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Effect of Single Base Bulges on Oxidative DNA-Protein Crosslinking

Author(s): Marina Abramchayeva, Amanda Madison,

Zitadel Anne Perez

Mentor(s): Eric D A Stemp

Institution: Mount Saint Mary's College, Los Angeles CA

Oxidative DNA damage contributes to disease and aging. Specifically, guanine is the DNA base most susceptible to this damage with an oxidation potential of 1.29 V. Bulges in DNA arise from replication and recombination errors and if left unrepaired, cause disease. Here, we are studying the effects of bulges on DNA-protein crosslinks. A DNA duplex was assembled using the strand 5'-TATAGATATGGATATGATAT-3', which was fluorescently labeled with Alexafluor 546 at the end 3' end, and a complementary strand containing a single base bulge, 3'- TATACTATACYCTATACTATA- 5', where Y = C, G, A or T. A control strand with no bulge was also synthesized. The GG sequence across from the single base bulge localized the guanine radical at that location. The flash quench technique was used to generate guanine radicals and intact DNA samples were analyzed by the gel shift assay. Results from agarose gels showed that G bulge DNA samples had higher amounts of crosslinking when compared to the no bulge, A bulge, C bulge, and T bulge samples. To determine whether the increased amount of crosslinking was due to the presence of the guanine on the complementary strand, we analyzed the samples under denaturing polyacrylamide gel conditions. Our results showed that there was still more crosslinking with the G bulge DNA than with the other DNAs, indicating that the DNA protein-crosslink was formed preferentially on the guanine on the fluorescently labeled strand. Overall, DNA bulges containing purines lead to an increase in DNA-protein crosslinking when compared to the well-matched DNA. Thus, structural perturbations such as bulges, when near a guanine base, can influence the amount of oxidative DNA-protein crosslinking.

Effect of Cytosine Derivatives on DNA-Protein Crosslinking from Guanine Oxidation

Author(s): Marina Abramchayeva, Danielle Lara, Zitadel Perez, Amanda Madison

Mentor(s): Eric D A Stemp

Institution: Mount Saint Mary's College, Los Angeles CA

Oxidative DNA damage contributes to aging, cancer, and diseases such as Alzheimer's and Parkinson's. Guanine is particularly vulnerable to oxidation and can create guanine radicals which can form DNA-protein crosslinks. Guanine cation radical is acidic ($pK_a \sim 3.9$) and can be deprotonated by cytosine in duplex DNA. Here, we investigate how the protonation state of the guanine radical in the oligonucleotide 5'-ATATGATATGGATATGATAT-3' affect its reactivity. If comparable amounts of radical

are produced, one would expect more crosslinking under conditions that favor the guanine cation radical. We synthesized DNA duplexes with cytosine derivatives (5-bromoC or 5-methylC) across from guanine, and the 3' end of the G-rich strand was labeled with a fluorescent dye (Alexa Fluor 546). Guanine radicals were created through a photochemical method called the flash-quench technique, using $Ru(\text{phen})_2\text{dppz}^{2+}$ (phen = phenanthroline, dppz = dipyradophenazine) as a photosensitizer and $\text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$ as the quencher. Crosslinking was detected using the agarose and polyacrylamide gel shift assay under native and denaturing conditions. 5-bromocytosine (BrC) is a weaker base than cytosine or 5-methylcytosine (MeC) and should favor the formation of the more reactive guanine radical cation. Results revealed that cytosine derivatives crosslinked in the order of 5-bromocytosine > cytosine > 5-methylcytosine, consistent with the presence of more radical cation with 5-bromocytosine, a weaker base than cytosine or 5-methylcytosine. Thermal denaturation experiments indicated minimal differences between duplexes with different cytosines, showing comparable stabilities between duplexes. Competition experiments are currently underway, in which DNA duplexes were assembled which contained both BrC and MeC on different strands, but on the same duplex. This will directly reveal the difference in reactivity of the guanine radical created by either cytosine derivative. These findings indicate that the reactivity of guanine in oxidative DNA-protein crosslinking reactions depends on its base pairing partner in the presence of cytosine derivatives.

Modifying the Load Carrying Capability of Soil by Adding Saline Water: An Environment Friendly Ground Modification Technique

Author(s): Beena Ajmera

Mentor(s): Binod Tiwari

Institution: CSU, Fullerton, Fullerton CA

Soils compress with the application of load resulting in settlement of structures founded on or within them. The phenomenon of settlement through the expulsion of water from the soil voids, which is known as consolidation, is an important parameter used in sizing of foundations of structures. Consolidation is measured through a parameter known as compression index. Index properties of a soil mass such as liquid limit (moisture content at which soil starts to flow like a liquid), plasticity index (indicator of how much water can bind the soil particles) or initial void ratio (ratio of the voids in a soil to soil solids) are some important properties that can be measured in the laboratory, 20 times cheaper and easier than the measurement of the compression index of soil. This study shows how the compression index can be estimated with reasonable accuracy with the index properties of soil. Although all researchers concur that the compression index is also dependent on the mineral composition of the soil specimen and the chemistry of the fluid existing in the void or pore space,

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few researchers have conducted studies for controlled mineral compositions and pore fluid chemistry. A systematic experimental study was performed to evaluate the influence of salt water as a pore fluid on the compression index for soil with controlled mineralogical compositions. From fifty mixtures composed of three different clay minerals - montmorillonite, kaolinite and illite, it was observed that the compression index of soils dominated by illite or kaolinite can reduce by 10% and montmorillonite dominated soils by 77%, by adding sea water into the soil mass, reducing settlement and construction costs for infrastructures built on them. A number of regression equations were also developed to estimate the compression index with index properties such as liquid limit and plasticity index.

