found 11.5% at risk drinkers (Odds ratio 8.88, 95% CI 6.89-11.61). Similar results were found in 18 to 20 year-old patients. MSE identified 1.7% at-risk drinkers and CASI reported 15.94% (Odds ratio 19.33, 95% CI 6.29-96.74). CASI increased detection of at-risk alcohol drinkers compared with MSE across all ages, gender, and primary language. CASI is a promising innovative method for alcohol screening in the ED for the adult population including under-aged drinkers.

Stress Reactivity and Depression in Early Pregnancy
Amber Morley
Mentor: Ilona Yim
For women, pregnancy can be a period of vulnerability to depression. During pregnancy a woman’s biochemistry is drastically altered in order to support the demands of the growing fetus. Stress reactivity may enhance this vulnerability. A study addressing stress generation found that women who were experiencing depressive symptoms had an increase in sympathetic responsivity to behavioral stress. No study to date has addressed the relationship between stress reactivity and depression in pregnancy. This study examined whether autonomic reactivity to a laboratory stressor during early stages of pregnancy predicted concurrent and future depressive symptoms. Twenty-six women in their second trimester of pregnancy were assessed using alpha amylase—a non-invasive biomarker for the autonomic nervous system—as a marker for stress reactivity. Depressive symptoms were assessed using the Edinburgh Postnatal Depression scale and the Epidemiologic Studies Depression scale. Contrary to previous studies, stress reactivity was significantly associated with a decrease in future depressive symptoms but not concurrent depressive symptoms. The results suggest a negative relationship between stress reactivity and depression.

Utility of Bedside Ultrasound in the Diagnosis of Acute Shoulder Dislocation in the Emergency Department
Emile Muallem
Mentor: John Christian Fox
Bedside Ultrasound (US) is an emerging point-of-care imaging modality that can potentially diagnose acute shoulder dislocation without exposing patients to radiation. The study seeks to understand whether or not bedside ultrasound measurements are sufficient in diagnosing shoulder dislocation through statistical comparisons with x-ray interpretations. Case reports in the emergency medicine literature have shown that US can be useful in demonstrating adequate reduction of an acutely dislocated shoulder. However, no studies to date have attempted to systemically describe a standardized approach to US evaluation of the acute shoulder injury in the Emergency Department (ED) or delineate the sensitivity, specificity and accuracy of US in diagnosing acute shoulder dislocation. Over an eleven-month period, 75 subjects were enrolled in a prospective observational study. Patients visiting the ED with a complaint of shoulder pain who were scheduled for conven-
tional x-ray also received US examinations. The measurement between the humeral head and glenoid rim is a positive value in a normal shoulder, and a negative value in an anteriorly dislocated shoulder. Most patient examinations with positive x-ray interpretations of anterior shoulder dislocation also had a negative glenohumeral US measurement. The US measurements of the glenohumeral distances in these patients were compared to x-ray interpretations with 100% specificity and 85.7% sensitivity. The study is limited by the number of positive anterior dislocations; however, it suggests that US is an effective alternative to x-ray interpretation in diagnosing anterior shoulder dislocation.

Effects of the Hudood Law upon Pakistan
Hassan Mukhlis
Mentor: Bojan Petrovic
My research centered on looking for comparisons within the original Islamic law and the Hudood Ordinance. I wanted to find the text the framers of the Hudood Ordinance used to develop the laws. My research first focused on finding what specific sources of Sharia Hudood laws came from. I found that, without a doubt, more than 90% of the law came directly from religious texts. The similarities in punishment, conviction, evidence, and trial are all on point and very similar to the original Islamic law. Next, I looked at the outcomes of the Hudood Ordinance upon the legislative, judicial, executive branches as well as the society and culture in Pakistan. I concluded that the Hudood Ordinance had both a positive and negative impact on Pakistan and its people.

