proportional to the number of particles striking the wire, which is proportional to the pressure. This study is a numerical analysis of a Pirani style gauge adapted to MEMS technology. The goal of this study is to determine the geometric parameters that would extend the operating range of highly sensitive Pirani style MEMS devices.

The Distribution of Apolipoprotein E (APOE) Allele Frequency and the Contribution of APOE-4 to the Prevalence of Dementia in the Oldest old: The 90+ Study
Rian Zuniga
Mentor: Claudia Kawas

Alzheimer's disease (AD) is the most common form of dementia. Currently, 4 million Americans have AD, and the number of cases is expected to quadruple by the middle of this century. The Apolipoprotein E (APOE) gene has three major alleles, E2, E3, and E4, of which E4 has been found to increase the risk of AD. However, most studies have analyzed subjects in the 6th and 7th decade of life. This study aims to 1) report the allele frequencies of the APOE gene in the oldest old (90 years of age and older) and 2) analyze if APOE-4 increases the prevalence of dementia in the oldest old. The study includes 252 men and women from the 90+ Study, a population-based sample in a Southern California retirement community that is primarily Caucasian. Dementia status was determined from a neurological examination using the Diagnostic and Statistical Manual of Mental Disorders IV (DSM IV) criteria. The allele frequencies were 8.8% for E2, 81.2% for E3, and 10.5% for E4. When allele frequencies are compared to younger Caucasian populations, the E4 frequency is lower in our study (10.5% vs. 15.8%) and the E3 allele is higher (81.2% vs. 76.5%). The proportion of demented people without an E4 allele (22%) and with an E4 allele (26.9%) was not significantly different (P=.45). Our study provides evidence that there is a difference in allele frequencies between younger and older Caucasian populations and that there is no association between E4 and the prevalence of dementia in the oldest old.

Group Projects

The Effects of Color, Negation, Inversion, Shape from Motion, and Dynamically-Changing Facial Expressions on the FFA as Determined by fMRI
Maia Cook & Navreet Raju
Mentors: Gregory Hickok & Donald Hoffman

Perception of human faces activates a specialized area within the brain known as the fusiform face area (FFA). We aim to examine the contributions of various physical attributes to FFA activation. Specifically, for static facial images, we will test the effects of color, inversion, negation, and internal (eyes, nose and mouth) and external (edge of face with hair) facial features on FFA activation. Also, the effects of rigid motion and dynamic emotional expressions on FFA activation will be investigated. Observers will passively view these face images, and we will use functional magnetic resonance imaging (fMRI) to measure and contrast activation of the FFA and other regions of interest across conditions. We anticipate that motion, color and dynamic facial expressions will enhance the FFA signal due to the natural and familiar context of these facial images. Additional brain regions sensitive to color and motion should also be activated. Prior studies suggest that inversion of faces does decrease FFA activation as compared to upright faces (Leube et al., 2003). Although negation maintains the characteristics of a face, the shading and colors of the image are unfamiliar and should slightly decrease the FFA activation. By presenting internal and external facial features, we are looking to determine what precise aspects allow the FFA to define an image as a “face”. We predict that FFA activation will be similar for internal features and for whole faces, and that the external features may possibly activate the FFA as well (Cox, Meyers, & Sinha, 2004).

Latinos in Higher Education: What are They Doing to Navigate Their Challenges?
Armando Cervantes & Humberto Hernandez
Mentor: Jeanett Castellanos

Latinos account for approximately 10% of the college student population. While this percentage has substantially grown over the past two decades, Latinos' representation is still dismal when compared to White undergraduates represented at 66.6% (NCES, 2002). With the limited representation, coupled with limited Latino faculty and staff, research suggests that Latino students have unique challenges in their quest to retain themselves in higher education. Specifically, marginalization, isolation, acculturative
distress, and a hostile campus climate are a few of the identified challenges that hinder retention or magnify attrition. Further impacting this phenomenon, while Latinos seem to be graduating at a higher rate than their Latina counterparts, they have reported greater stresses in college influencing their experiences and ultimately their graduation. The purpose of this study was to examine the means that Latino males implement to navigate the education system. Specifically, through a qualitative study, five main domains were examined: (1) perception of campus environment, (2) resulting student feelings, (3) challenges and barriers encountered in educational experiences, (4) self-recognized activities needed for self-retention, and (5) active educational and cultural coping strategies. A total of 19 participants were solicited from Latina/o-based classes, student organizations, and through campus postings. Four focus groups were conducted at the multicultural student center and data showed that active participation in organizations, family support, and a need to represent for their community helped Latino males persist despite an unwelcoming campus climate. Implications for research and practice will be addressed for the retention of Latino students and the enhancement of their college experiences.