Over Privileged Children in Relation towards Adult Self-Esteem

Author(s): Estella Al-Mutairi

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

It has been proposed that the self is a social construction, that individuals develop a sense of who they are and what they are from their observations and interpretations of the responses they receive from others (Mead, 1934). People's sense of self-esteem shapes their emotional reactions to success and failure (Coopersmith, 1967). Some have concluded that narcissistic character traits arise from being over privileged and the grandiosity is no more than a compensatory mechanism for the veiled feelings of worthlessness, unattractiveness and low self-esteem (Stein & Wilkinson, 2007). The present study expands on this research by examining the role of being over privileged in life and its effect on self-esteem, each of these variables were measured by its items from the Quality of Life Survey. Utilizing a sample of community dwelling adults drawn from Southern California, the reports were based on analyses from a sub-sample of a larger survey ($n = 50$). It was hypothesized that those individuals who were over privileged as children would have higher self-esteem levels as adults than those who were not over privileged. Results show the opposite of what was hypothesized, and in turn show that individuals who were not over privileged had higher self-esteem than those who were. This discussion focuses on people's level of being over privileged and their overall self-esteem in life.

Structural Examination of Peripheral Nerves Using Optical Coherence Tomography and 3D Image Reconstruction

Author(s): Xorge E Alanis, Michael C Oliveira, Shahidul Islam

Mentor(s): Hyle B Park

Institution: UC, Riverside, Riverside CA

Background: Peripheral nerves typically possess an undulating and coiled internal architecture in order to accommodate changes in length. These structures, known as Bands of Fontana, are not visible to the naked eye and have been previously visualized through highly invasive and inherently destructive techniques such with traditional histopathology and electron microscopy. *Method:* We present application of a minimally-invasive and non-destructive imaging technique, optical coherence tomography, to visualize such neural substructural features. Stacks of raster-scanned two-dimensional sections can be compiled into three-dimensional volumes, which are then used to quantify the Bands of Fontana. *Results:* We were able to quantitatively assess the thickness of the epineurium through graphs plotting light scattering and comparing it to the 3D model that was generated. The plots on the graph were fairly consistent with the 3D volume. The Bands of Fontana were also assessed through the same method of graph plotting and 3D volume comparison. The graph was used to plot the amount of light refraction and the peaks represented potential location of Bands at a certain depth. These peaks were fairly consistent with the appearance of Bands in the volume at that particular depth. *Conclusion:* We were able to identify and quantitatively assess the epineurium and Bands of Fontana and the results were consistent with other literature.

A Point Process Model for Simulating Gang Violence

Author(s): Mark Allenby

Mentor(s): Timothy Lucas

Institution: Pepperdine University, Malibu CA

Gang Violence is a prevalent problem in Hollenbeck, Los Angeles. To counteract this problem a point process method is presented for simulating gang-on-gang crimes. The Hawkes Process has historically been used to model earthquake and aftershock occurrences, but has clear application to criminology by the repeat and retaliatory nature of crimes. The Hawkes Process, a self-exciting point process is introduced as a temporal model for crimes between gangs. A variation of The Hawkes Process is then also applied as a marked point process to describe directional rivalry strength between pairs of gangs. This directional, rivalry-based Hawkes Process is then expanded upon to simulate crimes not only temporally but also spatially. Finally, we present a branched Hawkes Point Process to simulate crimes as a global system between

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all gangs in Hollenbeck. This model distributes crimes through space and time, and assigns the crime a pair of gangs and directionality within this pair. The parameters of all models were fit using spatially-penalized maximum log-likelihood estimation with 1400 gang-on-gang crimes in the city between 1999 and 2002. This data was provided by the L.A.P.D. and U.C.L.A. Department of Criminology.

Sea Stars Growth in Experimentally Altered Prey Fields

Author(s): Luis Alvarez

Mentor(s): Carlos Robles

Institution: CSU, Los Angeles, Los Angeles CA

Sea stars (*Pisaster ochraceus*) are a keystone predator, directly influencing prey (*Mytilus californianus*) abundance and distribution. We asked whether *P. ochraceus* energetics, measured as growth in grams, is in turn affected by the zonation of *M. californianus*. We hypothesized that sea star growth rate will increase when mussel distribution is extended lower into the intertidal. In contrast, sea star growth will decrease when mussel distribution is artificially extended higher in the intertidal zone. If this is the case, then experimentally lowering mussel boundaries will provide more prey and as a consequence it will elevate the sea stars' growth rate. However, prey zones that are raised will cause shrinkage to *P. ochraceus*. We translocated these sea stars to three islets in Barkley Sound, British Columbia, where prey zonation had been experimentally altered. After eight weeks, sea stars on sites with lowered boundaries (removals) increased live body mass and arm lengths, whereas sea stars on sites with unaltered (control) or elevated boundaries (additions) boundaries shrank. The growth is negatively size-dependant, with relatively large sea stars increasing the least in the former group or decreasing the most in the latter groups. This research suggests that the energetic budget of the predator plays a key role in determining prey boundaries.

Dynamics and Control of Earthquake Resilient Structures

Author(s): Pedro Alvarez, Brittany McElwain, Laura Thesing

Mentor(s): Anant R Kukreti

Institution: California State Polytechnic University, Pomona, Pomona CA

Earthquakes are the cause of millions of casualties as well as damages valued at billions of dollars. By researching the dynamic responses of a structure, new aseismic designs are implemented to create more resilient structures. Active, passive and semi-active designs, which are modern designs used today, were reviewed and simulated in order to understand the methods as well as possible improvements for the resilience of the structures. This re-

search considered small-scale and mathematical models of simple one-story structures that were subjected to free and base-motion excitations. Using numerical methods, the goal was to create more effective aseismic designs to understand and counteract catastrophic disasters to structures caused by earthquakes. Of the three means reviewed, the semi-active control proved to be a more effective design in comparison to the active and passive designs, both in smaller displacements and damping time. The semi-active control comprised a fuzzy logic algorithm, allowing control of various parameters, such as a damping coefficient. This approach improved efficiency in dampening structures.

