**Abstracts**

**Group Projects**

**Effect of Increased Fibroblast Growth Factor 2 Levels on Telencephalon and Tectum of Chicken Embryos**
Amanda Freise & Johnny Huang  
*Mentor:* Georg Striedter

The purpose of this study was to investigate the effects of FGF2 on brain size in chicken embryos. To that end, we injected chicken embryos with FGF2 at embryonic day 4. We measured volumes of the telencephalon, tectum, and the rest of the brain from sections of embryonic day 7 and embryonic day 12 embryos stained with Giemsa. The data show that FGF2 induced significant expansion of the optic tectum, but not of the telencephalon, as previously thought. We suggest several reasons for these results: precursor proliferation in the tectum, the earlier exit of telencephalic cells from the cell cycle, delays in neurogenesis, and differences in FGF receptor expression between birds and mammals. We also highlight future studies that can be done to further investigate the functions, mechanisms, and importance of FGF2.

**Influence of Spring Tides on the Population Dynamics of Fecal Indicator Bacteria in Southern California Coastal Waters**
Neal Maler & Selina Singh  
*Mentor:* Sunny Jiang

Fecal indicator bacteria (FIB) are organisms that are used to monitor and indicate water quality in coastal environments. Although FIB are not always pathogenic, their presence in recreational water indicates fecal pollution, which may ultimately lead to gastroenteritis and other illnesses in those exposed to the contaminated water. This project tested whether the retrieval of high tides causes coastal water quality degradation due to additional contaminants entering the water from land. Through understanding why and how FIB levels rise and decline, one can better prepare for unsanitary water conditions. Sampling was conducted during Fall and Winter at five different locations each within Dana Point, CA and Balboa Harbor, CA. Water samples were collected 1 hour before, during, and 1 hour after targeted tides on spring tide dates. The *E. coli* and *Enterococci* were identified by the membrane filtration method outlined by the EPA. Certain sites with higher FIB population densities demonstrated the expected trend that FIB levels increase with the onset of higher water levels. Through data analysis, it has been shown that FIB population levels vary within a short time period and the large variability is likely responsive to environmental conditions.

**Processed of Nanocrystalline Aluminum by Cryomilling and CIPping**
Jason Fung & Ronald Truong  
*Mentor:* Farghalli Mohamed

Nanocrystalline (nc) materials are novel materials whose metal grain size is in the range of 1–100 nanometers. These materials have unique features different from their conventional grain-sized counterparts. One method of obtaining these nc-materials is through a process known as cryomilling, which is the mechanical attrition of powders within a cryogenic medium. Conventional method of consolidating cryomilled powders such as high temperature isostatic pressing (HIP) requires high temperature which can lead to grain growth. In this project CIP was used to consolidate the sample. The resulting grain size of the CIPped samples is measured by using X-ray diffraction and transmission electron microscopy (TEM). Hardness and density of the CIP samples were also performed. The grain size of CIP samples are compared with HIP samples.

**Drug Delivery System Using Electro-Active Polymer Valves and Efficient Electrodes Using Pyrolyzed Polypyrrole**
Mark Shimada & David Szeto  
*Mentors:* Lawrence Kulinsky & Marc Madou

Polypyrrole (PPy)-based MEMs devices have a wide range of applications in the biotechnology field. Research shows PPy-based MEMs devices can be used as an actuation mechanism for a time-release drug delivery system and a manufacturing method for a highly sensitive biosensor. In both applications, PPy-based MEMs devices can be fabricated with ease in large quantities. The research in the applications of Polypyrrole takes advantage of its unique material properties to produce efficient and reliable MEMs devices. One of the achievements is the creation of the PPy-based three-dimensional high surface area electrodes ideally suited for such electrochemical applications as biosensors and microbatteries.

**Modulation of Glycosylation of Cystif Fibrosis Transmembrane-Conductance Regulator**
Wen Hsin Chang & Gevork Tatarian  
*Mentor:* Michael Demetriou

The intent of this study is to observe the rescuing effect of glycosylation on defective cystic fibrosis transmembrane-conductance regulator (CFTR) in cystic fibrosis cells. Cystic fibrosis (CF) is a hereditary autosomal recessive disease that affects the conductivity of chloride ions in epithelial cells. CF patients suffer from frequent lung and sinus infections, gastrointestinal and endocrine problems, infertility, and shortening of life-expectancy. CF is caused by
Degradation of Antidepressant Pharmaceuticals Using Free Radical Chemistry
Brian Nguyen & Francis Rodriguez  
Mentor: William Cooper

Trace levels of pharmaceutical compounds are ubiquitous in nature and have recently been classified as emerging contaminants of concern. This experiment focuses on three main antidepressant compounds— duloxetine, venlafaxine and bupropion—as they are found in wastewater and surface waters across the United States. Conventional wastewater treatment facilities are not effectively removing these antidepressant compounds and, therefore, this experiment explores removal mechanisms with three reactive species: hydroxyl radicals, hydrated electrons, and singlet oxygen. Hydroxyl radicals, however, have proven to provide the fastest reaction with orders of magnitude at least one or two times greater than hydrated electrons, or singlet oxygen reaction. This experiment requires the use of an Ultra Violet light and Solar Simulator to degrade the antidepressant compounds at varying periods of time to determine the efficiency of each reactive species. Degradation byproducts can then be achieved through gamma irradiation and analyzed through Liquid Chromatography Mass Spectrometry (LC-MS) machine to determine possible pathways of destruction.

Development of a Decision Instrument for Selective Chest Radiography in Blunt Trauma
Roxanne Mogtaderi & Roxanne Mogtaderi  
Mentors: Bharath Chakravarthy, Mark Langdorf & Shahram Lotfipour

Chest radiographs (chest x-rays) are one of the most common radiographic studies ordered in the Emergency Department of a hospital, with an estimated 22 million carried out every year. Chest radiographs expose patients to unsafe radiation, impose radiographic costs of over $900 million yearly, and also contribute to hospital over-crowding. This study aims to create a decision-rule for patients with blunt trauma, using clinical criteria to distinguish patients who have little to no risk of significant acute intrathoracic injury requiring urgent care as evident in chest radiographs. Executing these criteria will decrease the number of chest radiographs ordered for blunt trauma patients without overlooking significant intrathoracic injuries, potentially saving money and radiation for patients and hospitals alike. For every patient enrolled in this study, basic demographic information is noted, along with the mechanism of trauma. In addition, patients are assessed for whether the patient: is above 60 years of age, was injured through rapid deceleration, has chest pain, has a distracting painful injury, is intoxicated, shows any impression of altered mental status, and has chest wall tenderness. In addition, all radiographic procedure reports relevant to the thoracic region are looked at to determine if intrathoracic injury incurred. Chest radiographs, chest computed tomographys, and abdominal computer tomographys are considered. Injuries noted are paralleled with the above criteria. The study is currently ongoing. Many blunt trauma patients who received chest radiographs are expected to have a low risk of significant intrathoracic injury given the absence of the above clinical criteria, and at least 99% of blunt trauma patients with significant intrathoracic injury are expected to be positive for at least one of the above clinical criteria.

From Dreams to Waking Life
Audrey Nguyen & Christine Ta  
Mentor: Larry Jamner

Past studies investigating the effects of waking life on dreams have found that affective intensity of experiences during waking life predicts the affective content of dreams. This study examined the effects of affective dream content on wakeful moods. We hypothesized that affective dream content determines wakeful moods (i.e., negative affect dream content results in negative wakeful moods, while positive affect dream content results in positive wakeful moods). Our objective was to gain a better understanding of the impact dreams have on mood during subsequent waking life by examining the relationship between dream content and next-day mood reports. Four males and four females, aged 19 to 22, have fully completed the study thus
Dynamic Microbial Production of Greenhouse Gases in Secondary Activated Sludge: N₂O Production from Wastewater Treatment Processes through Aerobic Denitrification

Kathryn Lehr & Shayna Mcelveny
Mentor: Betty Olson

The denitrification process in wastewater treatment is an important bio-reaction. An incomplete process of denitrification caused by the presence of oxygen results in significant emissions of a greenhouse gas; nitrous oxide. Various types of heterotrophic bacteria are responsible for this reaction in conventional activated sludge; of these bacteria we targeted Paracoccus and Pseudomonas. We investigated the bacterial community of a wastewater treatment plant over a one-year period. Using molecular techniques such as PCR and qPCR assays to examine the environmental samples, we were able to validate the current molecular methodology in use and the significance of aerobic heterotrophic bacteria in activated sludge.

Monitoring of the Microvascular Network of VEGF-GFP Transgenic Mice following Photothermal Injury to Blood Vessels

Katherine Nielsen & Kathleen Teves
Mentor: Bernard Choi

Angiogenesis is largely promoted by the repair mechanisms of the vascular endothelial growth factor (VEGF), which plays a prominent role in initiating blood vessel growth to provide nutrients to the injured site. When injured, mice carrying the transgene reveal green fluorescence from green fluorescent protein (GFP) in and around the wounded areas. GFP serves as a visible marker for VEGF response. Imaging of the regeneration process following selective laser injury on transgenic VEGF-GFP mice allowed us to identify GFP and, hence, growth patterns in microvasculature. With the goal of better understanding the biological response involved in the vascular repair process, window chamber insertion coupled with blood vessel irradiation was performed prior to evaluation by laser speckle imaging (LSI) and fluorescence imaging. It was hypothesized that damage to the blood vessels would promote VEGF activity, thus starting the formation of new vessels and the dilation of existing ones, leading to a disruption of flow followed by an increase over time. Mean blood flow values quantitatively reveal a reduction in flow after laser, as well as a steady increase in flow due to recovery. The SFI and GFP images suggest that deprivation of oxygen to a specific area will induce VEGF promoter activity in that site, as illustrated by fluorescence seen in multiple mouse window chambers. Moreover, the data reveal apparent angiogenesis and collateral vessel perfusion, which both contribute to vascular repair in tissue.

The Role of Extracellular Matrix Components in the Induction of Ectopic Blastemas in Ambystoma mexicanum

Rachele Mariano & Tiffany Vu
Mentor: David Gardiner

As embryos, all vertebrates have totipotent cells, allowing them to regenerate any body part. However, after the embryonic stage, they can no longer undergo regeneration. Fully-developed salamanders, particularly the axolotl (Ambystoma mexicanum), still retain the ability to regenerate any part of their body following an injury. The pathway that most vertebrates undergo when injured is scar tissue formation. Axolotls, however, do not form scars. Their cells have the ability to dedifferentiate and form ectopic blastemas. Axolotl cells also contain positional information—information that is involved with where cells are located in the body during development. Through nerve deviations and extracellular matrix (ECM) grafting, the axolotl wound healing process and the interaction between limb components of differing positional values have been observed. It is shown that urea-treated anterior ECM, when grafted into an anterior wound site, does not produce an ectopic blastema. However, urea-treated posterior ECM grafts do result in asymmetric, ectopic blastema formation. Anterior ECM grafts treated with urea and the enzyme heparitinase-III (HepIII) also result in blastema development. Although the molecular process for blastema formation is not known, there is evidence that heparan sulfates within the ECM play a regulatory role in growth factor activity and act differently in anterior ECM and posterior ECM.

SPOT Synthesis Tripeptides may Reveal Unfavorable Interactions Related to Mutant Human γ-S-crystallin (G18V)

Alvin Kung & Wesley Yan
Mentor: Rachel Martin

The human eye lens consists of structural proteins called crystallins that are responsible for maintaining the high transparency and high refractive index of the eye lens. When these proteins are damaged due to either UV light or mutated by an inherited genetic predisposition, they can misfold and form insoluble aggregates that can precipitate in the eye lens and form cataracts. Currently, the only treatment for cataracts is the removal of the cataractous eye lens followed by replacement with an artificial intraocular lens. However, if the unfavorable interactions far. Verbal dream reports were collected immediately following the last REM stage of a participant’s sleep cycle, as detected and signaled by a sleep actigraph that was worn. Self-reported moods were collected multiple times per day for five days using a Palm Pilot personal digital assistant. Dreams were assessed using the Hall/Van de Castle coding system. Results are being discussed in respect to their implications.

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between the mutated proteins could be disrupted, a treatment for cataracts may be developed. To do this, binding assays with tripeptides synthesized by SPOT synthesis and fluorescently labeled wild type and G18V S-crystallin were screened for sequences that bound to G18V and not wild type. These sequences reveal information about where the unfavorable interactions between the proteins occur and may be able to disrupt protein aggregation. Further binding assays and surface plasmon resonance will aid in additional screening of the tripeptides that bind positively to G18V.

Quantitative Determination of Diamantane in Nanocrystalline Aluminum Stabilized with Diamantane by Using GC-MS
Garron Tou & Steven Westermire
Mentor: Farghalli Mohamed
Nanocrystalline aluminum stabilized with Diamantane is processed by cryomilling. The addition of diamantane inhibits grain growth in nanocrystalline aluminum. It is crucial to determine quantitatively the amount of Diamantane in the nanocrystalline alloy. The purpose of this experiment is to create a calibration curve to determine the amount of diamantane embedded in aluminum samples. Diamantane is used as an internal standard to improve the overall precision of the experiment. Using Gas Chromatography-Mass Spectrometry (GC-MS), the area peak ratios of diamantane to adamantane were calculated to create the calibration curve. This result allows for analysis of the amount of diamantane in cryomilled aluminum samples stabilized with diamantane.