Attitudes Toward Seeking Professional Psychological Help in Vietnamese Americans
Kevin Kaechoinda & Jennifer Nguyen
Mentor: Jeanett Castellanos

Previous literature on Asian Americans focused primarily on Asian Americans as a homogeneous group, which diminished the inter-group differences of Asian Americans. Therefore, this survey research study focused solely on Vietnamese American college students through an evaluation of the model minority construct, perceptions of the university environment, cultural congruity, and acculturation on attitudes toward seeking professional psychological help. It was expected that the predictor variables would be reliably correlated with the criterion variable. More positive perceptions of the university environment and greater cultural congruity would be associated with more positive help-seeking attitudes. A specific direction concerning perceptions of the model minority and attitudes toward counseling was not predicted, as the investigation was exploratory in nature. Furthermore, a direct relationship between acculturation and help-seeking attitudes was posited. It was hypothesized that acculturation level would be most predictive of attitudes toward seeking professional psychological help. Females were expected to have more positive help-seeking attitudes than males, and generation level was expected to positively correlate with attitudes toward counseling. Results and conclusions were discussed in the context of Vietnamese Americans utilization of mental health services.

Documentary History of Communism in Cambodia
David Donald & Jill Olson
Mentor: Gary Richardson

This project will consist of a video documentary depicting the impact of the Khmer Rouge takeover of Cambodia during the 1970s. Of particular interest will be the way in which the Communists' attempt to reform society--by emptying the cities and reeducating the populace in agrarian labor-education camps--influenced the attitudes and lives of those who lived through the experience. The project includes an emphasis on the economic, social, and personal changes experienced by those who survived the momentous changes in Cambodian society. We will take footage from feature films, documentary films, films stored at the UCLA film archive, and still photographs taken from a number of collections including the files of the Huntington Library and the National Archives of the United States.

Evaluating the Effectiveness of Addiction Treatment Coupled with Higher Education
Paul Alexander & Brendan Bickley
Mentor: George Tita

The objective of our research is to determine whether participation in an educational component increases the chances of post-release success for individuals participating in a drug and alcohol treatment program. Specifically, we examine the T.E.A.C.H. Program, a voluntary program that places clients in addiction counselor training classes at a local community college. Using a number of outcome measures to determine success, clients were assessed at the time of admittance, discharge, and six months after their discharge dates. Overall success was based on continued abstinence from drugs and/or alcohol, involvement in 12-step recovery meetings, employment, and enrollment in college. We anticipate that clients who participated in the T.E.A.C.H. Program will show a higher level of success on a number of outcome measures than those clients who did not participate in the T.E.A.C.H. Program. This work is important for aiding in the development of effective addiction treatment models.
Latina Undergraduates’ Attitudes Towards Counseling
Rosalinda Mendoza & Yesenia Ortiz
Mentor: Jeanett Castellanos

There are a growing number of Latina/o college students at four-year universities. While the representation of Latina/os has substantially grown, literature suggests Latinas experience the campus climate as hostile and unwelcoming. Further impacting this phenomenon, these students undervalue the university counseling centers and have negative perceptions towards seeking therapy. Previous literature has shed light on attitudes but limited research has helped explain Latinas’ attitudes towards counseling and other social support systems. For example, what are the causes of these negative stereotypes and what other social support systems do they have in place for retention? The study seeks to better understand Latinas’ attitudes toward counseling. Specifically, this study will include five focus groups, targeting a total of 40 Latina undergraduates at a research-type-I institution. Findings will serve as a qualitative introduction to Latina undergraduates’ attitudes towards counseling and their other means of social support. Recommendations will aid in retention efforts, as tailored counseling services could help students cope with psychological issues interfering with their educational progress.

Investigations of the Feasibility of Using Wastewater for Bacterial Production of Hydrogen for Use in Fuel Cells
Rayhaneh Mofidi & Giao Vuong
Mentors: Peggy Arps & Betty Olson

This research examined the feasibility of producing hydrogen gas during anaerobic digestion of sewage sludge. Today digestion of anaerobic sludge produces methane. The ability to switch to hydrogen as a fuel source will improve air quality, end a type of greenhouse gas emission, produce three times the amount of energy, and provide a sustainable energy source. To assess the ability of microorganisms in sludge to produce hydrogen, we selected the hydrogenase pathway I-IV, because this system is contained in E. coli and other coliforms in wastewaters, and because the genetics of this pathway is well documented. To accomplish the research anaerobic sludge samples were collected during the first three weeks of digestion from the Chiquita Wastewater Treatment Plant, Santa Margarita Water District, homogenized and four treatments applied. Then the sludge was distributed into vials flushed with nitrogen and sealed. Then at 0, 22 and 44 hr, the volume of hydrogen, methane, and carbon dioxide gases were measured and the copy number of hyfG gene which encodes for the enzyme that releases H2. The cumulative amount of hydrogen produced was 272 and 247 pM/gene copy hyfG for the samples blended for 1 min and 4 min, respectively, while the cumulative amount of hydrogen produced was 115 and 9.7 pM/gene copy hyfG for the heat-treated samples blended for 1 min and 4 min, respectively. The data show 1 min blended cultures produced more hydrogen gas/hyfG genes than those blended for 4 min, while heating markedly reduced the production of hydrogen gas under both blending conditions.