The Effects of Migrations on Agricultural Structures of a Frontier Town in the Amazon Basin

Author(s): Patricia I Amoroto

Mentor(s): Jocelyn Pacleb

Institution: California State Polytechnic University, Pomona, Pomona CA

This study explores the change in agricultural structures in a frontier town in the Amazon Basin due to the push-pull factors caused by globalization. Because of the risky nature and sensitivity of issues discussed in the study, the name of the town and interviewees are not identified. Central to the research is the investigation of agro-pessimism, i.e. how rural reform strategies based on liberalization have produced trajectories and contradictions in land use and employment. Furthermore, it tackles the evolution of occupations from rubber tapping, to logging, to cocaine trafficking and illegal turtle poaching in response to the need of sustaining a lifestyle once fully supported by subsistence farming. My methodology includes thirty structured interviews with the heads of family, all of whom were men except for one woman, ethnography, and a review of literature and public Government documents. Based on the study, I conclude that local agriculture is no longer the main source of food and income in the region. This has generated a certain amount of inequality and insecurity in the town. The factors that contribute to this shift from agriculture are: (a) movement of people from rural to urban areas (b) the perception that "white collar" jobs are of higher status and (c) the "overt-covert" cocaine trafficking and illegal turtle poaching trade.

Computational Analysis of Tapered Optic Sensors

Author(s): Christopher Anderberg

Mentor(s): Ertan Salik

Institution: California State Polytechnic University, Pomona, Pomona CA

Optical sensors can provide an effective way of measuring various variables, such as stress, temperature, refractive

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index, etc. There is demand for inexpensive optical sensors that perform effectively, especially in the biomedical field. One important tool that is useful in understanding tapered optic sensors is computational analysis. Changes in physical properties of the sensor and its surrounding environment affect the transmission of light through the sensor. By analyzing the transmission it should be possible to characterize these physical changes. One particular physical change we are interested in is changes in refractive index of the environment around the taper, an indicator of pathogens in the environment. We have developed a computational method that can use the transmission of light at two wavelengths through the taper to characterize changes of the refractive index in the environment. First two wavelengths are chosen that result in a transmission a quarter cycle apart. By using transmissions a quarter cycle apart, it is possible to use trigonometric identities to simplify the analysis and determine the change of phase of the transmitted light over time. We can then use a relationship between changes of phase and changes of refractive index in the environment to characterize the change of the refractive index of the environment. The method has been used on simulated data to verify that it works as expected. It is able to perfectly reproduce a curve that was used to create the simulated data. From here we can give it real data that is subject to noise and other deviations from what is ideal. Depending on how the method reacts to real data, it can be modified to accommodate noise and other deviations from ideal conditions. Based on its success with simulated data, this method seems as if it will be useful in analyzing data.

The Time-Course of Temporal Recalibration: Stable and Noise Conditions

Author(s): Conor D Anderson, Jess Hartcher-O'Brien, Marc O. Ernst, Massimilliano Di Luca
Mentor(s): Carmel Levitan
Institution: Occidental College, Los Angeles CA

Dynamic temporal recalibration is the capability of the brain to re-create the percept of simultaneity that is lost due to differences in the medium transmission and processing speeds of the different sensory modalities, most prominently the auditory and the visual systems. While the existence of this capability is not under question, the details of its mechanism are up for debate. Participants were adapted in 30 s bursts to audio-visual stimulation in three separate conditions: audio-leading, visual-leading, and audio-leading with a 5 ms Gaussian "jitter." After each round of adaptation, participants responded to 15 unimodal sound or light stimuli, providing reaction time data. It was expected that, as subjects became more adapted, their reaction time judgments would alter according to the direction of the latency-shift for each sensory modality. Auditory reaction times were expected to slow, while visual reaction times were expected to speed up slightly, due to the fact that the brain "trusts" vision more in pro-

viding temporal estimations of external events. Because subjects adapted in 30 s bursts, this gradual adaptation would show the time-course and function shape of the recalibration process. Although the resulting data was noisy, as is so often the case with reaction time measures, certain trends were visible and consistent with the hypothesized trends. The noise condition, however, tended to destroy any adaptation effects, suggesting further lines of research using different types and durations of noise. The trends suggested by the current data seem to be fully in-line with what is hypothesized about which sensory modality undergoes a latency-shift.

Community Based Conservation for the Sharks of Costa Rica

Author(s): Joellen Anderson
Mentor(s): Martha Matsuoka
Institution: Occidental College, Los Angeles CA

By creating a solution developed by the community that improves their lives and also increases biodiversity, community-based conservation ensures a more sustainable and beneficial arrangement particularly in developing countries which often depend heavily on natural resources. Currently, Costa Rica faces a crisis in the conservation and management of their ocean resources. Their fishing industry is an integral part of the economy and culture and they have the largest fishing fleet in Latin America. The country allows many foreign fleets to fish with virtually no enforcement of regulations and shark populations have decreased so drastically that the balance of many ecosystems has been disrupted (PRETOMA). As the demand for shark fin soup has increased in Asia, the killing of sharks has also increased in Costa Rican waters, ruining pristine and protected habitats around the country. Several organizations in Costa Rica attempt to address the over-fishing of sharks. I seek to evaluate how and to what extent marine conservation organizations in Costa Rica engage and mobilize communities to protect shark populations. I spent two months observing and identifying the key goals of the organizations, major players influencing the organizations, tactics of the organizations, and techniques being used within the shark conservation movement of Costa Rica. I conclude that organizations working in shark conservation in Costa Rica have extremely limited involvement of local communities. Furthermore, based upon my observations I believe the shark conservation movement could potentially benefit from broadening existing organizations' goals to include community issues and also the creation of new community-based conservation organizations with inclusion in the process as one of their main goals.