The Protective Effects of Estrogen on bEND Cells
Mengying Guo & Felicia Wong
Mentors: Sue Duckles & Diana Krause
Evidence has shown that women have longer life spans and reduced cardiovascular disease than men because of the protective effects of estrogen. Pre-menopausal women are less likely to suffer vascular diseases like ischemic strokes, and the risk increases greatly postmenopausal. Estrogen has the potential to reduce and protect against stroke, atherosclerosis, Alzheimer’s disease and other age-related disease. Our lab is working to understand estrogen’s protective effects on the brain and brain blood vessels. We have found that estrogen has important protective effects on mitochondria, reducing reactive oxygen species and increasing mitochondrial efficiency. We are especially interested in the endothelial cells that line the blood vessels because of the key role they play in keeping the blood vessels healthy. Currently we are validating a culture model of immortalized mouse brain endothelial cells (bEND.3 cells) to use to explore mechanisms of estrogen action. In particular, we are measuring endothelial and mitochondrial proteins by Western blot, such as cytochrome c and manganese superoxide dismutase. In addition, we have developed an assay to measure mitochondrial free radicals, that is, measurement of aconitase activity.

Diverse Perceptions of Participation in the National Children’s Study (NCS) in Orange County, California
Hazel Alvarenga & Tuyet Hong Thi Tran
Mentor: Kimberley Lakes
U.S. minority populations are underrepresented in biomedical research. When people from diverse ethnic and racial backgrounds are not included in research, restricted variability on key independent variables occurs, raising questions about the reliability and validity of associations found. Moreover, underrepresentation of minorities in research limits our ability to address health disparities for these populations effectively. However, attempts to expand research participation may face unanticipated challenges in recruitment, retention and informed consent as cultural beliefs and prior social experiences introduce new and diverse perspectives on the research process. The objective was to describe the experiences, perceptions, attitudes and values that are brought to bear when individuals from different racial and cultural backgrounds consider participating in biomedical research. Fifty-six diverse women and men participated in focus groups facilitated by researchers. Group sessions were audio-recorded, transcribed verbatim, and analyzed using qualitative thematic methods. Themes emerged in the following areas: concerns about privacy, the length of the study, trust between communities and science representatives, the burden of study visits, expectations for the research relationship, participation risks, scope of commitment implied by informed consent procedure, compatibility of research protocol with general cultural beliefs/values, and decision-making processes. A major facilitator of participation was the potential return of information that might help a subject’s child. The findings indicate that, to recruit diverse participants, it is important to address a range of issues in the informed consent process, build strong relationships between study centers and communities, and attend carefully to the return of information to families and communities.

Analysis of Local Texture across Layers in Electron-Beam Melted Ti-6Al-4V via Electron Backscatter Diffraction
Brandon Saller & Travis Van Den Vlekkert
Mentors: Farghalli Mohamed & John Porter
Ti 6Al 4V (Ti 6-4) is an aerospace and biomedical titanium alloy of 6% Aluminum, 4% Vanadium, and 90% Titanium by weight, typically manufactured by casting, forging, and heat treatment. The method of fabrication analyzed in this study is Electron-Beam Melting (EBM), which is a new layer build process. After one layer is built, a layer is begun on top of that, which consequently re-melts part of the underlying layer. This melting is thought to cause some
interaction between the grains in the two layers. The study analyzed the orientations of the grains across those boundaries using Electron Backscatter Diffraction (EBSD), revealing a standard cube orientation of the prior beta-grains. This standard cube orientation was then found to be continuous across the layers. Ion etching was used to reveal any prior beta grains of body-centered cubic structure and the hexagonal-close packed grains, which formed during cooling, within these beta grains.

**PDMS and In-Chip Compressive Immobilization and Maintenance of C. elegans**
Philip Chao & Brandon Wong  
*Mentor: Elliot Hui*

Since assays of vertebrate animals require expensive and complex instrumentation, researchers have targeted *Caenorhabditis elegans* as a model organism to explore the intricate web of genetic interactions that have already been identified but not understood. Due to the micro-scale nature of *C. elegans* (~40–50 μm in diameter and 1 mm long), immobilization is difficult; however, laser ablation of neurons, high resolution microscopy, and analysis of cellular development and gene expression all require *C. elegans* to be almost motionless before experimentation. Unfortunately, popular immobilization techniques are either irreversible, tedious, or change the natural biochemical state of the worm. The objective of this project is to create multiple adjacent semi-cylinders extruding from poly(dimethyl siloxane) (PDMS) as a platform to immobilize *Caenorhabditis elegans* in a configurable manner. Through gradual compression, a specimen is immobilized between the peaks and valleys formed from the extruding semi-cylinders. Early analysis of the device has demonstrated successful immobilization of *C. elegans* without affecting the health of the specimen or its progeny. Successful characterization of the device should lead to various laser ablation experiments to demonstrate functionality of the platform.

**Toxicological Responses to Bacillus thuringiensis israelensis: Mortality Comparisons Between Two Vernal Pool Inhabitants**
Catherine Drake & Linda Kim  
*Mentor: Peter A. Bowler*

From 1999 to 2002 six vernal pools were created along the southwestern edge of the University of California Natural Reserve System’s (UCNRS) San Joaquin Freshwater Marsh Reserve. The created pools were inoculated with benthic samples from a series of small vernally filled basins that were taken from the UC Irvine main campus. Resilient populations of *Brachinecta lindahli* and half a dozen vernal pool vascular plant indicator species developed and have been appearing annually as the pools fill with winter rain. The pools also sustain mosquito larvae, and the application of BTI, a *Bacillus thuringiensis israelensis* derived larvicide used to reduce mosquito larval presence, was suggested. Before using BTI, however, we tested its impact on *Brachinecta lindahli* individuals and other invertebrates recovered from the pools. A sequence of nine tests was conducted in which the recommended dosage of liquid BTI was applied to microcosms containing vernal pool water and ten individuals of the fairy shrimp, as well as mosquito larvae and other invertebrates from the pools. BTI has been reported to have no impact and cause no mortality to other species of fairy shrimp, but toxicity effects for *B. lindahli* have not been previously investigated. Our results indicate that BTI kills mosquito larvae within hours, but does not appear to be toxic to *Brachinecta lindahli*. In most of the tests, no mortality occurred during the first few days after treatment, and subsequent mortality followed the general pattern of natural mortality in the controls.

**Prospective Evaluation of Ultrasonographic Measurement of the Optic Nerve Sheath Diameter and Invasive Monitoring of Intracranial Pressure**
Stacy Hata & Thuy-Chung Nguyen  
*Mentors: John Christian Fox, Shahram Lotfipour & Warren Wiechmann*

Numerous studies have suggested that ultrasonographic measurement of the optic nerve sheath diameter (ONSD) may be clinically useful in determining the presence of elevated intracranial pressure. A prospective blinded observational study was performed using a convenience sample of adult patients with invasive intracranial pressure (ICP) monitors in the neurosurgical intensive care unit of a level-I trauma center. Forty-nine patients were enrolled by 8 EPs. One EP enrolled 28 consecutive patients, and separate analyses were performed on this subgroup. Elevated ICP (>15mm Hg) was found in 28.6% of patients. Ultrasound had a sensitivity of 42.9% and a specificity of 74.3% to detect an abnormal ONSD. Linear regression analysis showed no significant correlation between ICP and ONSD. The subgroup analysis showed elevated ICP in 39.2% of patients. Ultrasound had a sensitivity of 45.5% and specificity of 100%. Linear regression in this subgroup showed significant correlation between ICP and ONSD. This subgroup was compared to the remaining EPs, who enrolled 21 patients of whom 3 had elevated ICP (14.3%). Sensitivity and specificity were 33.3% and 50% respectively. Linear regression showed no significant correlation in this subgroup. These data show that ultrasound has poor sensitivity in measuring abnormal ONSDs in the setting of increased ICP and that there is no statistical correlation between these values. However, the data suggest that the correlation between ICP and ONSD is operator dependent, and increased exposure to ocular ultrasounds can improve the precision and accuracy of ONSD measurements.
The Prospective Role of Bedside Ultrasound in the Emergency Department in Determining Treatment of Ureteral Calculi  
Bhakti Patel & Jim Tran  
Mentors: Eric Chin, John Christian Fox & Shahram Lotfipour

The gold standard for diagnosing patients who present to the Emergency Department (ED) with renal colic is computed tomography (CT scan). However, CT imaging is a source of radiation which increases the risk of cancer. A possible alternative is ED ultrasound, which reduces radiation and is much more cost-effective, to measure urine jet frequencies. If a significantly reduced urine jet frequency can be positively correlated to stones greater than 4mm in diameter, we would then suggest that these patients undergo CT scans after bedside ultrasound. The relative jet frequency (RJF) was defined as the number of bladder jets on the symptomatic side divided by the total jet frequency. Specifically, an RJF of less than 35% of the unaffected side will be defined as abnormal and obstructed. Patients who presented to the ED with renal colic were identified and a 4-minute ultrasound of the bladder was performed to count the number of urine jets on both the right and left sides of the bladder. We then compared the ultrasound imaging to the CT scan to determine the location and size of the kidney stone. Sixty-three patients were enrolled, and 20 were excluded for having three or fewer jets. Using RJF of less than 35% to detect the presence of uretal calculi was 87.5% sensitive and 100% specific. Analysis also suggests that kidney stones larger than 4 or 5 mm in diameter obstruct the path of urine from the kidney to the bladder and so result in a greatly reduced urine jet frequency on the side with the kidney stone compared to the contralateral asymptomatic side. Therefore, bedside ultrasound may be a useful diagnostic test for the presence of ureteral calculi in the emergency department.

Cryomilling of Aluminum Sheet  
Kyle Magnuson & Christopher Stone  
Mentor: Farghalli Mohamed

Cryomilling metal powders is one of the primary methods used to produce nanocrystalline (NC) and ultra fine grained (UFG) materials whose grain sizes are in the range of 1–100 nanometers (nm) and 200–700 nm, respectively. After cryomilling, the powders need to be consolidated. In this project the starting material is in bulk form, in contrast to the conventional cryomilling method in which metal powders are the starting material. This helps limit contamination and eliminates a step that requires consolidation. Preliminary results are shown in this presentation. This method has yielded some very promising results, with the hardness profile through the thickness indicating an increase in local strength. The microscopic structure of cryomilled sheets for different times is also presented.

Aesthetics of Brow Shape  
Ashley Hamamoto & Tiffany Liu  
Mentor: Brian Wong

Eyebrows, the hairs above the eyes that follow the shape of the brow ridges, play a significant role in an individual’s expression of emotions and nonverbal communication. They also serve as a reference to which other angles and contours of the faces are aligned. The static shape of the brows is an integral element of expression, and altering brow shape is a major revenue source for the 250,000 salons in the U.S. Our research aims to determine if an ideal brow shape exists. We selected 10 symmetric faces from our existing database of 300 synthetic Caucasian women’s faces. For each face, we altered the brow shape using Photoshop. Brow shape was altered in three ways using guidelines established by internationally recognized lay experts and in accord with the conventional approach as advocated in art and plastic surgical textbooks. We organized the photos in the form of an electronic survey and used both focus groups and Internet-based methods to rate the photos based on attractiveness using an ordinal scale. The data we collected and analyzed revealed the impact of the eyebrow shape on the perceived aesthetics of an individual.

Design and Fabrication of a Fully Encapsulated Microfluidic Diagnostic Device  
Janice De Jesus & Transon Nguyen  
Mentor: Elliot Hui

A fully integrated “lab-on-a-chip,” or LOC—a device that takes large-scale laboratory processes and builds them into a single chip—has several biomedical applications, including biochemical assays and disease detection. In addition to their small size and portability, the fact that most LOC devices are pneumatically driven has significant global health implications, as resource-limited areas around the world may lack the ability to power traditional diagnostic machines. Unfortunately, many current LOC devices lack true portability due to their use of multiple external sources of control. To alleviate this problem, our proposed design bases the microfluidic circuitry and logic of a LOC off of equivalent transistor-based electrical circuits. This similarity to electronic logic allows us to take advantage of circuit designs from a well established logic family, thus allowing for the design of intricate pneumatic devices capable of complex operations. In conjunction with microfluidic circuits, hydrogels have been demonstrated as a material capable of analyte detection, due to their ability to grow and shrink in response to chemical stimuli. Because this proposed technology is still relatively new, certain fundamentals were established first. Research was conducted on the optimization of hydrogel formation, as well as the analysis of hydrogel swelling in response to stimuli. Such factors are essential for understanding how hydrogels can be incorporated into a diagnostic LOC. In the future, we
intend to design a circuit that can precisely “read” such swelling and give an output based on hydrogel response, essentially unifying our research on microfluidic logic and hydrogel behavior.