Design and Flight of a Morphing Wing R/C Airplane
Matthew Garcia & Philip Garcia
Mentor: Kenneth Mease

The morphing wing concept is a derivative of the variable sweep wing concept. During the end of World War II, the Messerschmitt Aircraft Company created the first plane with a variable sweep wing, the P.1101, a fighter with manually maneuverable wings. Although the P.1101 never flew, it did inspire the development of many successful variable sweep airplanes, both American and European. The advantage of a variable sweep wing is a reduction in minimum speed while maintaining a high maximum speed, allowing the airplane to perform a wide range of tasks. For example, the F-14 has a maximum speed of 1.88 times the speed of sound and can still fly slow enough to land on an aircraft carrier. The purpose of morphing a wing is to optimize aerodynamic properties to a greater extent than can be done through simply adjusting a wing’s sweep angle, thus enabling an even broader flight envelope. Specifically, a morphing wing demonstrates radical changes not only in sweep, but also in planform area and aspect ratio. This project accomplishes the design, construction and flight of an original and unique morphing wing airplane. Numerous mechanical and aeronautical challenges were overcome in order to complete this airplane. Through more flight-testing and design cycles, the capability of a morphing wing airplane will be realized.

Energetics of Locomotion in the American Alligator (Alligator mississippiensis): A Comparison of Swimming and Running in a Semi-Aquatic Reptile
Nick Comado & Brian Sedrak
Mentors: James Hicks & Suzanne Munns

Semi-aquatic reptiles face unique challenges in terms of their locomotion, functioning in both aquatic and terrestrial environments without specializing in either form of locomotion. Few studies on semi-aquatic reptiles have investigated the energetic costs of both
terrestrial and aquatic locomotion. In this experiment we investigate the energetic cost of swimming compared to running in the American alligators, *Alligator mississippiensis*. We hypothesize that the minute ventilation and oxygen consumption will be higher during running than swimming at equivalent speeds. Alligators were swum in a flume and run on a treadmill at three different speeds (0.75, 1.0 and 1.5 km/hr). Minute ventilation was measured using pneumotachography and oxygen consumption was determined using open flow respirometry. All experiments were performed at the alligators preferred body temperature of 30 °C after a minimum fast of five days. The duration of training to the experimental regime prior to experiments and the alligator's diet were held constant throughout the experiment. Minute ventilation and oxygen consumption increased in response to exercise during both swimming and running. However, higher oxygen consumptions were measured for alligators running relative to swimming at the same speed. The higher oxygen consumptions measured during running suggest that terrestrial locomotion is energetically more expensive than aquatic locomotion in semi-aquatic alligators.

Unlocking the Structure of Acyl-CoA Carboxylase (ACCase)
Deborah Mitchell & Huy Pham
Mentor: Sheryl Tsai

ACCases are a class of enzymes that carboxylate various acyl-CoA molecules, such as acetyl CoA to Malonyl CoA. The products of ACCase are then used as extender units for more complex molecules, such as fatty acids and polyketides. Thus, ACCases play a key role in controlling fatty acid and polyketide biosynthesis. ACCase structures will be vital for further development of cancer and obesity therapeutics, as well as expanding the biosynthesis of novel polyketide pharmaceuticals. We have focused on solving the crystal structures of ACCases and their mutants with substrate acyl-CoAs in order to understand the substrate specificity. We are also looking at the possibility of fatty acids as potential inhibitors to ACCase. We obtained the crystal structures by purifying the enzymes with affinity columns, crystallizing the enzymes with vapor diffusion methods, diffracting the crystals with synchrotron X-ray light-source, and analyzing the data with the aid of computer programs. Thus far, we have crystallized two different ACCase subunits, Accβ and Pccβ. We then determined the crystal structures of both the wild type and mutant of Accβ and Pccβ with various substrates and are in the process of obtaining more structures. These structures suggest that the substrates and cofactors bind in a manner other than previously proposed, in an L-shaped configuration. Our results will allow structure-based design drugs to aid in cancer and obesity therapy; structure-based mutants will also generate novel extender units for the biosynthesis of novel polyketide pharmaceuticals.

Evolution of the Long-Wavelength Opsin in Nymphalidae Butterflies
Lisa Inouye & Lawrence Lee
Mentor: Adriana Briscoe

Rhodopsin is a G-protein coupled receptor in photoreceptor cells that is light sensitive. In butterflies, it is composed of an opsin protein covalently attached to the chromophore, 11-cis-3-hydroxysterinal. The chromophore alone absorbs light in the ultraviolet regions of the color spectrum; however, certain amino acids in the chromophore binding pocket of the opsin protein can increase the peak absorbance (λmax) of the visual pigment to the longer wavelength region. Furthermore, previous studies in butterflies have shown that amino acid changes in the opsin protein have led to red-shifted sensitivities (Briscoe 2001, 2002). We wanted to find out the amino acid composition of the long-wavelength opsins in butterfly species with independently evolved red-shifted pigments to determine what evolutionary events have taken place that may be responsible for the physiological shift in sensitivity. We chose three species with red-shifted sensitivities, Danaus plexippus, Anartia jatrophae, and Cethosia pegala and two species with the ancestral, green-sensitivity, Inachis io and Philanthia dideo. For each of the species, we performed polymerase chain reactions using two or more sets of primers and cloned the PCR products. After extracting the plasmids from selected clones with the DNA insert, we sequenced the plasmid DNAs. We obtained long-wavelength opsin gene sequences for all three species. These data were compared with previously published green- and red-sensitive pigments, and examined for amino acid substitutions that are correlated with known spectral tuning sites in vertebrates and insects.