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The Distress of Deployment

Author(s): Valerie Anderson

Mentor(s): Virgil Adams III

Institution: CSU, Channel Islands, Camarillo CA

Family support and structure are crucial components for individuals in active military, both during deployment and upon returning home (Doyle and Peterson, 2005). Even when those deployed return home safely, the affects of war still resonate within them, and subsequently, their loved ones as well (Demers, 2009). Using a sample of adults residing in Southern California, the relationship between military deployment and familial distress was examined. The study analyzed aspects of distress and hope among family members of those deployed for active military duty. It was hypothesized that military deployment would increase distress and decrease hope and well being of the corresponding family members. Results indicated that although familial distress was proven to be rightfully significant, overall feelings of hope and well being of the sample group were not negatively affected by the deployment of a loved one. Discussion centers on the hope and well being among military families.

The Final Touch to the Future of Health: Applied Kinesiology – the Art of Muscle Testing

Author(s): David Andrade

Mentor(s): Kurt Meyer

Institution: Irvine Valley College, Irvine CA

Is Applied Kinesiology a meaningful or an effective component to improving our overall health and physical well being? Could it replace medication and malpractice? Could this prove similar importance as exercise and diet? This form of health care could be a great addition to preventative and rehabilitative health. Through this process of preventative health it will help us live more efficient, happier, healthier lives. Applied Kinesiology has been examined under blinded examinations and case studies. The methods used for these tests were different positions in which the limbs were moved to examine if Applied Kinesiology was effect in many positions or just certain configurations of body movement. In the study done by the Department of Occupational Medicine, there examination consisted of 41 patients (22 men) through a random sampling process. Throughout the results they found in these studies that reduced strength was significantly associated to the presence of problematic symptoms of pain. To conclude the results show that Applied Kinesiology has diagnostic potential to help identify problems with muscles. Though this evidence it might show that it could also help improve the problems that are associated with muscle weakness and muscle pains, it doesn't conclude that it helps eliminate the problems that were presented before the study. So even though the researchers believe that they have enough evidence to show that Applied Kinesiology works in this form of preventative and rehabilitative care, I

feel at this point in time there isn't enough evidence on this subject to prove that Applied Kinesiology is an effective way of health care at this moment in time. I hope that with more research I can help prove that Applied Kinesiology can help prevent and rehabilitate injuries, so we can move away from medication and malpractice.

The Analysis of False Positive Cyanide in Wastewater Due to Chlorination and Preservation

Author(s): Karen A Antonio

Mentor(s): Brett Stanley

Institution: CSU, San Bernardino, San Bernardino CA

It has been a concern to the Santa Ana River Discharge Association that wastewater facilities recycling effluent into the watershed have inconsistent results for the detection of cyanide. The cyanide ion is a regulated compound that becomes highly toxic when protonated, and is a danger for all forms of life that use the river as a habitat or source of water. This research investigates the unknown causes for these discrepancies in order to develop a proper analytical technique to provide consistent, reliable results for the detection of cyanide in discharged water. Several flow-injection-analysis techniques with colorimetric and amperometric detection were used to test effluent samples from eight facilities. Two methods for the detection of free cyanide have been evaluated and compared to the approved method for total cyanide. Results have shown minimal variations between the methods, and that it is possible to directly analyze cyanide without distillation. It was observed that common metals found in the matrices do not play a role into the false increase of cyanide. However, all preserved effluent samples have an increase of cyanide as compared to the original, non-preserved samples. Furthermore, effluent from wastewater facilities that undergo chlorination and dechlorination contain higher concentrations of cyanide by 2-4 ppb in non-preserved and preserved samples than effluent from alternative treatment. Holding time trials are in progress and suggest that at least several hours are available to analyze for cyanide without preservation. The thorough study into the chemistry of chlorination and preservation will continue as to understand the causes for the disparity in reported cyanide. This research will help determine a universal method to detect cyanide for all the wastewater matrices that discharge into the Santa Ana watershed, as well as provide critical statistical data to help establish a regulatory limit of discharged cyanide.

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Influence of Iron Oxide Particle Size on the Photochemical Production of Hydroxyl Radical via the Heterogeneous Photo-Fenton Reaction

Author(s): Erika Aragon, Caylyn Lanzl

Mentor(s): David M Cwiertny

Institution: UC, Riverside, Riverside CA

The redox cycling between ferrous iron (Fe(II)) and ferric iron (Fe(III)) plays critical roles in pollutant fate and transport. This is particularly true in surface waters where photochemical production of Fe(II) can ultimately give rise to reactive oxygen species such as hydroxyl radical ($\bullet\text{O}$), which is a powerful oxidant for many organic micropollutants. The geochemical factors influencing the production of $\bullet\text{OH}$ during the reductive dissolution of colloidal and nanoscale iron oxides remains relatively poorly understood. In this project, we examined how particle size influences the thermal and photochemical production of Fe(II) via reductive dissolution of hematite nanoparticles (7 and 40 nm). Rates of Fe(II) production were measured over a range of pH values for the thermal reductive dissolution with ascorbic acid, as well as for photochemical reductive dissolution in systems with model dissolved organic matter (i.e., Suwanee River Humic Acid). Ultimately, Fe(II) production as a function of particle size and solution pH was then related to the formation of $\bullet\text{OH}$ via the photo-Fenton reaction, in which Fe(II) reacts with hydrogen peroxide generated from the photochemical reaction of dissolved organic matter. Results thus far show that smaller nanoparticles (7 nm) are considerably more prone to reductive dissolution at all pH values relative to larger scale hematite (40 nm). The enhanced dissolution of 7 nm particles cannot be explained simply upon differences in available surface area in both systems, suggesting that these particles are inherently more surface reactive than the 40 nm particles. Results from this project further our understanding of the redox cycling on the surfaces of iron oxides in natural surface waters and the implications of this process for pollutant fate.