**Delicious Solar Technology**
Sarah Ewing & Sean Marquez  
*Mentor:* Hung Nguyen

With the rising need for renewable sustainable forms of transportation, recent research has resulted in fuel cell and battery powered electric vehicles being developed. However, there are limitations to these technologies. For example, hydrogen fuel cells need to maintain pressurized hydrogen storage tanks, and battery powered electric vehicles have a limited charge capacity and require a substantial amount of time to recharge. With a solar powered vehicle, we eliminate the need for pressurized gas and safety hazards that persist with acid based batteries, while still maintaining a minimal environmental impact. In addition, compared to fuel cell and battery powered forms of transportation, which require expensive forms of fuel, solar energy is free. DSSC (Dye-Sensitized Solar Cell) Technology generates energy from the sun by using cheap, harmless, readily available materials such as Titanium Dioxide (a material found in powdered donuts, toothpaste, and sunscreen lotion) and blackberries. The first process occurs when a photon from the sun is absorbed in the dye molecule that binds to the TiO2 (Titanium Dioxide), where an electron is then excited from the TiO2. It then enters the conductive layer, where it generates current to do work, and returns to the cell. Compared to other solar technologies, such as organic PV at about 6 % efficiency, DSSC is a fairly efficient solar cell that manages almost twice the efficiency. By calculating the required solar cell dimensions for the required load demand, we can further estimate the performance of this technology for a life-sized vehicle.

**A Retrospective Analysis Comparing Reported Alcohol Use Through a Medical Screening Exam at Triage and Computerized Response in the Emergency Department**
Narciso Caceres & Omar Sandoval  
*Mentors:* James Howard & Shahram Lotfipour

Efforts to alleviate alcohol-related illness, injuries and, ultimately, cost are being carried out in Emergency Departments via screenings and brief interventions. Using the Emergency Department for early intervention is particularly pivotal since an estimated 860 million annual visits to the Emergency Department can be attributed to alcohol related problems. The primary objective of this study was to investigate if the reported alcohol consumption responses provided by the patients are different between those given to the nurses during triage, versus the responses given through the computerized alcohol screening questionnaire/intervention, CASI. A retrospective chart review of the CASI database and the Medical Screening Examination (MSE) questionnaires are currently being analyzed. The results are still being analyzed but will be used to formulate correlations between quantities of alcohol consumption across different demographic parameters such as gender, age, language, AUDIT, and CAGE questionnaire. These results will demonstrate if electronic screenings lead to more honest responses when investigating alcohol consumption.

**The Relationship Between Wrongdoing and Children's Emergent Understanding of Truth and Lies**
Bianca Barrios & Mayra Jimenez  
*Mentor:* Jodi Quas

Research on children’s understanding of truth and lies indicates that this understanding develops around age four, and there is evidence that children first understand the moral connotation of a lie before they understand the definition. This suggests that young children who believe that any report of a wrongdoing is a lie may misinterpret scenarios involving truthful statements about acts of wrongdoing. This study tested this hypothesis. Fifty-one 4½- to 6-year-old children were presented with a series of vignettes in which two characters performed either good or bad acts and then told either the truth or a lie about their actions. Children were asked which boy told the truth/told a lie. The data was analyzed using a repeated measures analysis of variance (ANOVA) with condition (good or bad act) and report (truth or lie) as within-subject factors, age (3, 4, 5, and 6) as a between subjects factor, and summed accuracy scores as the outcome variable. Developmental improvements were evident, with 6-year-olds, $M = .886$, performing significantly better than 4-year-olds, $M = .59$, and 5-year-olds, $M = .73$. Children preformed better on conditions involving a good act, $M = .85$, compared to bad acts, $M = .65$; however, there was a significant gender X condition interaction, indicating that performance by condition differed for females only. These results indicate that wrongdoing can influence young children’s understanding of truth and lies. The theoretical and legal implications of these findings will be discussed.

**Causes and Consequences of the Erosion of Emergency Department On-Call Panels and the Effect on Higher-Level-of-Care Inter-Hospital Transfers**
Thuy-Chung Nguyen & Jimmy Tran  
*Mentor:* Omar Amr, Shahram Lotfipour & Michael Menchine

Recent literature notes a growing trend of deficiency in on-call specialist availability and an increasing need for higher level of care (HLOC) transfers for emergency department

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**Undergraduate Research: Launching the Future**
(ED) patients. The purpose of this retrospective study is to assess the financial implications to a university trauma center that frequently accepts transfers for HLOC. A chart review was conducted of all patients transferred to the University of California, Irvine Medical Center (UCIMC) from an outside ED for HLOC between January 1, 2007 and March 31, 2008. Charts identified were reviewed to determine the HLOC service received, patient characteristics, and the source of expected funding. Charges, costs, and collections were determined from the hospital financial services. Results indicated that UCIMC received a net gain of $2,576,200 during the 15 months covered by this study. Reimbursements varied drastically with insurance type. 39.9% were Medical/Medicaid with an average cost of $15,316, reimbursement of $7,734, a net loss of $2,168,510. 38.6% were private insurance; their average cost was $16,325 and reimbursement $36,697 for a net gain of $5,643,088. 10% were Medicare patients with an average cost of $26,095, average reimbursement of $28,433, net gain of $168,339. 7.1% uninsured/self pay with a cost of $16,746, reimbursement of $3,401, net loss of $680,557. 4.3% were MSI with an average cost of $22,768, reimbursement of $10,311, with average loss of -$386,160. The data suggests that hospitals receiving HLOC transfers could suffer financial harm from accepting a greater proportion of uninsured or Medicaid or MSI patients in comparison to hospitals that receive transfers with private insurance.

A Search for Eclipsing Binary Star Systems
Jesse Campbell & Ketron Mitchell-Wynne
Mentor: Tammy Smecker-Hane

For low mass stars, significant discrepancies exist between their observed physical parameters (i.e., mass and radius) and theoretical predictions of stellar evolution models. By accurately measuring the light curves of eclipsing binary star systems that contain low mass stars, we can accurately measure their stellar parameters. Our research team has monitored four candidate eclipsing binary systems provided to us by Scott Fleming (Univ. of Florida), who had previously found them to be spectroscopic binaries with periods ranging from 4.6–9.4 days. Using the UCI 24-inch telescope and ST9 CCD camera, our team observed a total period of 64 nights over a 5-month period (5% temporal coverage). We reduced our data using IRAF and performed photometry using DAOPHOT. Calibrations were done using Peter Stetson’s standard star fields with local standards defined in each eclipsing binary field. In this presentation we will report on the results of our photometry.

Role of Acetylcholine in the Arcuate Nucleus during Long-Lasting Electroacupuncture Inhibition of Cardiovascular Pressor Reflexes
Sarah Nisar & Kien Tran
Mentor: Stephanie Tjen-A-Looi

Previous studies have shown that electroacupuncture (EA) causes inhibition of cardiovascular reflex responses through the excitation of the arcuate nucleus in the hypothalamus, which excites the ventrolateral periaqueductal gray (vPAG) in the midbrain, inhibiting the rostral ventrolateral medulla (rVLM) in the brain stem. However, little is known about the specific chemicals and mechanisms involved in the activation and inhibition of these nuclei. We hypothesized that acetylcholine is a major neurotransmitter that plays a role in the activation of the ARC during applied EA. Experiments were performed on α-chloralose anesthetized cats in which the gallbladder was exposed. Repeated pressor reflexes were induced by applying filter paper soaked in bradykinin to the surface of the gallbladder every 15 minutes. EA was then applied at pericardial meridian acupoints (P5–6) for 30 minutes, which inhibited changes of mean arterial blood pressure (MAP) from each pressor reflex. An acetylcholine receptor antagonist, atropine, was then microinjected into the ARC while MAP was monitored. In addition, acetylcholine was microinjected into the ARC of separate cats that had not undergone EA. Results show that atropine in the ARC reversed EA’s inhibitory effect on blood pressure changes. In addition, acetylcholine in the ARC was able to mirror the effects of EA by inhibiting changes in MAP from induced cardiovascular pressor reflexes. These results suggest that acetylcholine is involved in the activation of the ARC and that acetylcholine receptors are present in the ARC. The activation of these receptors is important in producing the effects of EA.

The Inflammatory Response to Brain Death and its Effects on the Suitability of Organs for Donation and Recipient Graft Function
Matin Khoshnevis & Tony Le
Mentor: Darren Malinoski

The inflammatory response to brain death affects the number and quality of organs suitable for donation. Hypertonic saline (HTS) has been shown to lessen the inflammatory response to hemorrhagic shock, but this has not been studied after brain death. 35–42 kg swine were anesthetized and had femoral artery and jugular venous catheters placed. An epidural balloon catheter, subdural intracranial pressure (ICP) monitor, and a subdural laser Doppler flow probe were placed. Brain death was induced by inflating the balloon and confirmed by a decrease in flow to <15% of baseline, ICP persistently greater than mean arterial pressure (MAP), and fixed/dilated pupils. Animals were then allocated to receive either a 4cc/kg bolus of 0.9%
NaCl after brain death (NS, n=4), 7.5% NaCl bolus after brain death (HTS, n=6), or no brain death at all (SHAM n=6). Blood pressure was maintained at greater than 35 mmHg for 6 hours with 2cc/kg boluses of NS and serum levels of IL-6, IL-10, and TNF alpha were measured at were drawn at baseline, one, three and six hours after brain death. All cytokines increased over time in both groups. Increases in IL-6, IL-10, and TNF alpha were less with HTS, but did not reach statistical significance. Future studies that increase the duration of the brain death phase and add to our sample size are planned.

**Target for Mycobacterial-Drug Development: *Mycobacterium tuberculosis* Acyl-CoA Carboxyltransferase**

Jessica Yang & Kimberline Yang  
*Mentor:* Sheryl Tsai

The tuberculosis pathogen has become a dangerous bacterial infection worldwide because of its latency and resistance to current antibiotics due to its thick, waxy cell wall containing highly branched fatty acids. The cell wall is important for pathogen virulence, survival and latency. The enzyme that is necessary for the biosynthesis of the precursors for these fatty acids is acyl-CoA carboxylases (AC-Cases). By inhibiting the activity of this enzyme, the cell will be vulnerable to the effects of antibiotics because it no longer has the fatty acids contained in the protective cell wall. Individual subunits of this enzyme have been purified by affinity column chromatography to study the specificity of the enzyme for particular substrates and develop inhibitors for the protein active sites. The interaction between the individual subunits has never been studied. However it has been found that certain subunits such as an alpha subunit, AccA3, require other subunits, a beta subunit called AccD4, for the complete enzymatic reaction. Studying this alpha/beta subunit interaction allows for further research into understanding the interaction between the subunits of ACCases for the first time. This knowledge can eventually lead to development of new anti-tuberculosis drugs.

**Exploring Self-Righteousness as Compensation for Lack of Perceived Control and Self-Esteem**

Bojana Sandic & Marcus Solomon  
*Mentor:* Susan Charles

Self-righteousness is conceptualized as the tendency to believe one’s own beliefs are correct and that the beliefs of others are wrong. An online questionnaire was used to examine self-righteousness as a means of compensation for a lack of perceived control by developing it as a personality trait. Pilot test findings revealed that participants with higher levels of self-righteousness had lower mean scores of perceived control and lower mean scores of self-esteem. Although these results are preliminary, it is believed that these trends will become significant correlations as the data collection process continues. These findings support the hypothesis that self-righteousness may be an attempt to compensate for a lack of perceived control over the world; if this is the case, then self-righteousness is as much a coping strategy as it is a personality trait.

**Single Cell Resolution Circuit-Wide Imaging of *Drosophila* Clock Neurons in Whole Brain**

Steven DeGroot & Kelly Parson  
*Mentor:* Todd Holmes

Clock controlled circadian rhythms coordinate biological functions in virtually all eukaryotes and some prokaryotes. Malfunction of the circadian clock is implicated in many diseases, including diabetes and cancer. Animals have dedicated neural circuits in the brain that act as timekeepers for clocks distributed in the rest of the body. To further understand a model brain circadian circuit, we are implementing a sensitive live culture imaging procedure that allows us to observe multi-day continuous cycling of circadian clock promoter activity at single cell spatial resolution for the entire circadian circuit in a whole brain preparation. This is not achievable using standard existing technology such as immunocytochemical staining of clock proteins. To implement our imaging procedure, culture conditions had to be optimized, and we sought to develop behavioral assays that would allow us to image circuit activity similar to standard light-dark cycles as seen in the normal alternation of day and night. Low resolution anti-clock protein immunocytochemistry was used in parallel to generate a source of reference images. Finally, several trans-gene and mutant genotypes were combined in uniform genetic backgrounds that are capable of being imaged. We determined several culture parameters that are necessary for imaging and behavioral conditions that are optimal for imaging. Work on immunocytochemical reference images and generating uniform genetic backgrounds is in progress. We have applied these optimization improvements to our imaging procedure and results are shown.

**Comparing Semantic Role Labeling with Typed Dependency Parsing in Computational Metaphor Identification**

Christopher Pestano & James White  
*Mentor:* Bill Tomlinson

Metaphor, the partial framing of one concept in terms of another, pervades human language and thought. Eric Baumer’s Computational Metaphor Identification (CMI) system, along with the visual exploration tool metaViz, is an automated assistant for discovering metaphorical language in electronic text, with a variety of applications in creative and critical thinking. The existing implementation of CMI relies on the Stanford typed dependency parser, and is limited in the variety of grammatical relationships that can be recognized as employing the same metaphor.
My work has been to address that limitation and hopefully enhance CMI by integrating a parser that performs Semantic Role Labeling (SRL). The RelEx dependency relationship extractor (http://opencog.org/wiki/RelEx) was successfully integrated with CMI and was demonstrated to unify at least some potential metaphors expressed in both active and passive phrases. The limitations of RelEx and the complex nature of semantic roles also identifies SRL as a developing technology. An open question is whether using SRL yields results that are more effective for the users of CMI.