Tijuana Ceramic Lead Pottery
Teresa Amescua & Chris O'Connor
Mentor: Jonathon Ericson

Our research offers an answer to the paradox on why only 11% of the 33% of 1719 Tijuana children who were exposed to lead glazed pottery, had high blood levels of lead. This research has a direct bearing on the understanding of lead exposure of Latino children in California, Mexico and Latin America where traditional pottery is used. Exposure to lead by lead-glazed pottery
threatens many of these families because they are readily available and have been used in their families for generations. We have conducted leach experiments on exchanged pots from subjects in Tijuana to correlate their blood lead levels with the leachable lead from their pots. We expected to see a significant correlation between use and blood lead levels, but since exposure to lead is multifactorial our results did not show a strong correlation. We analyzed the differences in lead concentrations on 55 different used lead-glazed pots and then correlated blood lead and leachable lead levels from the subjects' pottery. The standard method that we used to get a precise measurement was extracting the lead with 4% Acetic Acid from the glazed ceramic surfaces for 24 hr between 20 and 24 °C. The concentration of lead in the solution was determined with a graphite furnace. Our findings will provide a better understanding of the paradox on why only 11% of the 33% of children exposed to these pots had high blood levels of lead.

The Heterogeneity Theory of Late Life in Drosophila melanogaster
Yasmine Abdel-Aal, Jonathan Shieh & Christine Suen

Previous studies have found that fecundity, like mortality, plateaus at late ages in several populations of Drosophila melanogaster and evolves according to the evolutionary theory of late life based on the declining force of natural selection. Although evolutionary theory explains the decline and plateau in fecundity, it is plausible that heterogeneity in individual female fecundity is causing the late life plateaus. That is, some females may be more fecund than others earlier in life, but die earlier, leaving only the less fecund females alive at late ages, contributing to the low fecundity pattern at late ages. Therefore, it is important for us to test this non-evolutionary theory to determine whether heterogeneity in fecundity contributes to the plateauing of fecundity at late ages. The goal of this project was to test the heterogeneity theory of late life by measuring individual female fecundity and death. Fecundity, rather than mortality, can be used to test the general heterogeneity theory of late life because fecundity shows the same plateauing pattern at late ages as mortality rates. We tested whether heterogeneity in fecundity causes late-life plateaus by comparing the fecundity of females who lived past the onset of the plateau with those that did not.

Change in ALP-induced Body Column Head Inhibitor Capacity With Time
Kausar Hamiduzzaman & Ayesha Mir

Mentor: Hans Boke

The heads of hydras release head inhibition signals down to the foot region so that if the head and foot regions were cut off, theoretically the head would not regenerate from the foot section due to these signals. It would instead regenerate from the original region. Hydras treated with ALP tend to reverse this head inhibition gradient because the body column develops a strong ability to inhibit head formation, as does a normal head due to the ALP. This experiment involved treating a number of hydras with ALP solution and grafting their heads onto host hydras that were cut beyond the “4 region”. A treatment schedule was devised to observe the change in inhibitor capacity with the increase of time. The grafts were carried out subsequent every 2 days. Due to the fact that secondary heads form about 8-10 days after end of treatment in the body column, and Wnt expression (a gene that stimulate head formation) has vanished by day 6, we would expect the head inhibition capacity in the body column to drop with time after the end of ALP treatment. This was found to be true according to data collected since the majority of treated hydras showed this phenomenon.

Density Functional Theory (DFT) Study of 1-Methylstannacyclohexane: Conformational Free Energies, Geometrical Parameters, and Relative Energies
David Hoang & Khue Trinh

Mentor: Fillmore Freeman

Density functional theory (BLYP, B3LYP, B3P86, B3PW91, BHandHLYP) with the SDD basis set and intrinsic reaction path (IRC) calculations have been used to study the conformational free energies (∆G), conformational interconversions, geometrical parameters, and relative energies of the chair, 1,4-twist, 2,5-twist, half-chair, and sofa conformations of axial (1) and equatorial (2) 1-methylstannacyclohexane and 1,1-dimethylstannacyclohexane (3). The chair, 1,4-twist, and 2,5-twist structures are minima and the 1,4-boats and 2,5-boats structures are transition states (each with one imaginary frequency). At the B3PW91/SDD level of theory the axial chair conformer of 1-methylstannacyclohexane (1) is -0.21 kcal/mol (∆G -0.20 kcal/mol) less stable than the equatorial chair conformer (2). The chair conformer of 1 is 2.70 in 3.26, 6.27, and 4.42 kcal/mol more stable than its 1,4-twist, 2,5-twist, 1,4-boats, and 2,5-boats structures. Similarly, the chair conformer of 2 is 2.70, 3.37, 3.49, and 4.42
On the Resource Allocation in Large-Scale Distributed Networks
Anh Nguyen & Nicholas Urrea
Mentors: Tadashi Nakano & Tatsuya Suda

In the past few years, there have been considerable amounts of studies on the performance improvement of large-scale distributed network services such as web content distribution on the Internet. Resource allocation is a key issue and many research groups have presented their ideas on how to efficiently use limited amounts of resources such as storage space. In this presentation, we formulate a resource allocation problem we are trying to solve. A cost function traditionally used in the literature is extended to capture service waiting time and amounts of resources used, as well as distance between users and services. We then discuss various resource allocation methods that can minimize the total cost. These techniques are evaluated through simulations, and their characteristics are revealed. We will finally present our current work of designing an adaptive resource allocation technique and suggest that our technique perform better than others in dynamic and changing network environments.