The Evolution of National Textile Industries: The Influence of Factor Endowments

Author(s): Christa R Argueta

Mentor(s): Peter Kilduff

Institution: California State Polytechnic University, Pomona, Pomona CA

The textile industry is a pillar industry, one of the first to develop as a country's economy grows. Since the 1950s, the textile industry has experienced a process of globalization, as production has spread to newly developing nations and as international trade in textiles and apparel has expanded rapidly. The result has been a general shift in textile production from the more developed economies to less developed economies. This study analyzes the influence of differences in national endowments of labor and

capital on the patterns of change in global textile production since the early 1960s. Relative capital endowments were measured by GDP per head; while population size became the measure of the relative labor endowment of the six selected countries. Observed patterns of change are compared to theories of textile industry evolution. Such theories include Toyne and Arpan's six stages of development; the Heckscher-Ohlin's factor proportion theory; and Michael Porter's competitive advantage of nations. Overall, the relationships between textile production and individual factor endowments are not as simple and direct as established models forecast. Rather it appears that textile industry development is influenced by a broader array of factors acting simultaneously.

The Role of Artificial Neural Networks in Bacteriophage Research

Author(s): Michael Arnoult

Mentor(s): Victor Seguritan

Institution: San Diego State University, San Diego CA

Bacteriophages are the single most abundant biological entity on earth, and influence every environment in which bacteria exist. Research of bacteriophages, their physical components, and functions are therefore of great interest to the scientific community. There are no current algorithms which reliably analyze protein sequences and predict their function. The research conducted will allow the classification of proteins using Artificial Neural Networks, a computational method of analysis inspired by biological neurons. Features of phage protein sequences with known classifications will be used to train the neural networks. The networks then predict whether an unknown sequence produces a protein of a specified function. Analysis of the predictions will allow biologists to decide, with some accuracy, which proteins are the most appropriate candidates for their research needs. The training and testing of Neural Networks for this purpose in BioInformatics is a multiple-step process. Known phage major capsid proteins and tail proteins will be collected, and rid of sequences with inappropriate descriptions. The percent compositions of the amino acids, as well as other mathematical representations of positive and negative sequence examples will be fed into neural networks. In test cases, the neural networks classify phage major capsid sequences and non-major capsid sequences with an average of 90% accuracy. Several neural networks will be trained using multiple combinations of the mathematical representations, in order to determine which factors yield the greatest predictive ability. The validity of the predictions made will be determined experimentally.

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The Role of Estradiol in Altering the Susceptibility to Systemic *Candida albicans* Infection in Male and Female C57Bl/6 Mice

Author(s): Melissa Arroyo-Mendoza

Mentor(s): Nancy E Buckley

Institution: California State Polytechnic University, Pomona, Pomona CA

Estrogen is a hormone, which is comprised of a group of compounds, including estrone, estradiol and estriol, with estradiol being the most potent and estriol being the weakest. Estrogen is the main sex hormone in women essential to the menstrual cycle and reproduction. However, estrogen also regulates thymic development and immune function due to estrogen receptors found not only in reproductive tissue, but also on certain immune cells including T cells, monocytes, and macrophages. In our laboratory, we recently found that female mice are more resistant to an acute yeast infection than males. Thus, we proceeded to investigate the role of estrogen in the resistance to this systemic yeast infection. Thus, c57BL/6 female or male mice ($n = 7$) 8 weeks or age were treated as follows: (1) female mice sham implanted; (2) male mice sham implanted; (3-6) males implanted with 0.05, 0.1, 0.25 and 0.5 mg/21 day release β -Estradiol 17-Acetate pellet, respectively. Four days after the surgery, the mice were infected with 5.5×10^5 *Candida albicans* (*C. albicans*) cells/mouse (i.v.) and observed daily for morbidity and survival. Twelve days post-infection, kidneys, liver, and spleens were harvested. Tissue fungal load was assessed as yeast colony forming units/g tissue (CFU/g). We found that none of the estrogen concentrations used enhanced the survival of the infected male mice. We are currently analyzing serum estradiol levels in the implanted males to compare to the levels found in females. Furthermore, we are investigating whether the serum cytokine profile is similar in female and male mice systemically infected with the yeast. Our findings will help us elucidate whether serum estradiol or cytokine production are indeed involved in gender specific response to the systemic *C. albicans* infection in mice.

A Lost Leader in History: The Transforming And Empowering Partnership of Dolores Huerta and Cesar Chavez

Author(s): Rebecca Avalos

Mentor(s): James-Mansaeu Saucedo

Institution: CSU, Long Beach, Long Beach CA

By using Agenda Setting Theory and investigating documented history of the United Farm Workers Movement (1960-1970), rhetorical strategies of Dolores Huerta and Cesar Chavez are revealed. By comparing the rhetorical strategies of Dolores Huerta and Cesar Chavez it is clear that both leaders contributed differently but equally to the United Farm Workers Movement. The focus of this study is to research what significant rhetorical role Dolores Huerta

played during the most successful boycott in the history of the United States. Despite her key role, Huerta as organizer, negotiator, and political activist, has not been widely recognized by the print media and mass media. Through a rhetorical criticism and textual analysis of documented historical events, interviews, and speeches we discover the synergy and complimentary contributions Huerta made to the Great Social Movement of the United Farm Workers. Ultimately, through this study we discover a new rhetorician and a significant historical figure. A lost leader in history Dolores Huerta is revealed. The transforming and empowering partnership of Cesar Chavez and Dolores Huerta was vital to the success of the United Farm Workers Movement. For future implications we can use this research as a template to further investigate women's rhetorical roles and strategies in the Chicano Movement, Civil Rights Movement, and the Woman's Movement.