**The Role of NRP in the vPAG Inhibition of the rVLM Neurons and Pressor Response**

Michael Chau & Harry Do  
*Mentor: Peng Li*

Cardiovascular disease is known to be the leading cause of deaths in the world, with hypertension being one of many cardiac risk factors that may lead to lethal cardiac abnormalities. There are currently many preventive medications that lower these risks. A new popular alternative of treatment includes electroacupuncture (EA), which has long been used for its therapeutic effects in normalizing abnormal physiological conditions, and may minimize complications seen through more Western approaches to cardiac disease. Previous studies have shown that the EA activates the ventrolateral periaqueductal gray (vPAG), which inhibits the activity of the rostral ventrolateral medulla (rVLM), the cardiovascular sympathoexcitatory nuclei. Other studies have shown that the nucleus raphe pallidus (NRP) also regulates rVLM activity. This study analyzes the possibility of an indirect projection from the vPAG to rVLM through glutamatergic projections to NRP by using cellular neuronal recording coupled with hemodynamic analysis post-injection of glutamate agonist and antagonist, D,L-homocysteic acid and kynurenic acid (KYN). The results of the experiment strongly correlate with the hypothesis that there is an indirect pathway from the vPAG to the rVLM pass through NRP.

**Male Reproduction as a Predictor of Death in Drosophila melanogaster**

Christopher Monsour & Xuan Tran  
*Mentor: Laurence Mueller*

Fecundity death spiral in female *Drosophila melanogaster* is known as a distinct time frame before death when the dying female’s ability to produce eggs is significantly lower than the average fecundity of the general population. Although previous studies have confirmed the phenomenon of female fecundity death spiral, the male equivalent of a virility death spiral has never been examined. This experiment investigates the correlation between male virility and mortality by recording each experimental male’s ability to fertilize eight female virgins once a week, for the duration of six weeks. The experimental males that died within seven days of the weekly mating were found to have significantly lower virility than the non-dying males. These findings confirm the existence of a virility death spiral in male *Drosophila* and indicate the possibility of using male fruit flies to further study the dying process.

**Computational Model of Magnetic Sensing in Cryptochrome Photoreceptor**

Alexandre Colavin & Andrew Hohne  
*Mentor: Thorsten Ritz*

Recent work of Ritz and others proposes that cryptochrome, the photoreceptive protein that regulates the circadian rhythms of animals and controls photomorphogenesis in plants, is also a candidate site for the radical pair magnetoreception mechanism, which is hypothesized to give many animal species their ability to navigate by means of the Earth’s magnetic field. The nonlocal nature of this mechanism has made experimental evaluation of this hypothesis difficult and inconclusive to date. Inspired by the holistic approach of the burgeoning field of systems biology, we developed a computational model based on a simple cryptochrome signaling network. Working in the MATLAB programming environment, we started from simple mass action kinetics and refined the model using published experimental data, such as absorption spectra and fluorescence decays of cryptochrome protein. Once the model was able to reproduce experimental results, we wrote and applied sensitivity analysis algorithms to analyze the dynamic and static properties of the system: fluorescence, steady state concentration and response time. Finally, we extended the model to calculate physiological signal-to-noise ratios for the experimental parameter space, yielding nontrivial results that can help explain previous data and provide a framework upon which to design future experiments.

**Changes in Mouse Pulmonary Responses as a Function of Airway Mass Deposition of Methacholine**

Brandon Haghverdian & Haydn Hoffman  
*Mentor: Michael Kleinman*

Nebulizers are used in medicine to deliver liquid drugs into the respiratory tract as aerosol mists. Different models of nebulizers produce aerosols with specific size distributions of respirable particles. The objective of this study was to use two different nebulizers to test the effect of particle size distribution of aerosolized methacholine (MCh), a bronchoconstrictor that provokes lung airway narrowing, on drug deposition and changes in pulmonary function in mice. Our hypotheses were: that the nebulizer that produced a smaller particle size would allow greater drug deposition in the deep lung and there would be a difference in physiologic response, demonstrated by changes in pulmonary resistance and dynamic compliance, due to...
dose as a function of MCh deposition in the lungs. A cascade impactor was employed to determine the average mass median aerodynamic diameter (MMAD) and geometric standard deviation (GSD) of the MCh aerosols generated by the two nebulizers. The PARI nebulizer produced an aerosol with an MMAD of 0.53 microns (GSD = 1.24), while the Whisper Jet nebulizer produced an aerosol with an MMAD of 0.62 microns (GSD = 2.91). The MCh aerosols from each nebulizer were delivered to tracheally intubated BALB/c mice to determine whether physiological pulmonary responses differed based on aerosol size characteristics. Preliminary results demonstrated that the PARI-generated MCh aerosols elicited greater pulmonary changes in mice than those of the Whisper Jet, and additional studies are underway to clarify these findings. These results may explain differences in murine pulmonary function measurements in rodent models of pulmonary disease.

Understanding the Relation Between Language and Memory in Infants
Priya Chakrabarti & Hoa Nha Nguyen
*Mentor:* Angela Lukowski

Language has been shown to facilitate long-term memory in infancy. In particular, previous research has suggested that the provision of specific verbal reminders at delayed recall facilitates memory to a greater extent than when more general prompts are used. Also, specific verbal labels seem to be more helpful when they are presented at retrieval rather than at encoding. This study was designed to investigate the importance of linguistic support at encoding on measures of immediate imitation and delayed recall in 16-month-old infants. Infants were enrolled in one of three conditions. In the highly supportive condition, infants were provided with informative noun and verb phrases as the event sequences were modeled. In the moderately supportive condition, infants were only provided with informative noun phrases as the sequences were shown. Finally, infants in the minimally supportive condition did not hear any informative statements. Data collection is ongoing. However, our primary hypothesis is that infants tested in the highly supportive condition will show the most evidence of memory at delayed recall relative to infants tested in the other groups; effects may be apparent at immediate imitation as well. If these results are realized, they will indicate that the language used at encoding affects long-term recall memory and suggest that receptive language abilities are critically important in learning and memory in the second year of life.

The Kinetic Isotope Effect: A Method to Slow Aging?
Kyle East & Stephanie Hammel
*Mentor:* Athan Shaka

The process of aging for all living organisms consists of various causes that ultimately lead to death by disease or the cessation of cellular and, thus, bodily functions. With the decreased effectiveness of cellular repair, biomolecules such as DNA may suffer a greater amount of damage as an organism grows older. Our work aims at delaying damage by improving the resistance of the most vulnerable sites in these biomolecules. *In vivo* experiments with *Drosophila melanogaster*, the common fruit fly, were used to investigate the phenomenon. To try to protect the molecules from damage, we fed the flies deuterated food as larvae; deuterium shows a kinetic isotope effect in many chemical reactions, reacting more slowly than hydrogen. This manifests itself by a slower rate of reaction for carbon-deuterium bonds in comparison to carbon-hydrogen bonds. By substituting hydrogen atoms (H) with deuterium (2H), we hoped to make the flies’ molecules resistant to damage. Using a dose-response curve with varying levels of one-time deuterium treatment, we experimentally determined an expanded lifespan of the fruit fly. This is consistent with the idea that the kinetic isotope effect does apply to the oxidative damage of biomolecules in *Drosophila*. As we continue to analyze the extent of deuterium incorporation into the flies, we hope that the findings may show us that deuterium does indeed hold the potential to increase lifespan in other living organisms, including humans.

Isolating and Trapping Malaria Infected Red Blood Cells in a Microfluidic Device
Siavash Ahrar & Peiran Lu
*Mentor:* William Tang

In this research, the feasibility of a point-of-care (POC) lab on a chip (LOC) device for detecting malaria infection from a small whole-blood sample was investigated. Previous work demonstrated that various stages of *plasmodium gallinaceum*-infected avian red blood cells (miaRBCs) in a blood sample could be detected based on their biomechanical changes in a way similar to the physiological traits of infected human erythrocytes, and therefore could be used effectively as a model system. The purpose of this research is to devise a mechanism to isolate and retain miaRBCs by analyzing the flow speed differences between infected and normal cells via characterization of media flow through a custom-designed microfluidic platform. Our experiment was divided into two stages: the quantitative study of erythrocyte movement, and the microfluidic experiment. In the blood study, a comparison of miaRBC and normal RBC flow speeds was determined after samples were placed under uniform shear flow rate in the device loading chamber at room temperature. The experimental results supported the assertion that progressive morphological changes in miaRBCs inhibit extracellular movement, resulting in a decreased flow speed. Characterization of the media flow rate was studied subsequently to provide experimental values for the shear flow profile. Preliminary results pointed to the viability of using
Neural Pathways and Mechanism of Electroacupuncture Effect on Cardiovascular Depressor Reflex during Gastric Distension

Jennie Ho & Peter Hoang
Mentor: Stephanie Tjen-A-Looi

Gastric distension (GD) under anesthetic agents ketamine and xylazine evokes inhibitory cardiovascular reflex responses in hypercapnic acidotic rats, however little is known of the neural mechanism of the GD-induced cardiovascular reflex. We hypothesized that the cardiovascular reflex is transmitted through both sympathetic and parasympathetic afferent pathways. We also hypothesized that the pathway is affected by electroacupuncture (EA), and the nucleus ambiguus (NA) and caudal ventrolateral medulla (cVLM) are two nuclei in the medulla involved in the responses. Experiments were performed on male anesthetized rats that were artificially ventilated, and heart rate (HR) and mean arterial blood pressure (MAP) were monitored. Repeated distension of the stomach every 10 minutes induced consistent decreases in MAP and HR. The response was reversed with denervation of the celiac ganglia and vagal nerve with 1% lidocaine. Unilateral depolarization blockade of the cVLM through microinjection with kainic acid reversed only the hypotension response, while HR was unchanged. Conversely, unilateral depolarization blockade of the NA through kainic acid microinjection reversed only the bradycardia response. Bilateral stimulation with low frequency EA at acupuncture points P5–P6 for 30 minutes significantly reduced the decreased blood pressure and heart rate responses. Unilateral microinjection of atropine into the cVLM transiently reversed the effect of EA on the hypotension response, whereas microinjection of normal saline did not. Unilateral microinjection of gabazine into the NA also attenuated the effects of EA while normal saline did not. These results suggest that both sympathetic and parasympathetic pathways mediated the decreased MAP and HR during gastric distension through a sympatho-inhibition and parasympatho-excitatory mechanism involving the cVLM and NA respectively. EA attenuates the cardiovascular depressor reflex through a cholinergic mechanism in the cVLM and a GABAergic mechanism in the NA.

Childhood Maltreatment among Juvenile Delinquents: Internalizing and Externalizing Symptoms

Ein Ho & Deanna Shiley
Mentor: Elizabeth Cauffman

Childhood maltreatment—defined as neglect, witnessing violence in the home, and emotional, physical, and sexual abuse by a parent or caregiver—has been found to be associated with high rates of both internalizing and externalizing symptoms during childhood. This study examined the relation between childhood maltreatment and mental health among male adolescent offenders. Specifically, we examined how maltreated and non-maltreated juvenile delinquents differed in externalizing and internalizing symptoms. Our sample consisted of 373 male juvenile offenders, ages 14–17, held in a Southern California juvenile secure facility. Five interviews were conducted, the first occurring within 48 hours of institutionalization. Follow-up interviews occurred weekly for three weeks, followed by an additional interview at two months. A variety of measures were used to identify various forms of maltreatment, and the Child Behavioral Checklist was used to measure internalizing and externalizing symptoms. Regression analyses revealed that only sexual maltreatment (as opposed to other types of maltreatment) was significantly related to internalizing symptoms. In addition, the number of types of maltreatment experienced was significantly associated with internalizing, but not externalizing symptoms. These results suggest that maltreatment is more related to internalizing than to externalizing symptoms among adolescent male offenders. Consequently, maltreated youth—especially those who have experienced sexual or multiple types of maltreatment—should be targeted for treatment, with an emphasis on addressing internalizing symptoms.