How Positive Writing Intervention Effects Test Performance
Mana Naeim
Mentor: Joanne Zinger
This study aims to examine the effects of a positive form of experimental disclosure on graduate school entrance exam performance. Specifically, our goal is to discover whether students who write about their best possible exam selves (i.e. a future in which they have done as well as possible on the exam and in which all of their academic and career goals have been realized) will perform better compared to students in a control condition. A previous study by Frattaroli, Thomas, and Lyubomirsky found that students who engaged in expressive writing (disclosing one’s deepest thoughts and feelings about their exam) had improved test scores compared to a control group. Our study aims to advance this knowledge further by replacing the expressive writing group with a “best possible self” writing group. Students preparing to take the LSAT, MCAT, or PCAT were recruited both from UCI and the local community and were given either the control or the best possible self writing prompt nine days before their exams.

Preliminary analyses of test scores provided by the participants revealed that, on average, the control group (N = 37) scored in the 58th percentile, whereas the best possible self group (N = 41) scored in the 59th percentile. Finally, possible mechanisms that could account for the effects of written disclosure on exam performance, such as test anxiety, study habits, depressive symptoms, and working memory, will also be discussed.

Question-Asking Behavior among Parents with Children with Autism Spectrum Disorder and Typically Developing Children
Karen Naguib
Mentor: Wendy Goldberg
Previous research examining mother-child verbal interactions found that mothers altered their question-asking behavior to meet child capabilities. One article examined verbal interactions among fathers and children with autism spectrum disorders (ASDs) but its conclusions are limited by a small sample size. This study investigated: (1) types and frequencies of questions asked by mothers compared to fathers within families of children with ASDs and those of neurotypical (NT) children, (2) types and frequencies of questions asked by parents in the ASDs group compared to the NT group, and (3) differences between parents’ question type and adequacy of child responses for both groups. Thirty-five parents (19 ASD; 16 NT) participated in 10-minute semi-structured playtimes. Two raters coded for counts of Wh-questions (e.g., What is this?) and Yes/No-questions (e.g., Are these apples?). Child responses were coded as adequate or inadequate as defined by Curcio and Paccia. Inter-rater reliability was excellent (intraclass correlations>.95). Findings are: (1) Within-group analyses demonstrated no significant differences between parents for Wh- or Y/N-questions in either group. (2) Mothers of children with ASDs asked marginally more Wh-questions (t(23.277)=-1.997, p=.058) and significantly more Y/N-questions (t(32)=-2.059, p=.048) than mothers with NT children. Fathers of children with ASDs asked significantly more Y/N-questions (t(32)=-2.38, p=.041) than mothers with NT children. (3) Fathers of NT children elicited significantly more adequate responses compared to mothers (t(15)=-2.238, p=.041); no significant associations were found in the ASD group. Results have implications for interventions altering question-asking behaviors to enhance communication of children with ASDs.

The Effects of Parental Anxiety and Medication Attitudes on the Use of Pain Medication in Pediatric Cancer Patients
Vincent Reginald Narvaez
Mentor: Michelle Fortier
Parents of pediatric cancer patients experience uncertainty with regards to cancer-related pain. Parental pain manage-
ment at home is very important in managing the overall symptoms of pediatric cancer patients. It is very important to investigate the relationship between parental anxiety and pain medication use. Studies have suggested that more anxious parents tend to experience more symptoms of acute stress compared to less anxious parents. Studies in post-operative children have also found that parental attitudes can be a barrier in pain management. In this study, I hypothesized that parents' having more favorable attitudes to medication administer more analgesics to their children. I also hypothesized that increased levels of anxiety in parents lead to a greater use of analgesic medication in the management of pediatric cancer pain. The study found that parents who had fewer misconceptions about medication avoidance ($p = 0.09$) and appropriate use ($p = 0.03$) administered more medication to their children. Parental attitudes regarding fear of side effects did not significantly impact the administration of medication. In terms of anxiety, only child-trait anxiety showed a significant relationship with the administration of medication ($p = 0.04$). The implications of this study may include parental counseling and intervention by the healthcare providers on medication administration. The healthcare providers must address questions regarding how much medication, how often, and what signs of pain to look for. This way, pediatric cancer patients can be treated adequately and appropriately for pain at home.