Getting Women of Color into the Graduate School Pipeline

Author(s): Denise A Baldacci, Jennifer E Mejia, Cristina Balesh

Mentor(s): Mary Danico

Institution: California State Polytechnic University, Pomona, Pomona CA

Attending and graduating from a four year university is challenging in itself, however, for ethnic minority women the cultural and social barriers are even more glaring. Our paper argues that women of color are more likely to face cultural pressures and gendered expectations from home, receive little to no mentoring or guidance about how to best "package" oneself to be competitive for graduate school, and are more likely to lack the resources available to them to fully understand their options after they graduate from a four year university. The challenges facing women of color in pursuing advanced degrees are a largely ignored and under-researched problem within academia. Our paper is based on a program project where we aim to provide on-line web support for students who may have similar questions about what to do after they graduate from college. Through extensive content analysis and focus group with women of color in Masters and PhD programs, our preliminary research suggests that direct mentorship and exposure to the field provide knowledge and confidence in pursuing graduate work, but working with a professor on a research or community project increases the chances of finding true passion in research.

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What You See Is What You Just Heard: The Effect of Temporal Rate Adaptation on Human Intersensory Perception

Author(s): Yih-Hsin A Ban, Shinsuke Shimojo

Mentor(s): Carmel A Levitan

Institution: Occidental College, Los Angeles CA

It is unknown from previous studies on perception whether psychophysical adaptation effects transfer from one sense to another. To test for this phenomenon, the current study examines the possible crossmodal transfer of temporal rate adaptation from vision to audition (VA) and from audition to vision (AV). Five subjects (four females and one male, ages 19-31) were trained, using feedback, to discriminate the perceived rapidity of either auditory or visual stimuli presented at a range of randomly-ordered frequencies as compared to that of stimuli (of the same modality) at a familiar average frequency. Afterwards, subjects were repeatedly exposed to stimuli (of the other modality) at a specific rate. To test whether adaptation resulted from this exposure, subjects again completed the task previously used for training, but now without feedback. After the initial training and adaptation phases, these test and adaptation tasks were presented in alternating order for a total of 20 repetitions each. A comparison of the pre- and post-adaptation responses showed whether there is evidence for crossmodal changes in subjects' perception of temporal rate. Due to the resulting shift in subjects' sense of rate, if adaptation to stimuli faster than those presented during testing had occurred, the subsequent stimuli would have seemed slower than they had before adaptation. On the other hand, if adaptation to slower stimuli had occurred, the opposite effect should have been seen. Confidence intervals calculated using Wichmann and Hill's (2001) psignifit toolbox for Matlab strongly indicate the presence of crossmodal effects in both the VA and AV conditions. However, further data collection is being conducted to verify these preliminary findings.

Powder X-Ray Diffraction of Croconic Acid

Author(s): Carlos J Barbosa

Mentor(s): Tim Usher

Institution: CSU, San Bernardino, San Bernardino CA

Croconic acid is an organic material which has recently been discovered to possess ferroelectric properties. A ferroelectric material becomes polarized when a voltage is applied to it. Most ferroelectric materials are ceramic, which limits their possible applications. Powder x-ray diffraction shows the crystal structure of the material being analyzed, with every compound having its unique x-ray spectrum. From the unique x-ray spectrum of croconic acid, we can learn about its crystal structure and find some insight into what gives croconic acid its ferroelectric properties. In order to obtain the spectrum, we placed approximately 0.25 grams of croconic acid into our

PANalytical X'Pert XRD system. The PANalytical X'Pert XRD system was running at 45 kV and 40 mA with a copper target and exposed the sample to x-rays with a wavelength of 1.5406 Angstroms. Although we could not find any previous reports of powder x-ray diffraction in the International Centre for Diffraction Data (ICDD) database, or the literature, our results were consistent with single crystal x-ray results reported in the literature, with the exception of one peak. Every other peak matched a Miller index consistent with an orthorhombic crystal structure with lattice constants $a = 8.7108$ $b = 5.1683$ $c = 10.956$ Angstroms. These results could shed light on where croconic acid derives its properties and help find more organic ferroelectric materials. Further research on this would include studying other compounds related to croconic acid, such as deltic acid or squaric acid.

Multiresolution Algorithms for Sparse Matrix Representation

Author(s): Mario A Barela

Mentor(s): Carlos Garcia-Cervera

Institution: UC, Santa Barbara, Santa Barbara CA

In this work we present results on the efficiency of existing algorithms that transform a large scale dense matrix: a matrix populated primarily by non-zero entries, into a sparse matrix: a matrix populated primarily by zero entries. We also modify current algorithms in effort to increase efficiency and usefulness of existing algorithms. Performing computations like matrix-vector and matrix-matrix multiplication, used to solve a variety of problems, can be carried out much faster when a sparse matrix is used. Many problems in the sciences, like Physics and Chemistry, reduce down to solving large systems of equations. If a sparse matrix represents a system of equations, solving that system will be much easier compared to its dense representation. We consider the multiresolution approach introduced by Harten et al. (Francesc Arandiga and Vicente F. Candela, Department of Applied Mathematics, University of Valencia; Valencia, Spain), based on polynomial interpolation, and compare the efficiency of linear solvers, and matrix manipulations, for different orders of accuracy of interpolation. We run large simulations using MATLAB to determine which algorithms are more efficient than others for certain classes of matrices. Using MATLAB, we also compare the sparsity of the transformed matrices, in terms of the accuracy of the interpolation used.