Hyperexcitability of Large Lateral Ventral Neurons (LNvs) from Cold Activated Transient Receptor Potential Channels, TRPM8

Irina Padua & Kelly Parson
Mentor: Todd Holmes

The neural circuits that regulate sleep, arousal, and circadian rhythms work together to determine an animal’s daily patterns of behavioral and physiological outputs. The large lateral ventral neurons (l-LNvs) of the Drosophila circadian circuit express the neuropeptide PDF, which is crucial for synchronizing and maintaining the molecular clock. Recently, the Holmes lab has shown that normal functioning of these neurons is also essential for regulation of sleep and arousal, making them an attractive target for studies into the interactions between these systems. We have previously used the UAS/GAL4 genetic system to drive expression of the bacterial sodium channel NaChBac in the Drosophila LNv, resulting in the firing of “hyperexciting” giant action potentials, which renders flies overactive at night and occludes their ability to respond to arousing stimuli. However, the constitutive nature of this hyperexcitation leaves the experimenter little control over the magnitude and duration of the measured neuronal and behavioral responses. Similarly, the interpretation of results using the dTRPA1 warm-activated channel to stimulate
neuronal activity in response to heating is confounded by the general tendency of “cold-blooded” flies to increase their activity when warmed. In this study we asked whether the cold-activated transient receptor potential (TRP) family member TRPM8 could be used to provide graded, temporally-specific control of Drosophila arousal and sleep patterns. Our results indicate that both short and long-term exposures of flies expressing 1–5 copies of TRPM8 in the LNvs to cold temperatures (22–18 °C) can be used to increase activity levels in a temperature- and gene copy-dependent manner.

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

Diabetes Mellitus is a condition in which the body either doesn’t produce enough, or does not properly respond to, insulin, a hormone produced in the pancreas. Patients with diabetes mellitus may develop a wide variety of problems, including high blood glucose levels, production of ketone bodies, or diabetic ketoacidosis (DKA). Our study sought to investigate what gases are exhaled by Emergency Department patients at UCI Medical Center who have diabetes mellitus. Although exhaled gas analysis, such as the “Urea Breath Test” for Helicobacter pylori infection and the “Breath Hydrogen Test” for intestinal malabsorption, has been commonly used for decades, the precise quantities of the various gases has not been correlated with the patient’s disposition. If such a correlation exists, exhaled breath analysis might be developed into a diagnostic tool in the future. To address this question, diabetic patients were approached for consent. The gas samples were taken by Matthew Gartner, a pre-doctoral student at the Rowland/Blake Laboratory. Mr. Gartner had the patients breathe into a stainless steel canister through a Teflon straw. Additional gas samples of the room, a healthy control, and Matt were obtained for controls. The canisters were then taken back to the Rowland/Blake laboratory at the UCI main campus to be analyzed on the three Gas Chromatography systems. The data is still in the process of being analyzed, and the exhaled gas amounts will be quantified and compared to the illness and severity that each patient was diagnosed with.

New York Satellite
Mouhanad Aboul-Zeloof & Hayley Palmer
Mentor: Eli Simon

The New York Satellite Program includes daily classes that range from various genres of dance, to vocal coaching, to auditioning techniques, to television and film acting. This intensive program proved to us that diligence, dedication, and talent are necessary to survive in this industry. In addition, establishing connections is an imperative part of becoming successful in the field, and this program has definitely given us a good foundation. Our extraordinary teachers forced many of us to venture out of our comfort zones. The daily challenges we faced reminded us that life is about pursuing our passions and that we must learn to “be comfortable with being uncomfortable.” We also discovered how much we tend to limit ourselves by underestimating our abilities. You can never reach your full potential until you turn off that voice in your head that says “This is the best I can do,” or “I think this is good enough.” The goal of the performer is to go into class, onstage, and into life with no concept of limitations - only visions of what we strive for. This program gave us a more accurate idea of what a bicoastal acting career would really entail, and why we might prefer one coast over the other depending on the lifestyle we desire as performers. Now that we are able to make a more educated decision regarding where we would like to establish our careers, we can clearly focus on turning our goals into reality.

Talk to Me: Early Adolescent Communication Style and Later Friendship Quality
Caroline Chu & Joyce Hsiao
Mentor: Wendy Goldberg

The objective of this study was to examine adolescent friendships by investigating early interactional styles and later friendship quality. Eighty-seven sixth-grade participants from one site of the Study of Early Child-Care and Youth Development, and a friend of their choice (47 girls, 40 boys), participated in the observational phase in which the pairs discussed vacation plans and made informal conversation. These conversations were videotaped for later coding of verbal and nonverbal behaviors. In tenth grade, the same participants completed questionnaires about peer relations and friendships. Preliminary results suggest both verbal and nonverbal communicative behaviors early on were associated with several aspects of later friendship quality. For example, eye contact and positive mood in sixth grade were positively correlated with self-reported quality. Eigh ty-seven sixth-grade participants completed questionnaires about peer relations and friendships. Preliminary results suggest both verbal and nonverbal communicative behaviors early on were associated with several aspects of later friendship quality. For example, eye contact and positive mood in sixth grade were positively correlated with self-reported help and guidance from friends at tenth grade. Results underscore the importance of examining early adolescent communication styles in relation to later quality of friendship.

Emergency Department Psychiatric Agreement on Disposition Study
Stacy Hata & Kelly Wang
Mentors: Shahram Lotfipour & Daniel Thompson

To treat psychiatric patients, emergency physicians must consult a psychiatrist before making a final decision on the disposition of the patient. However, this procedure causes a delay in the ultimate treatment of the patient, thus preventing the emergency department from running at optimal levels of efficiency. Since very little research has been
done regarding the actual need for these psychiatric consults in management of emergency psychiatric patients, we used a survey to analyze the agreement between emergency physicians and the psychiatric consultant and their respective decision on the disposition of the psychiatric patient. Over a seven-month period, 200 subjects were obtained. Of these, the majority were suicidal patients (59.5%) and overall, 69.5% of the all patients were admitted. In general, the emergency physician decision to admit was 85.3% sensitive and 44.4% specific compared to the psychiatry decision. However, for suicidal patients, the emergency physician decision to admit was 90.4% sensitive and 42.3% specific. For the 35.0% of patients in whom the emergency department assessment on the 6-point Likert scale was a “definitely admit,” 88.4% were admitted by the psychiatrist. According to the data, patients who present to the emergency department for suicidal ideation most likely will not need a psychiatric consult prior to admission for this subset of “definite admits.”

Spirituality and Religion: Latina/o Students’ Coping, Well-Being, and Persistence
Jessica Khayat, Jesus Renteria & Sandra Saravia
Mentor: Jeannet Castellanos

Latina/os are the fastest growing U.S. racial and ethnic minority group but experience underrepresentation at 4-year universities. Recent research on Latina/o college students has focused on the factors that contribute to educational persistence, the process of success, and means of coping, to increase retention rates within educational institutions. More specifically, recent work has identified spirituality and religion as key elements to Latina/o students’ coping and persistence. As such, the purpose of this study is to explore how psychological, social, and cultural factors contribute to Latina/o undergraduate persistence in the context of implementing spirituality and religion as coping means to navigate their educational journeys. The qualitative study implements the psychosociocultural framework, with a sample of 28 upper-division undergraduates. Preliminary findings suggest that spirituality and religion play a part in students’ daily coping. Results will provide better understanding of the Latina/o educational experience for university officials and faculty. Understanding the role spirituality and religion play within this community can lead to the implementation of changes that improve Latina/os’ experiences in college, and perhaps lead to higher retention of Latina/o students in 4-year universities.

Processing of Nanostructured Copper by Electrodeposition
Aaron Jimenez, Saam Ostovari & Eric Somogyi
Mentor: Farghalli Mohamed

Electrodeposition is a process in which metal films are obtained by electroplating from a suspension of small particles that are deposited with the plated metal. The advantages of electrodeposition over other coating methods include uniformity of deposition for complex shapes, reduction of the waste often encountered in dipping or spraying techniques, low levels of contamination, and the ability to process parts continuously. This study has been conducted by applying pulse current electrodeposition to produce nanostructured copper that can be used for assessing properties. The results have demonstrated the formation of a deposit of nano-crystalline copper onto a brass sample. The morphology and characteristics of the deposit were examined using various microscopic techniques, such as TEM.

The Effects on Memory after Multiple Presentations
Gig Phoong, Cameron Rabideau & Gregory Sanchez
Mentor: Charles Chubb

The more experience one has of a stimulus, the better we expect one’s memory to be for it. However, preliminary results suggested this expectation might be violated in the following experiment. Phase 1: participants viewed images of objects and judged whether they were more likely to be seen indoors vs. outdoors. Some images were presented three times, others only once. Phase 2: After a brief delay, participants were given a surprise memory test in which they were presented with another series of images; Half were “old,” i.e., identical to images seen in phase 1. The others were “lures,” i.e., slight variations of images seen in phase 1. We hypothesized that sensitivity to lures vs. old images might be higher for images seen once vs. thrice in phase 1. On the contrary, d’ for discriminating lures from old images was 1.30 for thrice-seen images vs 0.73 for once-seen images. However, participants were much more biased to judge thrice-seen than once-seen images as old, suggesting that the decision statistic they used was sensitive not only to the difference between a lure and the original image but also to the information acquired by the number of presentations of the image to the lure.

Assessing Neighborhood Effects on Educational Outcomes
Victor Araujo, Johanna Martinez & Justina Ryan
Mentor: Elizabeth Cauffman

It is well established that crime levels vary in different socioeconomic neighborhoods. Social disorganization theory explains this disparity by looking at community disadvantage, which consists of measures of community poverty, residential instability, and ethnic heterogeneity. More recently, neighborhood disadvantage has been explored in schools to explain differences in behavior and academic performance. While most research is conducted with older adolescents, school misbehavior involving academic and interpersonal problems often appears at an earlier age, increasing risk for later misconduct. Thus, this study exam-
mixed in a chemical reactor. This study focuses on a pair mixing with dry air in a humidifier, or multiple reactants mixing in the ocean. Industrial applications include moist smokestack injecting smoke into the air or a chemical spill scalar contaminants mixing in the atmosphere such as a contaminant in a fluid flow that is present in such low concentration that it has no dynamical effects (such as buoyancy) on the fluid motion itself.” Examples of a passive scalar mixing can be found in many natural phenomena and industrial applications. Natural phenomena include passive scalar contaminants mixing in the atmosphere such as a smokestack injecting smoke into the air or a chemical spill mixing in the ocean. Industrial applications include moist air mixing with dry air in a humidifier, or multiple reactants mixing in a chemical reactor. This study focuses on a particular application of passive scalars mixing, the mixing of gaseous fuel with air inside of a gas turbine pre-mixer. A gas turbine pre-mixer is a device used to mix air and gaseous fuel before it enters a combustion chamber, which can contribute to reduced emissions and improved efficiency of the gas turbine.

Effect of Scales and Turbulence Intensity on the Mixing of a Passive Scalar in Grid-Generated Turbulence
Scott Bougie, Allen Giragosian & Thang Pham
*Mentor:* John LaRue

The mixing of a passive scalar in turbulent flow has been an attractive topic of study in the field of fluid mechanics. A passive scalar is defined by Warhaft as a “diffusive contaminant in a fluid flow that is present in such low concentration that it has no dynamical effects (such as buoyancy) on the fluid motion itself.” Examples of a passive scalar mixing can be found in many natural phenomena and industrial applications. Natural phenomena include passive scalar contaminants mixing in the atmosphere such as a smokestack injecting smoke into the air or a chemical spill mixing in the ocean. Industrial applications include moist air mixing with dry air in a humidifier, or multiple reactants mixing in a chemical reactor. This study focuses on a particular application of passive scalars mixing, the mixing of gaseous fuel with air inside of a gas turbine pre-mixer. A gas turbine pre-mixer is a device used to mix air and gaseous fuel before it enters a combustion chamber, which can contribute to reduced emissions and improved efficiency of the gas turbine.

Polymer Electrolyte Membrane Fuel Cell Fabrication
Andrew Chester, Justin Huang & Yangbin Wu
*Mentor:* Yun Wang

Fuel cells are a promising technology because of their unique ability to generate electricity at a high level efficiency without producing any harmful emissions. Our project focused on building a small-sized proton exchange membrane fuel cell that uses hydrogen as the fuel source. The primary challenge was to develop a membrane that was highly catalytic, both ionically and electronically conductive, and conducive to the flow of gas and liquid through the membrane. Our design consisted of three separate layers hot pressed to form a single membrane. The two outer layers consisted of porous and hydrophobic carbon paper that had been painted with a carbon-backed nano-platinum catalyst. The inner layer consisted of a thin perfluorinated ionic polymer called Nafion™. The fuel cell was analyzed via theoretical modeling and experimental testing. Our simplified model predicted a maximum power output of 3.5 Watts for our 5x5 cm fuel cell. This occurs when operating at the predicted optimum current density of 1.07 A/m² or roughly a fuel input of 1 g H₂/hour. Further testing and investigation of the fuel cell will be conducted throughout the current quarter.

Health Professionals’ Perceptions on Tobacco Harm Reduction
Penney Libao, Ann Nguyen & Chelsea Semrau
*Mentor:* David Timberlake

The objective of this study is to evaluate the perceptions of health care professionals on tobacco harm reduction and identify why they hold their beliefs. We currently work under Dr. David Timberlake, evaluating smokers and their perceptions of tobacco harm, from which we derived the idea for this study. The study uses semi-structured interviews conducted from January to May, 2010. Professionals ranging from physicians to tobacco cessation specialists were interviewed one-on-one in their workplace setting. Health professionals seem to entertain the idea of tobacco harm reduction and are in support of the idea; however, they do not believe in the actual power and likelihood of such products being popular in society. Due to the nature of their professions—desiring to increase the health of individuals and the population—they naturally long for healthier products to promote healthier lifestyles, whether it be food, beverage, or tobacco. This longing is, however, tempered by the realistic challenges that come along with actually changing addictive behavior.