**Understanding the Role of the United States Government in Monitoring Economic Stability**

**Mentor:** Michelle Nelson  
**Mentor:** Gary Richardson

Historically, the United States’ economy has gone through a series of “booms” and “busts” wherein the rates of unemployment, consumer confidence and consumption fluctuate at high levels. For the past century in the United States, Americans have looked to the government not only to monitor economic policy, but also to intervene in the event of a financial crisis. One of the most drastic interventions was the Great Depression, which began in 1929. My goal for this research was to determine the role of the government during a financial crisis in congruence with economic reform policies. In this study, I examined the time period leading up to, during, and following economic downturn in order to determine the most effective method to stimulate the economy as measured by the financial health of New York banks in the given time period based on their balance sheets. By analyzing banking statements in relation to public policies for both time periods, I was able to draw conclusions regarding the effectiveness of the government’s intervention. Because the United States goes through periods of economic fluctuations, it is essential that policymakers understand both past and current reforms in order to maintain a stable financial system. This study shows the most effective reform policies following a strong shift in consumer behavior.

**Role of Mitochondrial Dysfunction in Autism Spectrum Disorders**

**Zahra Nematinejad**  
**Mentor:** Pinar Coskun

In recent years, several lines of evidence have suggested the role of mitochondrial dysfunction in the etiology of Autism Spectrum Disorders (ASD). Some reports have linked mitochondrial dysfunction and altered metabolism to social and cognitive deficits in Autism. Limited scientific advances, however, have been made towards the causes of the idiopathic ASD cases. This study hypothesizes that mitochondrial dysfunction might orchestrate the functional and clinical features characteristic of ASD. We used idiopathic ASD cell lines and age-matched controls, with $n=6$, and $n=3$ for ASD and control, respectively. We ran several assays to characterize mitochondrial efficiency in these cell lines. Net endogenous ATP levels, cellular viability via MTT assay, apoptotic threshold as a function of Caspase-3 and -7 activity, and metabolic profile via XF seahorse assay of these cells lines were measured, plotted and evaluated. Overall, ASD cell lines exhibited lower viability and lower apoptotic threshold versus control lines. These cell lines also presented with altered ATP production and defective metabolic profile.

**Bank Morbidity in Rural vs. Cosmopolitan Areas during the Great Depression**

**Stella Ng**  
**Mentor:** Gary Richardson

In 1933, the United States Congress and Franklin D. Roosevelt enacted the Emergency Banking Relief act to remedy the chaos and uncertainty of the Great Depression. This act would go on to change the way banking was handled in the United States, from capital flow to loan regulation. In order to explore the changes in regulation in a more concentrated state, the focus of this study is in the state of California, and its differing regions (Metropolitan San Francisco versus Rural Visalia). Banking data from the years 1931, 1932, 1933, and 1934 (for the Bank of America National Trade of savings association consolidation in both Visalia and San Francisco) were for changes in the following: paid-up capital, surplus & profits, deposits, loans and discounts, bonds and securities, and other liquid assets and liabilities in banks. Further research was also done on the Great Depression in California as a whole to contextualize data. After analyzing my hypothesis and the percentage change in capital flow within the two respective banks, it was found that my null hypothesis had been rejected. The change in capital in rural areas was less than that of metropolitan areas; showing that metropolitan areas suffered more during the Great Depression. In conclusion,
rural areas suffered less than metropolitan areas, and had lower changes in capital flow and assets. Also, rural areas suffered fewer bank closures.

U.S. Foreign Relations in a Post-Cold War World: Cuba and Vietnam
Andrew Nguyen
*Mentor:* Wayne Sandholtz

With the Cold War over, U.S. foreign policy is no longer framed within a bipolar world, the “us versus them” mentality. With the threat of a communist superpower gone, the United States does not have to oppose communism vigorously across the globe. In fact, the U.S. has extensive foreign relations with states that are still dominated by communist regimes but are not world powers. Most of the current literature focuses on U.S. relations with other great powers, but tends to ignore relations with lesser powers. Most of the foreign relations with states that are still dominated by communist regimes are not world powers. My goal is to understand the rationale of U.S. foreign policy with small communist states. This paper examines U.S. relations with Cuba and Vietnam from 1990 to the present. Any contact between the U.S. and these two states was considered, with emphasis on bilateral agreements and U.S. law and policy. Cuban relations revolve around heavy economic sanctions while Vietnamese relations have been productive and focused on increased economic ties since the country switched to capitalism in the early 1990s. U.S. foreign policy seems to be guided by economic interests. The evidence shows that when the U.S. decides to engage with another state, they primarily and extensively cooperate on economic issues while downplaying the importance of other issues, such as human rights. If the other state does not have an economic interest for the United States, the U.S. will not actively engage in positive relations, leaving the other state open to either neutrality or antagonism.