Visuospatial Information Processing: A Behavioral Analysis of the Ventral and Dorsal Pathways
Aisa Green & Theresa Phung
Mentor: Charles Wright

Visual processing in the human brain involves two functionally distinct pathways: the ventral pathway identifies objects and their properties, the dorsal pathway processes spatial relations. This study examines the visuospatial abilities of the dorsal and ventral pathways. We measured the response time of one hundred and four participants, who were tested on seven behavioral tasks. Four of the tasks were expected to rely primarily on dorsal processing while three were primarily ventral. Factor analysis of response time revealed two factors. The ventral tasks loaded primarily on one factor (mean loading = .644) and substantially less on the second factor (mean loading = .215). The dorsal tasks exhibited an opposite pattern, with smaller loadings on the first factor (mean loading = .328) and substantially larger loadings on the second factor (mean loading = .618). These findings were consistent with the previous study by Chen, J., Myerson, J., Hale, S., and Simon, A. (2000). We extend this work with two additional tasks, one that is putatively dorsal involving reaching movements, and the other is putatively ventral involving shape identification.

Community College Transfers to the University of California
Alejandro Espinoza & Hugo Salazar
Mentor: Caesar Sereses

In 1997 the University of California and the California community college system with the support of Governor Gray Davis’ administration developed a Memorandum Of Understanding (MOU) that developed a “partnership agreement” to increase the admissions of community college transfers into the University of California system. The University of California and the California community college system helped fund programs designed to assist community college students in transferring to the University of California system. The 1997 MOU projected an admissions increase of fifteen thousand students within five years of the programs’ implementation. This study will analyze the effectiveness of the Puente project in increasing the number of community college transfers into the University of California system. With the assistance of interview responses from Puente participants and administrators the study will shed further light on the contributions of this program to the attainment of the set goal of the 1997 MOU.

Development of Anodic Bonding
Nasbi Guzman, Karina Hernandez & Annette Moreno
Mentor: John LaRue & Richard Nelson

High lead glasses have beneficial properties that can be exploited in MEMS devices. To date, no other investigations using anodic bonding of high lead glasses have been published. In this study, we will present technology of glass-glass bonding using two methods of bonding. We use two different depositioning materials, amorphous Si through LPCVD and SiN through PECVD. Two different techniques are applied. One technique is that of a voltage divider, and another using standard application of charge to top glass and bottom glass. The voltage divider supplies charge to bottom
glass and to the interface via a probe tip. The interfacial bond strength is measured using an Instron tensile test machine for a bond strength comparison of high lead glass anodic bonding to previously known MEMS bonding methods.

Localization of DSCAM1, A Trisomy 21 Gene, in Normal and Keratoconus Corneas
Nicole Jordan, Julie R. Korenberg & Vinitha Reddy

Mentor: Cristina Kenney

Trisomy 21 (Down Syndrome, DS) has three copies of chromosome 21 instead of two. This syndrome causes cardiac and ocular abnormalities as well as mental retardation. The increased expression of chromosome 21 leads to specific phenotypic characteristics of DS individuals. Keratoconus is an ocular disease that affects the general population, however, it is 50-300 times more prevalent in individuals with DS. KC is a non-inflammatory ocular disease with progressive thinning of the central cornea that leads to decreased vision. My research focuses specifically on the Down Syndrome Cell Adhesion Molecule (DSCAM1). This gene is found on chromosome 21 and can be detected in normal corneas. The purpose of this project is to determine any significant discrepancy of DSCAM1 found in KC corneas compared to normal corneas, which could help explain the increase prevalence of among DS patients. Various methods were used in conducting this research. Nine normal and nine KC frozen corneal tissue samples were sectioned. The tissues were then stained with DSCAM1 antibody (1:100) and then viewed with a Nikon fluorescence microscope. My results showed that DSCAM1 is cornea-specific and stains epithelial, stromal, and endothelial cells. The staining pattern of the KC corneas is similar to that of the normal. Other isoforms of DSCAM are available for further study; therefore, DSCAM remains a viable candidate gene to investigate. I have learned various procedures including sectioning corneal tissues, immunohistochemistry, microscope/camera operation, and data analysis.