The Effects of Smoking on Cerebral Oxygenation in Adult Smokers Using Near-Infrared Spectroscopy
Joyce Ang, Thanh Cao & Kimberly Leung
*Mentor:* Jean Gehricke

Smoking is the leading cause of preventable disease in the United States, with a smoking prevalence rate of 20% in adults. Nicotine, the major psychoactive ingredient in cigarettes, has been found to have substantial effects on cerebral activity. The aim of this study is to characterize how cigarette smoking affects brain oxygenation. It was hypothesized that cigarette smoking leads to higher oxygen metabolism and an overall reduction in cerebral oxyhemoglobin during smoking as compared to baseline measurements. Cerebral oxygenation and hemodynamic changes were monitored using non-invasive near-infrared spectroscopy (NIRS) before, during, and after smoking a cigarette.
in five smokers (mean age 22.4 ± 1.14 years), following 12-hour smoking abstinence. NIRS measurements were baseline corrected and were separated into nine sequential time intervals (20 seconds each) for the entire smoking duration. Results showed that oxyhemoglobin was reduced from the beginning to the midpoint of the smoking period, which was followed by an increase from the midpoint to the end of the smoking period. An increase in deoxygenated hemoglobin was observed from the beginning of smoking to the first puff of cigarette smoke, which was followed by a reduction towards the end of the smoking period. Cigarette smoking has been observed to induce vasoconstriction of cerebral arteries, which may contribute to the initial reduction in oxyhemoglobin. The findings may explain the development of smoking-related diseases and long-term cognitive decline.

The Importance of Interactions in Reducing Social Stigma

Ani Artsvelyan, Megan Joyce & Alexandra Ramon
Mentors: Dana Garfin & Roxane Cohen Silver

This study examined social stigma towards four potentially stigmatizing conditions: Stigma serves as a social mark setting others apart in society. Certain stigmas such as physical disabilities are visible, whereas others remain undetected until personally disclosed. Previous research has indicated that people tend to stigmatize others with certain physical and mental illnesses or who have been convicted of a crime. However, few studies have explored these ideas in an interactional setting. One hundred and fifty-two college-age females were randomly assigned to interact with a confederate who disclosed a physical or mental illness or who were not stigmatized at all. The confederate was convicted of a crime, had a criminal conviction, or nothing (control condition). Self-report data on preference for social distance was collected both before and after meeting the confederate. Participants reported less preference for social distance from the confederate after the face-to-face interaction. The premeasures indicated a difference in preference for social distance between the five groups. In contrast, after the interaction, there were no differences between the five conditions in stated preference for social distance. These findings are consistent with previous literature suggesting that contact with people who have a stigmatizing condition reduces preference for social distance and may increase interpersonal and social acceptance.

Patient Monitoring System via Pulse Oximetry

Siavash Ahrar, Jonathan Orosco & Samy Zaynoun
Mentor: Zoran Nenadic

Oxygen saturation and accurate pulse measurements are vital signs used in emergency care. Pulse Oximetry (PUO) provides a noninvasive measurement of such vital signs. The principal behind PUO is spectral analysis. Blood oxygen levels can be determined by measuring the absorption spectra of hemoglobin. Since the two forms of hemoglobin, oxygenated (HbO2) and reduced hemoglobin (Hb), have significantly different spectra between the 600 nm to 1000 nm wavelengths, knowing the concentration of HbO2 to Hb allows for the determination of oxygen saturation (SaO2). Our group designed and assembled a PUO device that uses two LEDs, with wavelengths 660 nm and 940 nm, and a photosensor to measure the transmitted light through a finger. The design included the following blocks: first, an analog front-end performing LED driving, signal conditioning of the photodiode current using a transimpedance amplifier, and additional filtering using op-amps; second, a digital block consisting of a microcontroller to perform A/D conversion of the photodiode signal, data storage of calculations on a FPGA board, and a graphical LCD for displaying a photoplethysmograph with the corresponding SaO2 levels. We successfully demonstrated wireless data transfer from the finger probe to our data collection board. Our device is currently able to accurately measure and display the pulse rate on the LCD, while measurement of the oxygen saturation is proving to be a larger challenge to overcome.

Stand Assist Rehabilitation Apparatus

Justin Carter, Mehernosh Gundevia & Justin Lin
Mentor: David Reinkensmeyer

Spinal Cord Injury (SCI) is defined by permanent disability or loss of movement (paralysis) and sensation below the site of injury. Level of injury can range from complete tetraplegia to incomplete paraplegia. Cardiovascular and neurological control is severely disrupted during spinal cord injury limiting movement and sensation. It is well documented that the effect of exercise on cardiovascular function is beneficial. Stand Training is a novel technique that involves intense exercise of the affected limbs. Our project goal is to develop a rehabilitation device for stand training in SCI patients to be used either at home or at a training facility with minimal assistance from a therapist. This device is built in such a way that there are three main parts—the actuation for the affected limbs, the stability support skeleton and the circuit control system—which all work synchronously to simulate standing for SCI patients (paraplegics) who have lost function in their lower extremities.

Enhancing Recruitment among Diverse Populations: A Comparison of the Methods Used in Five Diverse Communities and their Outcomes

Michelle Choi, Geoffrey Ngo & Angela Patanawong
Mentors: Mary Coggins & Kimberley Lakes

Increasingly, there is an emphasis in the health sciences to include diverse populations in research. Historically, minorities have been underrepresented in health research, ultimately contributing to health disparities for these popu-
lations. The Orange County Vanguard Center for the National Children’s Study (NCS) developed tailored community outreach and engagement methods as part of its overall strategy to recruit a representative sample of Orange County families. From our experience in the NCS, we learned that neighborhood-based recruitment requires tailored approaches that vary widely across communities. We present neighborhood characteristics and demographics from five diverse neighborhoods in the following Orange County cities: Costa Mesa, Huntington Beach, Aliso Viejo, Fullerton, and Rancho Santa Margarita. We describe the community outreach and engagement methods tailored for each community and compare recruitment results in these communities. Across the five communities, the percentage of residents who completed the initial survey ranged from 76% to 97%. The percentage of women agreeing to complete a lengthier pregnancy survey ranged from 83% to 96%. Our results from questions assessing if and how residents had heard of the NCS prior to the survey indicated that tailored outreach methods were modestly effective in engaging diverse communities in the NCS. We discuss differences in completion rates and challenges encountered in those communities. Anticipating challenges and tailoring outreach methods using some of the strategies we describe may enable future researchers to increase diversity among their participants.

The Effect of Stigmatized Conditions on Social Anxiety Levels
Allie Lam, Victoria Piar & Sara Tousi
Mentors: Dana Garfin & Roxane Cohen Silver

Past research has shown that stigmatizing conditions are associated with anxiety. A large portion of those studies has focused on the anxiety level experienced by the stigmatized individual. However, this study used an interactional setting to focus on the anxiety level of non-stigmatized individuals when exposed to an individual with a perceived stigma. We recruited 152 female students from the University of California, Irvine and assessed implicit and explicit preference for interacting with individuals with potentially stigmatizing conditions. Participants were randomly assigned to interact with a confederate who was labeled with one of four potentially stigmatizing conditions (cancer, AIDS, bipolar disorder or a drunk driving conviction) or a control (no label). Participants were interviewed about their life experiences, listened to a tape recorded interview where the confederate described her condition, completed a series of questionnaires, and then participated in a video recorded interaction with the confederate. After the interaction, the participant completed an additional set of questionnaires. The pre- and post-measure questionnaires included a thought-listing procedure in which participants were instructed to write down any thoughts or feelings they had about the interview and interaction. Results of the study suggest that individuals expressed higher levels of anxiety when interacting with others with perceived stigmas. However, the levels of anxiety varied depending on the condition itself.

Conducting Research in Diverse Communities: Implications for Outreach and Recruitment
Kathleen Carter, Jocelyn Lo & Ragy Saad
Mentor: Kimberley Lakes

The Children’s Health Act of 2000 initiated the National Children’s Study (NCS), a longitudinal study that will recruit 100,000 children to study environmental and biological influences on child health and development. Orange County was selected as the location for one of seven original Vanguard Centers, where the protocol for the study would be piloted. For this research project, we studied the ethnic, socio-economic, geographic, political, and religious characteristics of particular segments of Irvine, Tustin, Anaheim, and Westminster that were selected randomly for inclusion in the NCS. Based on these characteristics, we developed individual community strategies that aimed to increase resident participation. Our first step in developing an outreach framework involved organizing comprehensive segment profiles for each community that outlined similarities and differences that could affect the effectiveness of various outreach strategies. We then implemented various outreach strategies in each segment prior to and during the study phase involving household and pregnancy surveys. We report subsequent participation rates for the household survey (ranging from 74% to 96%) and pregnancy screening (ranging from 74% to 91%) across segments. We identify challenges encountered in each segment and discuss methods developed to address those challenges. We also report the percentage of participants who had heard of the NCS through our outreach, and the method of outreach they reported as successfully reaching them. To successfully engage a wider range of the population, researchers need to tailor outreach and recruitment based on unique community characteristics.

A Comparison of Tailored Research Outreach and Recruitment Methods and Outcomes in Five Different Neighborhoods
Andrew Pham, Sonia Sapra & Megan Wang
Mentor: Kimberley Lakes

The National Children’s Study (NCS) will recruit thousands of children and follow them over a span of 21 years to better understand the impact of biological and environmental factors on child health and development. The Orange County Vanguard Center at UC Irvine is involved in the pilot phase of the NCS; one goal of this phase is to identify effective community outreach and engagement strategies to enhance recruitment and gain the trust of community members. A range of community outreach
strategies were developed to inform and gain the trust of culturally and socioeconomically diverse communities. We distributed recruitment materials to each home; attended community events in libraries, parks, and schools; and established Neighborhood Advisory Communities in each selected neighborhood. We compare and contrast the outreach methods used in five diverse neighborhoods within the following cities: Laguna Beach, Santa Ana, Garden Grove, and Yorba Linda. We compare participation rates in a household survey (ranging from 84% to 99%) and a pregnancy survey (ranging from 86% to 95%). We also report the percentage of participants in each neighborhood who had heard of the NCS prior to the surveys and the individual percentages for each outreach method participants indicated as their prior source of information about the study. Overall, direct and indirect methods of outreach were successful in different ways and different extents in each neighborhood. Our work in the past year demonstrates that with tailored methods of outreach, community-based studies can have high participation rates.

### Corrosion Properties of Nanostructured and Commercial Copper

Ignacio Lopez, John Shek & Eric Shum  
*Mentor:* Farghalli Mohamed

Understanding corrosion behavior is of significance to industry because its occurrence and associated damages are responsible for billions of dollars in losses in terms of maintenance, repair, and injury. The emergence of nanocrystalline materials has motivated research for the purpose of understanding the corrosion behavior of this new class of materials. In this investigation, the corrosion characteristics of electroplated nanocrystalline copper characteristics during and after continuous salt spray corrosion simulation were closely examined. The results were then compared with those of commercial grade copper, which underwent the same corrosion treatment procedure. It has been found that the electroplated nanocrystalline material is more resistant to salt spray corrosion than commercial grade copper.

### SensorChip

Jacqueline Li, Aileen Ramirez & Geetika Singh Potdar  
*Mentor:* Mark Bachman

The project focused on the creation of a sensing system designed to detect changing pressure and send this information wirelessly to a computer. The system made use of three major functional components, including a pressure sensor, a microcontroller, and a wireless transmission device. The computer is programmed to accept information through the wireless transmission device and manipulate it to play a game of Pong in real time. The entire sensing system was encapsulated within a wooden board, and two such boards were used for the project. The game worked when participants exerted different levels of pressure on the wooden boards and correspondingly observed different results on the computer. The project team was divided into three major subsystems, each subsystem dealing with a specific functional component. The sensor subsystem made use of a Flexiforce sensor to measure the change in pressure by changing their resistance and, correspondingly, changing the voltage across it. The microcontroller subsystem dealt with conversion of analog information from the sensor subsystem to digital information that could be understood by the computer. Xbee, a wireless transmission device, was used to transmit this digital information. The project significantly contributed to enhancing teamwork, project development, technical writing, and presentation skills of the team members in addition to improving their technical knowledge.