The mTOR Inhibitor INK128 and the HDAC Inhibitor Vorinostat Synergistically Induce Apoptotic Death in SUP-B15 Leukemia Cells
Duc Nguyen
*Mentor:* David Fruman

Increased signaling through the PI3K-mTOR-AKT pathway, involved in diverse cellular processes such as growth, survival, and proliferation, characterizes many cancers. Multiple proteins within the pathway have been identified as druggable targets but the promise of initial inhibitors has been mitigated by compensatory mechanisms that confer resistance. In this study, we investigate the efficacy of combinatorial drug treatment of INK128, an active site mTOR inhibitor (asTORi), and Vorinostat, an HDAC inhibitor which relieves transcriptional repression of many genes including mediators of apoptosis, or programmed cell death. The leukemia cell line SUP-B15 was incubated with varying concentrations of INK, Vorinostat, or combination treatment at 24, 48, and 72 hours. Cell viability was determined by 7AAD, which binds to exposed DNA of cells with compromised membranes. Apoptosis was assessed by Annexin V, which binds to phosphatidylserine exposed on the surface of apoptotic cells, and by caspase activity. Fluorescently labeled cells were quantitated by flow cytometry. Our results indicate a synergistic effect of combination treatment in inducing death when compared to single agent treatment. Increased Annexin V staining and caspase activity signify that this form of death was apoptosis. Overall, our results suggest that disruption of PI3K-mTOR-AKT signalling and presumed abrogation of compensatory resistance mechanisms can lead to effective cancer therapy.

A Novel Microfluidic Device for Point-of-Care PCR Analysis in a Portable Diagnostic Unit
Eric Nguyen
*Mentor:* Abraham Lee

Current methods of Polymerase Chain Reaction (PCR) are restricted to being performed in a lab due to bulky and non-portable devices such as thermocyclers. This poses a problem for medical diagnosis because in remote regions such as in developing countries, patient samples need to be delivered to a laboratory for analysis and the diagnosis submitted back to the doctors and medical personnel in that remote region. This process can be expensive and there is lag time between when a sample of the patient is obtained and when the results return. This project aims to produce a low cost portable device capable of performing PCR in less than fifteen minutes with no dependence on external pumps, power supplies, or analytical tools. The device will accomplish sample preparation, DNA amplification, and optical analysis internally with no specialized user training required. This will be done by creating a Lab-on-a-chip (LOC) that will pump the sample through a region of hot and warm to break up and polymerize the DNA, the thermocycling process. The sample will be pumped through the microfluidic channels via LCATs. The project will be broken up into four stages and this summer will focus on the stage that incorporates the thermocycler and the LCATs. We are very optimistic about this project and expect exceptional results for this project over the summer.

Study of the Mechanism of Alkenyl Alkenethiosulfonates formation from Alkenesulfenic Acids
Evelyn Nguyen
*Mentor:* Fillmore Freeman

A computational chemistry study of the formation of thiosulfonates from alkenesulfenic acids (R-S-O-H) found in garlic was done in this research. The calculations were carried out using CCSD(T) and QCISD(T) with the cc-pVDZ basis set and also using the hybrid density functionals
**The Quantitative Differences of Gray Matter Concentration in Healthy Brains due to Gender and Aging**