Bedside Ultrasound for Differentiation of Cellulitis vs. Abscess in the Emergency Department
Zerlina Casillas, Claudia De Los Santos & Isabelle Pamart
Mentor: John Christian Fox & Federico Vaca

Soft tissue infections are a common complaint in the emergency department (ED). Cellulitis typically responds well to antibiotic therapy, whereas abscesses must be drained surgically (I&D). The purpose of the study was to determine the utility of ED bedside ultrasound (US) in detecting abscesses when added to the physical exam. All adult patients with a chief complaint of cellulitis and/or abscess were eligible for enrollment. Prior to the US, the treating physician completed a questionnaire including signs and symptoms, physical exam findings, and a yes/no assessment of whether they believed an abscess was present. All patients with a pre-ultrasound assessment of abscess were incised regardless of the US findings, while all others were treated with antibiotics and/or drainage at physician’s discretion. The results from August to October 2003 showed that out of the 39 patients enrolled, 11 were diagnosed with abscesses on clinical grounds and three were presumptively diagnosed as cellulitis without abscess. Of the 11 presumed to have abscess, 10 were confirmed by ultrasound and then by drainage of pus after incision. One patient, suspected to have an abscess, had a negative ultrasound scan and no pus on attempted I&D. Of the three patients without clinical suspicion of abscess, one had a positive ultrasound scan and pus on I&D. Therefore, out of 14 patients the diagnosis was changed based on the ultrasound in two. The conclusion that can be drawn from this study is that bedside emergency department US may enhance differentiation of abscess from cellulitis.

The Progression of Alzheimer's Disease in Down Syndrome
Saba Hamiduzzaman, Neda Khadem & Cassandra Stewart
Mentor: Linda Nelson

Down syndrome is often associated with cognitive impairments and presently with Alzheimer’s disease in early adulthood. Current cognitive tests are not as sensitive to Alzheimer’s disease when they are used with individuals who are developmentally delayed or suffer from mental retardation, such as those with Down syndrome. The purpose of this research is to measure cognitive functions in adults with Down syndrome. The researchers are hoping to discover new procedures for testing older age subjects with Down syndrome. Due to common cognitive impairments of subjects with Down syndrome, it has previously been challenging to effectively assess their cognitive abilities. Tasks used in this study have been demonstrated in age-sensitive and brain-specific in animal models of aging. These tasks measure functions that are believed to systematically decline over the course of Alzheimer’s disease. A Pilot study funded as a competitive grant by the Alzheimer’s disease Research Center at UCI to Dr. Nelson (2001), demonstrated preliminary feasibility of the four nonverbal tasks. Our study will continue this line of research and demonstrate that performance on these animal based tasks by humans is feasible. Most importantly, we expect that these findings will open new...
avenues of assessment and measurement of treatment outcome in people at risk for Alzheimer's disease.

**Alteration of Soil Hydraulic Conductivity and Soil Stabilization Using Ultramicrobacteria**
Tzu-Yu Lai, Gloria Shin & Aaron Tea
Mentor: Stephen Lyon & Jan Scherfig

The intrusion of seawater into coastal aquifers is a common occurrence throughout the world. Extensive clogging due to the formation of biofilm from bacteria could prevent or at least inhibit salt-water intrusion; the subsequent mineral formation could stabilize soils subject to liquefaction. This study examines the behavior of bacteria in solid matrix. The extent of the clogging is limited to the ability of the bacteria to penetrate into the soil or rock matrix. In their normal growth state, bacteria can penetrate between a few centimeters to tens of meters depending on the volume of the bacteria and the pore size of the matrix. Using native bacteria, it is possible to create a group of ultramicrobacteria that can be introduced into a matrix such that there is complete and uniform penetration of the matrix by the bacteria. In order to form such a matrix, several test apparatus were constructed and tested.

**Effects of Simulated Microgravity on Arterial Vascular Smooth Muscle Wall Composition: Alpha Actin and Myosin Light Chain 20**
Julie Huyah, Sang Le & Trang Nguyen
Mentor: Ralph Purdy

Upon their return to Earth, microgravity-adapted astronauts experience problems on standing upright, namely, orthostatic intolerance. Orthostatic intolerance may be caused, in part, by the inability to raise body total peripheral resistance. Previous studies showed that simulated microgravity induced contractile deficit or hyporesponsiveness in blood vessels of Hindlimb Unweighted (HU) rats, similar to that observed in astronauts. Simulated microgravity was induced in male Wistar rats, by elevating the hindquarters 35° above the horizontal by using a tail harness attached to a swivel and hook fixed to the ceiling of the cage. The major goal of this study was to determine the effects of microgravity on the major structural contractile proteins, α-actin and Myosin Light Chain 20 (MLC20), of the vascular smooth muscle. After 20 days of HU treatment, carotid and femoral arteries and abdominal aortas were isolated from Control and HU animals. Western Blot Analysis was carried out to determine the protein level of α-actin and MLC20 in the CTL and HU tissues. α-actin was reduced by HU in the abdominal aorta, but not in either the carotid or femoral arteries. In contrast, MLC20 was reduced in all three vessels. The results indicated that simulated microgravity-induced decrease of the MLC20 level in the smooth muscle could contribute the vascular hyporesponsiveness observed in HU tissues. Furthermore, additional data on DNA quantification showed no change in amount of DNA between CTL and HU tissues for all three vessels. These findings suggested that only the down regulation of the expression of MLC20 is needed to cause a decrease in vasorestriction of the arterial smooth muscle.