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Dechlorination of Harmful Groundwater Contaminants with a New Cobalt Catalyst

Author(s): Brandon R Barnett

Mentor(s): Joseph M Fritsch

Institution: Pepperdine University, Malibu CA

Tetrakis-(4-sulfonatophenyl)porphyrin cobalt was identified as a highly-active reductive dechlorination catalyst for chlorinated ethylenes. Through batch reactor kinetic studies, degradation of chlorinated ethylenes proceeded in a step-wise fashion with the sequential replacement of Cl by H. For perchloroethylene (PCE) and trichloroethylene (TCE), the dechlorination products were quantified and the C₂ mass was accounted for. Degradation of the chlorinated ethylenes was found to be first-order in substrate and catalyst. The dechlorination activity of this catalyst was compared to that of another water-soluble cobalt porphyrin under the same reaction conditions and found to be comparable for PCE and TCE.

Criminal Heroes: Greatness, Tragedy, and Contemporary Fiction

Author(s): Ben Basuni

Mentor(s): Linda Palumbo

Institution: Cerritos Community College, Norwalk CA

Fast Horse from James Welch's novel *Fool's Crow* and Michael Corleone from Mario Puzo's novel and director Francis Ford Coppola's film *The Godfather* are elite members of different cultures. Fast Horse's tribe members believe that he has achieved heroic status at a young age and has the potential to become a great leader; at a young age, Michael Corleone is respected for his duties in the military and is the most intelligent of the Corleone brothers which potentially leads him to become one of the greatest leaders of the Corleone family. However, both figures turn to criminality and suffer destruction in a contemporary twist on classical tragedy. Critical analysis and primary sources from current cinema movies emphasizing cultural studies and aesthetic movements suggest that current literature across culture requires tragic loss to complete character development of heroes, making such figures not just traditional heroes of action but also sufferers in mind and spirit. Particularly, a new genre of hero-criminals represents anti-social behavior through greatness of loss. These traits create a paradox: advantage among others and loss that comes later in life. There are three main conflicts for these characters that emerge: self-control of their greed for greatness, another individual's love to make them realize that what they want might not be right for their loved ones, and the patience to endure threats to their core values.

Preliminary Evaluation of the Effectiveness of the HELPS Reading Fluency Program in a Community-Based After School Program

Author(s): Danielle M Batin, Lemontrel L Leary, Lindsey J Luu, Kali R Osbeck

Mentor(s): John C Begeny

Institution: North Carolina State University, Raleigh NC

The Helping Early Literacy with Practice Strategies (HELPS) Program was developed in response to the absence of reading fluency instruction in core reading curricula throughout U.S. classrooms. The HELPS Program combines eight evidence-based fluency building instructional strategies into a structured program and can be feasibly implemented and accessed for free by all educators. The purpose of the present study was to replicate and expand upon earlier studies evaluating the efficacy of HELPS, specifically with students attending a community-based after school program. It was predicted that, on average there will be a significant increase in students' reading fluency from pre- to post standardized test measures of reading fluency. A paired *t* test was used to determine the significance of a difference before and after administration of the HELPS reading intervention program. Findings showed that students receiving the HELPS Program significantly improved their reading skills on standardized measures of reading performance. Overall, the HELPS Program appears to be an effective fluency-based program that future community teachers and student volunteers may use when improving students' overall reading fluency.

Reactions to Homelessness: The Social, Cultural, and Psychological Sources of Discrimination

Author(s): Brooks Baumgartner

Mentor(s): Lisa Bauer, Khanh Bui

Institution: Pepperdine University, Malibu CA

The issue of homelessness has a tendency to create division and provoke a wide array of responses. For some, the suffering of the poor evokes compassion and sympathy, leading them to a life of service and care of those in need. While others have a tendency to blame the poor for their plight and even go as far as rebuking government support for creating dependence. It seems that the issue of homelessness has created a modern day schism, causing some to respond with kindness and concern and others to respond with opposition and willful ignorance. The purpose of this study was to explore the social, cultural, and psychological forces that influence how one responds to the issue of homelessness and poverty. In order to explore the different sources of discrimination toward homelessness, a series of five online surveys were administered to 100 Pepperdine University undergraduates. Five independent variables were taken into consideration: belief in a just world, individualism-collectivism orientation, and causal

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attributions made toward the homeless (i.e., locus, stability, and controllability). The dependent variable, attitudes toward homelessness, was measured using the Attitudes Toward Homelessness Inventory (Kingree & Daves, 1997). A simultaneous multiple regression revealed that belief in a just world, individualism-collectivism orientation, and causal attributions made toward the homeless were significant predictors of attitudes toward homelessness, accounting for 30.4% of the variance in the variable. Specifically, the causal attributions of locus of control and controllability emerged as significant factors. This study is important because it increases our understanding about the sources of discrimination toward the homeless and helps identify values and principles that can be taught to combat discrimination and promote compassion.

Outflanking BCR-ABL Drug Resistance

Author(s): Abinav Baweja

Mentor(s): John Colicelli

Institution: UC, Los Angeles, Los Angeles CA

Chronic myeloid leukemia (CML) is the result of a chromosome translocation involving the gene encoding ABL1, a tightly regulated tyrosine kinase. The resulting fusion protein BCR-ABL1 has constitutive kinase activity, causing altered signal transduction and hyper-proliferation of myeloid cells. Current CML treatments include tyrosine kinase inhibitors that target the BCR-ABL1 catalytic domain. However, drug resistant BCR-ABL1 mutations develop in many patients administered such inhibitors, raising the question of how to counter this resistance. Previous studies show that RIN1 enhances the catalytic activity of ABL1 by binding to the SH2 and SH3 domains, relieving their auto-inhibitory effect on the kinase domain. Interestingly, overexpression of RIN1 in CML cell lines enhances BCR-ABL1 kinase activity and cell transformation. Conversely, deletion of RIN1 blocks transformation of cells by BCR-ABL1. Hence, the RIN1-ABL1 binding interface presents a novel and promising molecular target for CML therapy. We used TR-FRET (Time-Resolved Fluorescence Resonance Energy Transfer) to perform a high-throughput screen for compounds that block the interaction of RIN1 with ABL1. The modified forms of RIN1 and ABL1 used in the assay are expressed from a baculovirus vector in SF9 insect cells. We screened over 80,000 molecules from a variety of drug libraries and identified 40 compounds as hits, meaning they display inhibitory potential. To test selected compounds for inhibition of RIN1-mediated stimulation of ABL1, we will perform in vitro kinase assays, in the presence and absence of RIN1. The same approach will be carried out with kinase inhibitor-resistant BCR-ABL1 mutants in order to validate the efficacy of prospective drugs. We are primarily interested in discovering compounds that show inhibition of RIN1-mediated kinase stimulation as opposed to direct tyrosine kinase inhibitors. Selected drugs may lead to new CML treatments that outflank the undesirable effects of relapse.