Helen Nguyen  
*Mentor: Frithjof Kruggel*

Until recently, brain structures could only be quantified post-mortem. Now, magnetic resonance imaging (MRI) is used to reveal detailed human brain anatomy during a lifetime. We analyzed a large MRI database to find quantitative differences in brain structures due to gender and changes that occur with healthy aging. The results of our study can be used as normative data to assess the amount of pathological changes due to brain diseases (e.g., cerebral infarction) or due to pathological aging (e.g., Alzheimer’s disease). High resolution T1-weighted MR images were acquired in 502 healthy subjects (age 18–70, 248 females and 254 males). Images were corrected for intensity inhomogeneities. The intracranial compartment was cut out and segmented into the major compartments gray and white matter and cerebrospinal fluid. Each brain was separated into 116 regions-of-interest based on the Anatomical Automatic Labeling (AAL) template. Gray matter (GM) concentrations in all regions of all subjects were calculated. Gender-related differences and age-related changes were determined using linear regression. Highly significant results were found in 16 regions in which the GM concentration differed up to 4% between genders. A highly significant loss of GM concentration with age was found in 72 regions at a rate up to 0.4% per year.

**Internalization of CD98 in Sup-B15 Cells**

Jannett Nguyen  
*Mentor: Aimee Edinger*

Sup-B15 cells are a line of human leukemia cells; more specifically, they are B-cell lymphoblasts, immature cells that are destined to differentiate into mature lymphocytes. In previous studies, the Edinger Lab has shown that FTY720, a sphingolipid-based drug, selectively kills cancer cells by down-regulating their nutrient transporters, causing cell starvation. The goal of my project is to determine if CD98, a glycoprotein that forms amino acid transporters on the cell surface, is internalized upon treatment with FTY720. To study the internalization of CD98, a 4μ2 stain was performed and the data was gathered using flow cytometry. Sup-B15 cells were first labeled with a primary antibody and then incubated in a 5μM FTY720 solution for different amounts of time. A secondary antibody stain was used to determine the amount of surface CD98 remaining after the treatment. The results show that with 5μM FTY720 treatment, about 60% of surface CD98 is internalized after an hour of treatment. Additionally, further results show that CD98 is internalized into a recycling endosome upon FTY720 treatment and that a washout of FTY720 will cause CD98 to be recycled back to the cell surface. These results help elucidate the mechanisms through which FTY720 down-regulates nutrient transporters.
or mTOR pathway. Therefore, Coxib L-DJ may have targeted anti-cancer effects against different prostate cancer metastasis and deserves further study to fully elucidate the mechanism of its action, any potential risks, and its in vivo anti-tumor efficacy in animal models.

**Palladium-Catalyzed Cross-Coupling of Zincke Aldehydes**

Lucas Nguyen  
*Mentor:* Chris Vanderwal

Though it has been known for nearly a century, the Zincke reaction and its utility were recently demonstrated in the synthesis of several natural products with its ability to quickly generate molecular complexity and to form pyridine derivatives. Thus, this project explores the previously unstudied reactivity of Zincke aldehydes in palladium-catalyzed cross-coupling reactions, helping not only to accelerate the application of Zincke aldehyde in organic synthesis, but also synthesize currently unavailable pyridines. The development of this reaction required systematic arrays screening precatalysts, coupling partners, bases, temperature, etc. to identify the optimal conditions to facilitate the Heck reaction. Extensive investigation demonstrated good regioselectivity, but with only moderate yields, thereby limiting synthetic viability. However, this work still presents an efficient route toward functionalized pyridines. Recent forays attempt to pursue alternatives, including the Heck-equivalent Negishi reaction involving organozinc intermediates from the zirconation of Zincke aldehydes.

**Elucidating the Novel Priming Mechanism by the Enzyme AuaEII in Aurachin D Biosynthesis**

My Chi Nguyen  
*Mentor:* Sheryl Tsai

Polyketide biosynthesis is usually initiated by incorporating acetate starter units. The biosynthetic pathway of Aurachins is unique in that it involves a novel non-acetate priming strategy. Previous research has revealed that activation of these unconventional starter units are done by a protein called AuaEII. Here, we report the preliminary expression, purification, and crystallization of AuaEII. We are in the process of obtaining new DNA constructs that will give proteins that are more amenable to crystallization. Solving the crystal structure of AuaEII would allow us to observe its specificity for the non-acetate starter unit, anthranoyl-CoA, and give us insight into how the enzyme functions.