#### Platforms for Studying Surface Topological and Mechanical Strain Effects on Neurogenesis

Ouwen Liang, Derek Tam & Jonathan Yu  
*Mentor:* William Tang

The study of neurogenesis—how neurons differentiate from precursor stem cells—holds the keys to understanding the fundamental mechanisms of how unhealthy or damaged nerve could be therapeutically repaired. It has been shown that, in addition to biochemical factors, mechanical stimulation from the extracellular environment plays an important role in nerve growth. To further understand the mechanical cues that cause neurons to grow and differentiate, mouse neural stem cells (mNSC) were plated onto a geometrically patterned polydimethylsiloxane (PDMS) polymer to determine whether or not the stem cells’ growth or differentiation is favored on a certain area of the PDMS. The results did not show any significant clumping of neurons in any area, but that may be because of the high density plating. One aspect that will be changed in a following experiment will be a lower plating density so individual neurons stand out more. As a follow-up experiment, the mNSC will be plated on different geometrical shapes, such as triangles and circles. In addition to studying the effects of a static environment, an experiment was performed to study the influence from a quasi-dynamic mechanical stimulation. In this second study, a cell stretching and compression platform, made of PDMS bonded to glass, was designed and fabricated with the intention of determining what effects mechanical strain have on neuronal morphogenesis and differentiation. The platform contains a thin film of PDMS where neurons are cultured and placed under tensile or compressive forces, so their behavior can be studied optically. Observing how the cells behave in different topological and mechanical strain conditions will provide a better understanding of neural stem cell growth and differentiation.
Social Influences’ Mediating Effect on Psychopathy and Offending Behavior
Nathan Hadinata, Adam Malnove & Elizabeth Velaquez
Mentor: Elizabeth Cauffman

Psychopathy has been found to be a critical factor in understanding incarcerated juveniles’ involvement in delinquency. However, recent theory suggests that individuals with psychopathic traits are emotionally affected by ostracizing relationships, which may cause them to satisfy their unmet needs with aggression toward others. We investigated whether social influences could explain the predictive power of psychopathy over offending behavior (i.e. mediation). Our study consisted of 355 incarcerated male juveniles whose personal characteristics were assessed using the Youth Psychopathic Traits Inventory and their self-report of offending. Their social influences consisted of parents, peers, and very important non-parental adults. The strength of the mediation was determined by the amount of significance lost between psychopathy and offending when social influence variables were present. As anticipated, psychopathy was a strong predictor of offending frequency and offending variety. VIP antisocial influences fully mediated the relationship between psychopathy and offending frequency, while parental warmth and hostility, peer antisocial influence, and VIP antisocial behavior partially mediated this relation. These results suggest psychopathic traits alone may not fully explain incarcerated juveniles’ involvement in delinquent behavior. The interaction of these social contexts may, for instance, be the difference between getting in a fight and walking away from one.

The Use of Ocular Ultrasound in the Diagnosis of Increased Intracranial Pressure
Michael Gragnani, Hemi Jung & Shane Mesko
Mentor: John Christian Fox

The intention of this study was to test the ability and accuracy of ocular ultrasounds in measuring the optic nerve sheath diameter, and whether those measurements could be used to detect increased intracranial pressure proficiently. Previous studies indicated a strong correlation between an increase in diameter of the optic nerve sheath and the presence of increased intracranial pressure. Adult patients with invasive intracranial pressure monitors in the neurosurgical intensive care unit of a level-I trauma center were selected for additional ocular ultrasounds of each eye, from which the optic nerve sheath diameters were measured. Emergency physicians used a 10.5 MHz linear probe, 3mm behind the globe to obtain the diameter measurements. The mean binocular diameter was then compared to that of the intracranial pressure monitor, which measures the intracranial pressure within the skull. Using the set guidelines (15mm Hg normal pressure), the intracranial pressure monitors were used to confirm the presence of increased pressure and whether they correlated to the diameters measured. The linear regression analysis showed that there was no significant correlation between increased intracranial pressure and the optic nerve sheath diameter. The data indicated that the ultrasound showed poor sensitivity in measuring abnormal optic nerve sheath diameters in the setting of increased intracranial pressure. On the other hand, the data also indicated that the correlation between the optic nerve sheath and increased intracranial pressure is operator-dependent, and therefore an increase in exposure to ocular ultrasounds could lead to the improvement of the precision and accuracy in measuring the diameter.

The Effect of Demography, Body Content and Aging on Heart Function in Drosophila melanogaster
Jenny Chou, Alan Estero & Jacky Ip
Mentor: Michael Rose

The purpose of this study was to determine the effects of demography (generation cycle) and body content on the heart function of Drosophila melanogaster at different ages. It was hypothesized that if demography were the major factor in cardiac function and activity, then D. melanogaster selected for accelerated generation cycles would experience decreases at a faster rate. If body content was the major determinant, then flies with a higher fat content would experience decreases in function faster than those with normal body content. Three replicates of four experimental populations of D. melanogaster that are genetically differentiated and maintained in identical conditions were put through heart activity and electrical-induced pacing assays. The heart activity assays involved performing semi-intact heart dissections over a span of ten weeks of their adult life. The exposed D. melanogaster hearts were filmed and used to gather a number of quantitative measurements, such as heart rate analysis, cardiac irregularities like arrhythmia, and systolic and diastolic heart diameter. Electrical-induced pacing assays were conducted to measure immediate cardiac arrest rates and their subsequent recovery. The results from the first two replicates appear to demonstrate the greater effect of demography on cardiac function as the D. melanogaster age compared to body content. Results for the third replicate are still pending and are expected by late April. Future assays with other genetically differentiated D. melanogaster or ones placed in different environmental conditions may be performed to provide further insight into how factors such as demography can influence cardiac function with age.

UCI Satellite
Steven Chung, Allen Giragosian & Timothy Van Name
Mentors: Manuel Gamero-Castano & Benjamin Villac

The goal of the UCI Satellite (UCISAT) project is to design, build, and launch nano-satellites into Low Earth Or-
bit (LEO). UCI Satellite’s first project, UCISAT-1, is a 10cm x 10cm x 10cm cube satellite. The primary mission objective for UCISAT-1 is to capture images of the Earth and transmit them to the K6UCI ground station. The undergraduate team has spent the 2009-2010 school year assembling and testing the satellite for its orbital flight in December 2010. The UCISAT team has recently begun its second project, UCISAT-2, which will be a joint effort between the Civil and Environmental Engineering Department at UCI and the UCISAT student team. UCISAT-2 is currently in the research and development phase. The goal of the second satellite is to investigate water purification using high-energy solar radiation.

**Advanced Structural Design**

Eric Clough, Brandon Grant, Derek Gregoriev & Randall Schubert

*Mentors: Marc Madou & Lorenzo Valdevit*

The overarching goal of this research project was the development and characterization of a new category of composite materials and structures based on three-dimensional carbon architectures. The enabling technology is a novel manufacturing method based on the pyrolysis of prestructured polymeric precursors, which enables precise dimensional control on the resulting carbon structures, ranging from the micro to the macro scale. Notably, any shape that can be imparted to a polymeric precursor is amenable to carbonization. The open pores within the carbonized backbone are subsequently infiltrated with a polymer (e.g., an epoxy resin), resulting in a composite material with 3-D reinforcement architecture. We anticipated that these novel materials would exhibit a unique combination of advantages not present in any other state-of-the-art solution, namely: virtually unlimited flexibility on the carbon backbone architecture, with associated design flexibility; ability to fabricate structures of virtually any shape and size without the weak interlaminar regions always present in conventional composite laminates; and potential to functionally grade the carbon architecture to optimize the weight efficiency of the structure without introducing large localized stresses at regions of discontinuity. Within the limited scope of this program, we focused on three different reinforcement architectures, based on natural wood, stochastic foams and rapid prototyped periodic trusses. We will demonstrate the fabrication approaches that we have developed (including optimal pyrolysis schedules and infiltration processes), and present the resulting microstructures of these novel composite materials systems. We will illustrate the mechanical characterization tools that we have used, and qualitatively and quantitatively demonstrate the reinforcement mechanisms that contribute to the strength of these materials. We conclude that optimized composite systems with 3-D reinforcement architectures have enormous potential in high-end applications which require superior stiffness and strength at low weight, possibly under complex multi-dimensional loading scenarios.

**The Development and Analysis of Prokineticin 2 Antagonists**

Andrew Gould, Amy Ngo, Dewey Nguyen & Josephine Vu

*Mentor: Qun-Yong Zhou*

Prokinetics 2 (PK2) is one of the newly identified regulatory peptides. In the central nervous system, PK2 is involved in controlling the circadian rhythms via activation of a PK2 receptor. Dr. Zhou’s laboratory has designed a family of PK2 receptor antagonists. This project involved one part of the structure-activity relationship studies. By using a three-step reaction of amide bond formation, deprotection reaction, and reductive amination, Andrew and Dewey synthesized about two dozen compounds. The potency of the compounds in antagonizing PK2 signaling was measured *in vitro* Ca2+ mobilization assay by Amy using PK2 purified by Josephine. We found that halogenation in particular benzene rings greatly enhanced the potency of the compounds in antagonizing PK2 receptors.

**Evolution of Physiological Changes in Late Life and Aging as Observed in Drosophila melanogaster**

Keila Benjamin, Tra Duong, Maria Samson & Shane Seymour

*Mentor: Michael Rose*

Previous studies involving medflies, nematodes, yeasts, and humans have shown that mortality rates increase exponentially with age and eventually plateau in late life. The age at which mortality rates plateau is known as the breakday, and separates late life from aging. Previous studies have shown that aging and late life are different physiologically. This study tests whether physiological characteristics between aging and late life evolve according to the generation length and lifespan of a population. Two populations of *Drosophila melanogaster*, with varying demographic characteristics, were used to explore the differences between aging and late life. The populations were tested for four physiological characteristics: time in motion, negative geotaxis, starvation resistance, and desiccation resistance. Based on the demographic differences of the two populations and the data thus far, it can be predicted that physiological changes between aging and late life will occur earlier in the population with the accelerated life cycle compared to the longer lived population.

**The GRILL Interface**

Rowan Cannaday, Eric Middleton, Jessica Tang & Jonas Tsai

*Mentor: Mark Bachman*

The loss of fine motor skills has been a common occurrence in the elderly and recent war veterans. This loss of
dexterity can be caused by any number of reasons, such as genetic disorder, cerebral palsy, arthritis or spinal cord injuries. While there are many rehabilitation programs available for the rehabilitation of fine motor skills, these programs are expensive and their results lackluster. The GRILL interface is a platform that creates an immersive environment that is designed for, but not limited to the rehabilitation of fine motor skills. The GRILL provides a tangible method of interaction between the user and a computer, using a sensor array and optional peripherals. Focusing on retraining dexterity, software was created that combines audio and video interaction with the tangible interface. This provides the user with sensory feedback from the device that motivates the user to carry out the retraining program. Unlike products currently on the market, the GRILL allows the user to interact with an audience or other users. This creates richer dexterity training because the user is creating something dynamic, rather than manipulating objects on a peg board. The GRILL can be modified easily by replacing its sensor panel or loading software for other applications such as a tangible educational game for children. The capability of this platform is endless and provides an exciting future for collaboration with software and hardware developers.

**UCI Stirling Engine**
Megan Campbell, Justin Carter, Mehernosh Gundevia & Daniel Rodriguez
*Mentors: John LaRue & Farghalli Mohamed*

As global warming continues to threaten and damage ecosystems, innovative approaches must be taken to reduce the amount of emissions from power sources. The goal of this project is to develop an engine to run on a renewable energy source such as solar thermal. The simple Stirling Engine consists of two reciprocating pistons at a 90 degree phase angle. To power the Stirling engine, an external heat source on one piston is used, creating a temperature gradient through a heat exchanger called a regenerator that drives each cycle. The regenerator preserves the gradient between the two pistons by absorbing heat as the working fluid travels to the cold cylinder and returning the energy as the fluid flows back to the hot cylinder. Solar collectors harness solar thermal energy by employing reflective mirror arrays to collect sunlight over a large area and focus it over a smaller one. Because solar collectors produce zero emissions, it is an ideal source of renewable energy for Stirling engines in areas with climates conducive to solar collection.

**UCI Steel Bridge**
Wendy Bang, Victoria Espinoza, Vilon Truong & Jun Yeung
*Mentor: Ayman Mosallam*

Each year the American Institute of Steel Construction (AISC) hosts the AISC Student Steel Bridge Competition, a national competition in which participating American Society of Civil Engineers (ASCE) student chapters participate. The AISC presents a problem statement for the construction of a structural steel bridge and students are given the opportunity to bid on a project by designing and fabricating a scale model of their design. Bridges are scored on the estimated costs of a full scale serviceable bridge. The final cost of a full scale bridge is determined by how well a bridge meets design constraints and its performance in terms of weight, construction speed and deflection. A main goal of the team was to lower construction times for its bridge without sacrificing the stiffness of a bridge composed of many pieces. A truss bridge was chosen as the main structural feature, and its connections became a main focus in design because construction speed is heavily reliant on how quickly the separate members can be constructed into a standing structure. Although we were able to build the bridge with existing equipment in the structural labs, fabrication ran into many challenges that had to be solved while satisfying AISC rules and constraints. The loaded bridge held the required 2,500 lb. load in competition and deflected according to values calculated during design while achieving lowered construction times due to the improved connection pieces that were designed.