**Computational Study on the Cycloadducts and Mechanism of the 1,3-Dipolar Cycloaddition of Azomethine Ylde to Alkenic Dipolarophiles**
Szu-Hau Chen, Angela Huang, Kevin Lau & Jennifer Vu
Mentor: Fillmore Freeman

It is well known that the [3+2] cycloaddition of 1,3-dipoles to alkenes is one of the most widely used routes to pyrrolidine ring systems. B3LYP/6-311+G(d,p) level of calculation under the density functional theory in Gaussian 98 is being used to calculate the relative energies and geometrical parameters for azomethine ylide, azacyclopentane, cis- and trans-3,4-disubstituted azacyclopentanes, and the transition states for the cycloaddition of azomethine ylide to ethene and disubstituted ethenes [(Z)- and (E)-2-butene, (Z)- and (E)-1,2-dichloroethene, (Z)- and (E)-1,2-dicyanoethene]. There is common presumption that [3+2] cycloadditions proceed via a concerted pathway; however, our results suggest otherwise. The transition state from the Z-isomer is of lower energy than that from the respective E-isomer. Moreover, the relative reactivities between the ylide and the substituted ethene are in good agreement with a (LUMO_dipole)-(HOMO_dipole) controlled interaction. The transition states for the Z-dipolarophiles are consistent with a synchronous concerted π₆ + π₂ cycloaddition mechanism. Furthermore, the E-dipolarophiles appear to proceed via both a concerted and stepwise mechanism. For example, the E-(3,4)-dicyanoazacyclopentane does not go through a cyclic transition state as the other trans-3,4-disubstituted azacyclopentanes. Intrinsic reaction path (IRC) calculations connected the transition states with the respective reactants and products. The conformational free energy (AG) of the azacyclopentanes were calculated and are discussed.
The Assessment of Independence and Autonomy In Preschool Children
Amit Cheema, Sharon Chi, Katherine Melech & Sonal Mundhra
Mentor: Wendy Goldberg

Family sleep arrangements have been linked with independence. Keller & Goldberg (2004) indicated that, while early co-sleepers are less independent in sleep domains, in other areas of development they are more independent than children who were early solitary sleepers or who co-slept after an extended period of solitary sleeping. The current study aims to replicate and extend the results of Keller and Goldberg's research by using direct observation of children's self-reliance and autonomy, along with data gathered from teachers and parents on children's social independence and independence in daily living skills. Primary objectives were to differentiate the constructs of independence and autonomy, identify reliable and valid means to assess these constructs in preschoolers, and examine relations between these constructs and family sleep arrangements. The sample consists of parents and preschoolers in the Irvine area. Teachers and undergraduate observers rated the classroom behavior of the children whose parents returned surveys. Moderate concordance is expected among these various assessments of independence and autonomy. We also expect significant association between sleep arrangements and young children's independence and autonomy.

Micro-Fuel Cell Design Project
Juan Chavez, Christopher Larson, Janea Magallanes, Jesse Pompa & Noel Tapia
Mentor: John LaRue

With an increasing amount of pollution in our environment, there is a great need for a new technology that can eliminate the emissions from the production of energy. The fuel cell is a power device that transforms thermal energy from a fuel into electrical energy with minimal pollutant emissions. Fuel cells are often associated with fuel cell powered and hybrid vehicles, but they can also be used as the source of power for a variety of other applications. Our design team explored the use of fuel cells to power a small-scale home appliance. Under the advice of Professor LaRue, we designed and built a micro-fuel cell to model the size and output of a D-battery to power a flashlight. After researching other micro-fuel cell designs, we decided to build a fuel cell that could use both hydrogen and methanol. Each component was designed so that the total current and voltage matched those of a D-battery, yielding the same power output. Testing includes varying the flow rate, temperature, and pressure at which the fuel cell operates to optimize performance. The construction of this fuel cell serves as a prototype for future designs utilizing fuel cell technology in small-scale applications.

Instant Messaging Visualization Project: Social Networks Within the Virtual World
Michelle Gregorio, Chih Yuan Liu, Adrian Sugindhi, Peng Sun & Arkadej Albert Udompanyakavit
Mentor: Gloria Mark

The Instant Messaging Visualization Project (IMVP) focuses on the potential expansion of users' social networks created through online messaging. IMVP uses the constructs of AOL Instant Messaging protocols to create a simplified messaging system with added features. IMVP introduces two distinct functionalities that may contribute to the growth of a user's network: (1) the availability of viewing other users' profiles, and (2) the provision of a list of users ('extended' connections) who are derived from the buddy lists of the users of one's own buddy list. These connections display a list of online users who have a common buddy with the user. For example, User A has User B on his buddy list, and User B has User C on his list. With IMVP, User C will now show up on User A's Extended Connections list and the system will graphically display that User B is the common buddy between the two. IMVP provides the means for users to expand social networks by using current connections to reach out to other users who share those connections as well. We give the users of our system the ability to reach out to new people and potentially expand their network of buddies, and we do this by using their current connections and creating an online "degrees of separation" visualization that points to other users who are up to two degrees away.