**The Role of Extracellular Matrix in Regulating Bone-Marrow Derived Macrophage Phenotype**

Phoebe Nguyen  
*Mentor:* Wendy Liu

Macrophage cells are the key mediators of chronic response to biomaterial implants, recurrent inflammatory diseases, and wound healing processes. Macrophage cells display remarkable plasticity and polarize towards two distinctive phenotypes upon exposure to different stimuli. Pro-inflammatory, or classically-activated (CA or M1) macrophages are characterized by a high level of cell spreading, expression of nitric oxide synthase, and secretion of pro-inflammatory cytokines. Conversely, alternatively-activated (AA or M2) macrophages are characterized by a high degree of cell elongation, expression of arginase, and secretion of pro-healing cytokines. While the role of soluble mediators in macrophage polarization has been well documented, the role of insoluble environment is not well understood. Here, we investigate the role of the extracellular matrix (ECM) on bone-marrow derived macrophage (BMDM) polarization by examining the effects of: (1) various ECM proteins including fibronectin, collagen, and Matrigel, (2) ECM density, and (3) ECM geometry using micropatterning adsorption of fibronectin along elongated shape. Results show that BMDM cells cultured on different substrates for 24 hours exhibit striking morphological differences, protein marker expression, and cytokine secretion levels. BMDM cells display more cell spreading on fibronectin when compared to those on collagen and Matrigel. Furthermore, the level of cell spreading was altered by ECM concentration. Interestingly, BMDM cells on micropatterned surface form more adhesion sites along fibronectin-patterned region, express markers of alternative activation, and display elongated shape when compared to those on unpatterned surface. The findings suggest that both the soluble and insoluble factors within the cellular environment significantly influence macrophage polarization and phenotype.

**Mechanical Changes of Bovine Tendon following Electromechanical Reshaping**

Tony Nguyen  
*Mentor:* Brian Wong

Tendons and ligaments are connective tissues that provide the human body with mechanical stability and joint movement. They routinely undergo massive stress and strain that can result in injury. The use of a recently developed technique, known as electromechanical reshaping (EMR), has been studied and demonstrated to provide a change in shape and biomechanical properties in an *ex vivo* bovine tissue model. EMR uses milliamp DC currents in the form of platinum electrodes that produce an electrochemical reaction within the tendon. During EMR, redox chemistry driven changes in the structure of matrix molecules, as well as transient localized changes in tissue pH at the electrodes alter the tendon’s mechanical behavior. To assess the differences in length change and mechanical behavior, the tendon was placed under mechanical stress (either extension or compression), and the Young’s modulus was measured using a precision mechanical testing platform. One future possible application for EMR is to treat Du-
adolescence, and teenage smokers have an increased risk of progressing to other illicit drugs. Evidence suggests that the DA system, which mediates reward, may be affected by nicotine exposure. We have previously shown that nicotine pretreatment during adolescence affects DA-mediated locomotion and penile response. Neurochemical studies revealed that nicotine pretreatment also increases the number of quinpirole-, a dopamine 2 (D2)-like receptor agonist, activated corticotropin-releasing factor (CRF) cells in the paraventricular nucleus (PVN) of the hypothalamus suggesting that CRF may mediate some of nicotine’s effects on DA-mediated responses. This study sought to determine if CRF-1 receptors mediate increased locomotor activity and/or penile response observed in those animals. Adolescent male Sprague-Dawley rats were pretreated for four consecutive days, postnatal (P) 28-31, with either nicotine (0.06 mg/kg) or saline. On P32, rats were habituated to an open-field box and given an injection of saline or 10 mg/kg CP 376395, a CRF-1 receptor antagonist, 10 minutes into habituation and 0.4 mg/kg quinpirole 20 minutes later. Locomotor activity was recorded for 30 minutes, after which penile response was immediately scored. CRF-1 receptors do not mediate quinpirole-induced locomotion in nicotine-pretreated rats, but they do mediate penile response. These results suggest a novel mechanism for D2-like penile response in adolescent rats.