**Energy Conservation in the Home: Trends and Misconceptions**
Jessie Baker, Samantha Bondi, Katrin Escobar, Kristen Figueira & Isabel Wang
*Mentors: David Kirkby & Daniel Stokols*

Scientific evidence overwhelmingly points to carbon emissions caused by residential energy use as a leading cause of climate change. As a result, there is a need for greater understanding of how residents use energy and whether they are actively attempting to conserve. According to Black, Stern, and Elworth, there are two main types of energy conserving behaviors: curtailment and efficiency. They defined the former as an act performed routinely to reduce the consumption of energy, such as turning off lights or appliances. The latter was characterized as a usually one-time-only act performed for the same reason, such as purchasing or installing newer appliances that use less energy than their older counterparts. While public service announcements and magazine articles have disseminated information to the general public about ways to reduce energy use, they have often only encouraged curtailment behaviors, underestimating the fact that efficiency behaviors typically yield far greater reductions in energy con-
Benefits of implementing RIM included increased focus, phonemic awareness, memory, and oral literacy skills. Although the original intent was to enhance literacy development, students progressed in socio-emotional development as well. Whole class music activities helped to build confidence, verbal expressiveness, ability to focus attention, engagement with visual aids, and motor skills. Benefits of implementing RIM included increasing/improving state and in-class test scores, integration of the arts with the academic curriculum, and flexibility of curriculum implementation. RIM may be applied easily to any educational environment. Implementation of RIM involved teaching in the classroom for 30-45 minutes once a week, debriefing meetings of UCI teaching artists and observers, and coding and analysis of data. Preliminary results showed that both classes where RIM was implemented were developing socio-emotionally, academically, and cognitively.

### Autonomous Control System in Underwater Environments

**Mentor:** James Bobrow

The Autonomous Underwater Vehicle competition challenges students to design a robust autonomous underwater vehicle to perform several missions, such as going through a gate, hitting a buoy, shooting a torpedo, and surfacing within an octagon. The project requires high-level cooperation among computer scientists, electrical and mechanical engineers. It also creates room for the engineers to experiment with a large playing field of creativity and innovation. The Autonomous Underwater Vehicle research team at UC Irvine has been recognized at various technical events for its reputation to innovate and advance rapidly within a short time span. In this project, engineering students showcase their talents in design, manufacturing, and management. At the end of the first quarter, we built the first prototype and tested in pool the mechanical, electrical, and computer systems. At the end of the second quarter, we finished the mechanical design of the second frame, implemented the vision algorithm in C programming language, and successfully interfaced compass and pressure sensors for navigation purposes. Our computer program is able to identify a gate, recognize a buoy, and control the thrusters for appropriate movement. This quarter, our goal is to fully integrate the electronic sensors, computer, with the mechanical systems. Thus far, the project has provided students with hands-on experience on water sealing techniques, power and propulsion, image-processing algorithms, and control engineering.

### UCI Rocket Project

**Mentor:** Kenneth Mease

The primary objectives of the UCI Rocket Project are to design, construct, launch and recover a rocket carrying a 10 pound payload that is capable of reaching a minimum height of 10,000 feet using a Loki Research N3800 solid propellant motor as a baseline. An experimental liquid bi-propellant motor will also be designed, constructed and ground tested to meet the thrust requirements of the rocket for possible implementation in flight. The Experimental Propulsion System (EPS) subteam has conducted combustion analysis using FORTRAN to design a mono-
coque liquid bipropellant motor using the solid propellant motor as a benchmark. The Airframe System (AS) subteam has used CAD modeling and finite element analysis (FEA) software to design the external and internal rocket structure. The Recovery System (RS) has analyzed configurations for the reusable parachute system to allow a safe descent rate for recovery. The Flight Dynamics and Data Acquisition (FLDAS) subteam has performed flight simulation to evaluate aerodynamic efficiency and thrust capabilities as well as set up avionics for data acquisition. Design tradeoffs were mitigated in weekly meetings so finalized rocket components could be approved by all affiliated subteams. Flight data collect by onboard avionics will be analyzed to reconstruct the trajectory of the rocket and evaluate aerodynamic forces for design assessment. A test launch and ground test has been schedule for May 1, 2010 at the Friends of Amateur Rocketry facility in the Mojave Desert.

**Design/Build/Fly**
Calvin Nguyen, Kamil Samaan, Sothea Sok, Dennis Tam, Giuseppe Venneri & Chen Weng
*Mentor:* Robert Liebeck

The Design/Build/Fly Competition is an AIAA sponsored annual and international event that allows undergraduate college students to gain hands-on experience. The goal is to design and fabricate a remote-controlled model aircraft to complete assigned missions and fly on a specified flight course while carrying assigned payloads. The payloads for this year are softballs and “bats,” which are actually 30-inch long 2-inch diameter PVC pipes. It was UCI’s sixth year in the competition, and the team learned new ways of manufacturing the aircraft using composite materials. The wings, tails, and landing gear can be fabricated much lighter than with the previous method and still withstand the necessary loads. The data from the test flight can be obtained from a programmable speed controller, which logs current draw, voltage, temperature, rpm, and throttle. The team placed 19th out of 69 teams overall.

**Ensemble Thinking: The Creation of DTM2 Improvisation Ensemble**
Lindsay Berliner, Rachel Berman, Marissa Brown, Natalie Johnson, Katrina Muffley, Jason Pouillard & Alysha Shroff
*Mentor:* Lisa Naugle

In the summer of 2009, under the direction of Professor Lisa Naugle, twelve students from the Claire Trevor School of the Arts participated in the International Festival of Composers in Andalucía, Spain. As Resident Choreographer for the festival, Professor Naugle established a research project for students to create dance events in collaboration with professional composers who specialize in the art of improvisation. The research was grounded in the formation of DTM2 Improvisation Ensemble and furthered the theory and practice of ensemble thinking in performance. Ensemble thinking is the collective understanding of sequence organization while creating individual/original movement in performance. During the two-week period, DTM2 created more than twelve new works for the stage. We premiered at the Jardín Botanico Fina de la Concepcion as part of the World Congress on Research in Dance, sponsored by the United Nations Educational, Scientific and Cultural Organization. We also premiered at the Casa de la Cultura in Frigiliana and the Conservatorio Superior de Musica in Seville. Our performances ranged from group choreography set to music by internationally recognized composer Jesus Villa-Rojo, to solo dance with solo musician on trombone, as well as “spontaneous events” in the streets of Malaga. We will perform three structured improvisations, deliberately leaving some sections open while other sections are predetermined. This international artistic collaboration allowed us to experience the depth of improvisation and value of ensemble thinking as a necessary aspect of performance. The works performed will be *You And Me*, *Thermodynamics* and *Lament*. In addition, we will give a brief oral presentation with still video images.

**Wireless Magnetic Stripe Scanner**
Ahmad Abiri, Wesley Cheng, Franklin Jeng, Justin William Jones, Derrick Lo, Don Nguyen & George Yameen
*Mentor:* Pai Chou

The ability to electronically document, store, and aggregate the number of people attending a school event has not been as prevalent as one would expect. It is extremely hard and expensive to buy commercial systems that do not perform every function that suits an academic setting. A specifically built wireless scanner would not only be more economical but more beneficial to the user. It would be able to accept a variety of attachment scanners, allowing it to be more versatile, and include an LCD and keypad for easier user interfacing. The unit would also be able to take advantage of a USB flash drive as local storage. Universities all across the nation still rely on paper and pen sign-in sheets to keep track of students’ attendance in lectures and discussions. With the help of our Synchronous Wireless Scanners, taking attendance in class will be simple, and most importantly, in a digital format that is highly portable and manipulatable. Once attendance is taken, our Application Server will have the ability to automatically update class attendance lists and email the Professor the data. The scanners will be portable hand-held devices, making them easier to set up anywhere that wireless Internet is available. Attendance will be easily tracked anywhere large crowds are present—sports events, concerts, and even dining halls will be simple to monitor. In addition, the design will allow...
sensitivity. If left untreated, the eye will develop chronic infections, corneal regenerative properties, and decreased corneal sensitivity; deterioration of the cornea, corneal ulcers, impaired wound healing compared to the right eye (control). This is consistent with the symptoms of NK, demonstrating that our rat model can be used for future studies on treatments for NK.

**What are the Differences Between an Employee Health Promotion Program that Rewards Employees Based on Attendance and a Program that Rewards Employees Based on Received Knowledge?**

Farzad Alikozai, Kristall Lee, Lesley Nguyen, Randy Popieliarp, Gunbir Rana, Rose Raymond & Hamza Siddiqui  
*Mentor: Zuzana Bic*

Companies are increasingly turning to employee health promotion programs as a way of reducing health insurance costs. Previous studies have shown that when incentives and/or some sort of competition are introduced, employee health promotion programs become more effective. In this study we are comparing two programs (A and B) that only differ in the type of competition used. Both programs are five weeks in length and consist of weekly one-hour health education classes, followed by a quiz on the information covered in the class. In program A participants will be competing for prizes based on their attendance. In program B participants will be competing on the score received on the quizzes. In addition changes in lifestyle habits and health awareness on topics covered in the program will also be measured. This study is still ongoing.

**Development of Neurotrophic Keratitis in a Rat Model**

Zixin Deng, Chris Ju, Mark Lii, Michael Lim, Amy Ngu, Timothy Nguyen, Long Tran, Stephanie Tran & Krystal Vanichsarn  
*Mentor: Edward Wong*

Neurotrophic Keratopathy (NK) is a corneal degenerative disease with symptoms that consist of, but are not limited to; deterioration of the cornea, corneal ulcers, impaired corneal regenerative properties, and decreased corneal sensitivity. If left untreated, the eye will develop chronic infections that may lead to functional blindness. The purpose of this study is to develop an animal model in rats that can be used as a reliable source for information on NK. To produce an accurate model, the rats undergo surgery in which they lose their blink reflexes by lesioning the left trigeminal nerve using a stereotaxic unit, developing symptoms in the left eye that would mimic those of NK. After successful surgery, the rats undergo femtosecond laser surgery, which is a technique that uses pulses of light to damage the cornea, followed by Optical Coherence Tomography (OCT) imaging, which is a method that produces cross-sectional images of living tissue at high resolution. Our results have shown that the left eye will exhibit a decreased rate of wound healing compared to the right eye (control). This is consistent with the symptoms of NK, demonstrating that

**Wind Energy for Regions with Low-Velocity Winds**

Gary Le, Khoi Le, Kersey Manliclic, Ka Ng, Sarah Oliver, Phong Phan, Duy Nam Ton, Ryan Wong, Matthew Woo & Zhiou Yang  
*Mentor: Yun Wang*

A wind turbine captures the energy of the wind to spin an electric generator in order to produce electricity. However, traditional horizontal-axis wind turbines can only function in areas with high-velocity winds. Fortunately, for areas with low wind speeds, using vertical-axis wind turbines (VAWT) is an alternate option, since those do not require strong winds. Our goal was to investigate in the potential use of wind energy in areas with low-velocity winds. First, we designed a 2-meters-tall VAWT with emphasis on its wind capturing ability; this process also took budget constraints and material considerations into account. Next, we machined and fabricated every necessary components of the turbine, and assembled them together. Finally, we tested our finished product under wind speeds of approximately 10 mph to determine how much voltage and power our turbine can generate. Our wind turbine was able to produce 6–12 volts with a power output ranging from 10 to 40 watts. These results suggest that our wind turbine can produce enough electricity to be used for small applications.
Can Public Health Education, with Focuses on Physical Activity, Nutrition, Stress Management and Coping with Financial Burden, Improve the Quality of Life among Adolescents and Young Adult Cancer Populations?
Erica Fernandez, Toni Geronimo, Roukaya Hassanein, Omeid Heidari, Mark Ilarina, Tina Jagtiani, Nima Khoobiyary, Michael Nguyen, Phuong Nguyen, Nabeeha Siddiqui & Shahrzad Yavari
Mentor: Zuzana Bic

This study seeks to increase the levels of public health literacy and awareness about cancer/cancer-related issues that will help individuals ages 19-29 cope better with their diagnosis, treatment, and remission—allowing them to integrate effectively back into society. The main topics included: nutritional education, stress management, physical activity, educational integration, and additional resources to improve quality of life. After considering various hospital sites within Orange County, California, the Cancer Center at Hoag Memorial Hospital Presbyterian in Newport Beach, California, has been determined to be the study location to create and/or improve the existing level of support groups offered for these individuals diagnosed with cancer. Also, this study seeks to use the acquired results to develop an essential pilot public health cancer resource website. The researchers have recorded a total of five, 1-hour presentations which correspond to the topics mentioned above, to be uploaded to a future section of Hoag Hospital Cancer Center’s official website. The pilot study, which will incorporate an online evaluation method that will consist of a pre- and post-survey, will determine whether involvement in this study increased the knowledge and adherence among participants. This study is anticipated to continue into Fall, 2010, and seeks in the future to show how information found on the website can be used by cancer patients to instill lifestyle modifications for improving quality of life from the comfort of patients’ own homes.

UC Irvine-UC Santa Barbara Dance Exchange 2010
Jeanette Abell, Sarah Alaways, Rachel Berman, Julian DeGuzman, Kayla Garton, Alyssa Junious, Justin Keats, Madison Krekel, Phillip Lu, Crystal Norbut, Amy Quanbeck, Kari Richardson, Shane Scopatz, Kellie St. Pierre, Robyn Wallace, Ching Ching Wong & Andrea Yorita
Mentor: Donald McKayle

The goal of the Dance Exchange is to foster and promote creative, artistic and academic dialogue between emerging and imminent university dancers. In its fifth year, the Dance Exchange will reunite the UCI Etude Ensemble with the UCSB Dance Company for another exciting collaboration in dance. The two-day format (Spring 2010) of the Dance Exchange will allow both students and educators a larger perspective on the validity of dance as a worthwhile academic pursuit in a university setting.