Design and Development of a Data Acquisition Interface
Golam Kabir, Jonson Limurty, Jeffrey Sawyer, Tian Shi & Alex Tang
Mentors: John LaRue & Richard Nelson

Most laboratories are transitioning from analog to digital data acquisition systems for data gathering and analysis of electrical systems, this requires a certain amount of circuitry to adapt standard PC format computers to gather required data. We designed, constructed, and integrated a laboratory data acquisition box and computer interface using the Measurement Computing DAQ Board PCIM-DAS1602/16 analog and digital I/O pc board. The software written in Matlab interfaces with the hardware and allows for data gathering and storing. Moreover, this software provides a toolset to display and
analyze data collected from the hardware interface. The advantages of this system are in the acquisition of data, such as in high-speed transients and long duration experiments. This allows the experimenter to concentrate on the experiment by performing an automatic computation for the user. Data displayed during the experiment can provide insight, such as real-time graphical plots for experiment data, for example. The system performs preliminary data reduction during the course of the experiment and final data reduction after completion of the experiment.

SAE Heavy-Lift Cargo Plane
Jezabel Cruz-Iglesias, Alexis Huh, Trevor Orr, Greg Raith, Tina Riddle, Anwar Torres & Terens Whelan
*Mentor: John LaRue*

The Society for Automotive Engineers (SAE) holds an annual competition where engineering students design a cargo plane and compete against their peers to see which plane carries the most cargo. UCI has entered their aircraft, “Tridactyl” in this competition. The rules state that the wingspan of the competing aircraft must be greater than 10 ft and specify the OS .61 FX model engine as the power plant. “Tridactyl” has a wingspan of 12 ft, a wing area of 16 sq ft, and uses the required engine. The aircraft was used to explore advanced composite construction methods as well as conventional aircraft design.

Bare Bones Dance Theater
Krista Abramson, Briana Bowie, Nicole Byrd, Lindsey Carter, Dorothy Chang, Allison Knight, Marc Macaranas, Kaylen Ratto, Nick Ruvalcaba & Julia Stewart
*Mentor: Israel Gabriel*

Bare Bones Dance Theater is committed to providing students from diverse majors with the resources necessary to produce a dance concert of professional quality. The production is designed to be an educational experience, which allows choreographers, performers and administrators to learn how a collaborative dance concert is brought to fruition. Celebrating our seventeenth year, our concert, entitled "Does a Body Good", took place March 18-20, 2004 at the Winifred Smith Hall. This year, our organization provided free master classes of various dance genres to our participants and a closing gala event for cast and audience members where scholarships were presented. The two annual Bernard Johnson Scholarships in Choreography and Costume Design were given this year to Briana Bowie and Liz Jorgensen, respectively.

Empty Sky/The Rising
Nicole Byrd, Whitney Cover, Felicia Flores, Heather Hall, Lauren Kadel, Tawny Marwaring, Charlotte Perebinossoff, Jennifer Selner, Laura Todd & Lindsey Tooker
*Mentor: Robert Boross*

Since attending UCI I noticed that the Ballet and Modern Dance programs provide a lot of opportunities to the dancers in the department, however there are not many opportunities for Jazz dancers. This project not only gave a great number of students the chance to perform in an entire production built on the fundamentals of Jazz Dance, but it also gave the chance to see how a dance show is put together from beginning to end. We went through auditioning, rehearsing, performing, and a grueling process of recording our project so that it could be made into a music video. There were many choreographic techniques that we watched to prepare the piece for video. As dance majors we found it interesting to see what worked and what did not on video as opposed to stage. It was an enlightening experience that could not be found in any other class and moved us closer to our careers.

UCI Etude Ensemble
Briana Bowie, Lindsey Carter, Dorothy Chang, Mario Espinoza, Jared Hanaika, Katherine Huntley, Marc Macaranas, Jennifer Magpantay, Noella Menard, Meredith Ostrowsky, Ellen Ritter, Valerie Salgado, Amy Taylor & Mandarin Wu
*Mentor: Donald McKayle*

The UCI Dance Exchange, created in 2004 by the UCI Etude Ensemble and directed by Professor Donald McKayle, was designed to foster a greater dialogue at this most critical intersection in a dancer’s life: as both scholar and artist. The Etude Ensemble, representing the UCI Dance Department, hosted UC Santa Barbara’s dance company. A collaborative educational environment, the project included seminars, master classes, and performances on the UCI campus on May 5, then at UCSB on May 7. Included were new works by Professor McKayle and UCI alumni Nathan Hodges. The format of the program allowed for several important new opportunities for both dance companies. First, working with another collegiate dance department exposed participants to a variety of new teaching, choreographic, and performing styles, as well as a giving platform for sharing constructive criticism and creative insights. Second, an exchange amongst pre-professional dancers gave greater access to resources needed for life after college, including tapping into the experience of faculty, networking with peers, and strengthening each
department's reputation with high-caliber performances.

Last and most importantly, the project promoted dance education beyond UCI's campus: by bringing two UC universities together, and engaging local artists who support such creative activities. Thus, the UCI Dance Exchange gave both students and educators insight into the role of collegiate dance and its relationship to both the professional dance world and the Southern California dance scene.