**Maoism, Revolution as a Process**

Y Nguyen  
**Mentor:** Yang Su

Maoism has long been identified as a static concept, often characterizing particularities of politics, military tactics, and economic policies of China under Mao Zedong. However, very few academic works identify the development of these characteristics as being conditioned by the historical conflicts within and without China. The purpose of this study is to trace the development of Maoism, not only in China (1926–1949), but also in Vietnam. The first part of the study argues that the development of the political, military and economic dimensions of the Chinese Revolution was shaped by historical internal and external conflicts. However, reciprocally, these dimensions and the revolutionaries of China shaped the details and resolutions of these conflicts. This first part uses historical biographies, works on Maoist thought, historical books on the Chinese Revolution, and Mao’s writings. The second part of the study uses biographies of leading Vietnamese Revolutionaries, the written works of these revolutionaries, and historical books on Vietnamese Revolution (1945–1975) to argue that the adoption and development of similar military, economic, and political characteristics of the Vietnamese Revolution were influenced by historical conflicts, both internal and external, which made Maoism relevant. As a result of this work, a historical theory is constructed, presenting history as not circular, but rather helical, conditioned through conflicts and contradictions in and outside a society, which process, however, can only be enacted through individual agents of history. Thus, Maoism, a product of this process, must too be conceptualized and understood as a dynamic and developmental theory, emerging from historical contradictions.

**The Effects of Nicotine Pretreatment during Adolescence on CRF and Dopamine Interactions in Behavior**

Emily Nolasco  
**Mentor:** Frances Leslie

Adolescence is transitional period characterized by behavioral and neurological changes. Neurotransmitter systems, such as the dopamine (DA) system, actively mature during this period, making them vulnerable to the effects of drugs, such as nicotine (the main psychoactive component in tobacco). Initiation of smoking typically occurs during adolescence, and teenage smokers have an increased risk of

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**“Glasgow’s Miles Better” Phantasmagorical Constructions of the Post Industrial City: Rethinking Glasgow in the Twenty First Century**

Kelly Novahom  
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In 1990, Glasgow was designated as the European City of Culture. The title had many implications at the time for Glasgow and its attempt at revitalizing the urban landscape. It was about a century ago that Glasgow was considered an ugly city but with a thriving economy based on heavy industry, shipbuilding, and engineering. This is not the case today for Glasgow. It has enjoyed multiple titles in the past decade: UK City of Architecture and Design in 1999, European Capital of Sport in 2003, and more recently became part of UNESCO and given the honor of becoming City of Music in 2008 through their partnership. Glasgow has established itself as a prominent European city and has thrived in recent years as a popular tourist spot. It is important to synthesize revolutionary thought and critique of our socio-political environment in the context of cultural production in Glasgow of the twenty-first century, specifically as it can be related to particular pseudo-political campaigns and endeavors to create a new reputation for Glasgow, bringing the arts and entertainment industries to the forefront of the city’s image. Not just in Glasgow but perhaps in all cities transitioning from industrial to postindustrial, one must look at the ramifications for such a huge shift from manufacturing goods to...
reliance on an economy based on culture and entertainment. The rapid changes in the city obscure the future of the community itself by throwing out the idea: What is Glasgow?

**Obstacles for Change: Challenges Faced by Critical Resistance Activists**

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A prison industrial complex (PIC) understanding of the process of punishment takes into account political, economic, and ideological structures. As PIC abolitionists, Critical Resistance activists’ work confronts such issues as surveillance, policing, political domination, neoliberalism, racism, sexism, heteronormativity, state violence and oppression, and global capitalism. They work toward their radical agenda of “shrinking the system into nonexistence” through four main strategies: intervention, prevention, accountability, and transformation. However, research has not investigated what challenges PIC abolitionists encounter in their daily work. Therefore, this study aims to uncover these challenges. Drawing from participant observations and conversational interviews, two major challenges were found. First, the public’s narrow imagination for alternatives to the current system hindered discussion about how to address the nuances of the PIC. Second, difficulties with retaining and using new members overburdened those who were active in the organization. I suggest that a new orientation program will better prepare activists to overcome the general public’s one-dimensional preference to solving complex issues. Also, creating a position within Critical Resistance to ensure new members develop a sense of investment will ensure that the workload is spread evenly. Implementing these changes is likely to minimize the challenges discussed by participants of this study.