A Systems Analysis of Pepperdine University as a Multi-Cultural Organization

Author(s): Darren G Becket, Haley Hacker

Mentor(s): Juanie Walker

Institution: Pepperdine University, Malibu CA

The purpose of this study was to conduct a systems analysis of diversity programs at Pepperdine University. The following research question guided the study: How well aligned is Pepperdine's treatment of diversity across its five schools? Cox and Blake's (1991) seven spheres of managing cultural diversity were used to identify components of Pepperdine's diversity program and to guide data gathering, which consisted of collecting organizational artifacts about diversity and conducting interviews with administration and faculty involved in diversity programs. Using McKinsey and Company's (1986) 7S systems model of organizational strategic alignment, researchers evaluated how well these components align with the university mission. Recommendations are made for increasing systems alignment of Pepperdine's diversity program.

Minkowski Length of Polyhedra

Author(s): Olivia D Beckwith, Matthew Grimm, Bradley Weaver

Mentor(s): Jenya Soprunova

Institution: Harvey Mudd College, Claremont CA

The Minkowski sum of two polytopes is the set of all pairwise sums of their points. In this project we studied the Minkowski length $L(P)$ of a lattice polytope P , which is defined to be the largest number of non-trivial polytopes whose Minkowski sum lies in P . The Minkowski length represents the largest possible number of factors in a factorization of polynomials with exponent vectors in P , and shows up in lower bounds for the minimum distance of toric codes. I will explain a polytime algorithm for computing $L(P)$ where P is a 3D lattice polytope. Our result extends a previously known algorithm for finding Minkowski length of lattice polygons. Our methods are substantially different from those used in the two-dimensional case, relying on a volume based argument rather than Pick's theorem. I will prove by example that there exist polytopes with up to 4 interior point that have Full Minkowski Length 1. We have also shown that a maximal decomposition can have no more than 8 interior points.

The Paradoxical Position of Homer in Plato's *Protagoras*

Author(s): Peter Beer

Mentor(s): Damian Stocking

Institution: Occidental College, Los Angeles CA

Plato's *Protagoras* presents a debate between Socrates and his formidable interlocutor, Protagoras, on the question of

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whether virtue can be taught. At one point in the debate, the two men begin an extensive evaluation of an old poem of Simonides, the ancient Greek poet. However, after a lengthy investigation, Socrates denounces the presence of extraneous voices (that of the poets) in settling such questions. He voices a preference for conducting the investigation into virtue using only the ideas of those present at the discourse. Both agree to this course of action. Strangely, immediately following this agreement to keep their discussion amongst themselves and within their own resources, Socrates quotes Homer as he inauguates the final movement of their debate. Why, having just eschewed any references to poets, does Socrates unabashedly contradict himself? Eric Havelock's seminal work *Preface to Plato* argued that Plato's entire project was to revolutionize Greek thinking by taking it from an oral or "mythopoetic" mindset to a written, and "scientific" one. Havelock's claim, one that he bases on a careful study of Homeric poetry and the psychology of oral cultures, is that scientifically analytic and critical thinking cannot take place within an oral medium. Thus, the rejection of poetic reference in the *Protagoras* might be seen as part of Plato's program to establish the possibility of a properly analytic way of thinking. And yet this does not explain the paradoxical return to Homeric citation. The point Plato is attempting to make here, so I would argue, is that the analytic method cannot finally escape the necessity of interpretation; indeed, as I hope to show, the need for interpretation even within analytic discourse can be understood as the foundation of a Platonic conception of community.

Progress Towards the Syntheses of Tripodal Tris(diphenylphosphino) Co(I/II) Complexes for Functionalization of Si(111) Surfaces

Author(s): Donatela E Bellone
Mentor(s): Harry B Gray, Michael J Rose
Institution: California Institute of Technology, Pasadena CA

Investigators from The Powering the Planet Center for Chemical Innovation (CCI Solar) have proposed a photovoltaic cell which splits water to its elemental components H₂ and O₂ using earth-abundant metal catalysts. On the H₂ generating side, there is a need to attach transition metal complexes as catalysts to a Si(111) surface. In this work, we have synthesized the metal-binding ligand (2-((diphenylphosphino)methyl)-2-phenylpropane-1,3-diyl)bis(diphenylphosphine) (PhC(CH₂PPh₂)₃) bearing three phosphino-P donors in a tripodal array; the three soft P-donors should stabilize low-valent oxidation states of first-row transition metals (like CoII/I and NiI/0) that are necessary intermediates in cathodic H₂ generation. In a tetrahydrofuran solution, reaction of PhC(CH₂PPh₂)₃ with the Co(II) starting material CoI₂ spontaneously generates the Co(I) complex [PhC(CH₂PPh₂)₃CoI(I)], which was successfully isolated, characterized by X-ray crystallography, and monitored

electrochemically. We are also synthesizing a ligand derivative, namely (2-(4-bromophenyl)-2-((diphenylphosphino)methyl)propane-1,3-diyl)bis(diphenylphosphine) (BrPhC(CH₂PPh₂)₃) bearing a single functional group at the ligand periphery for covalent attachment. The Grignard reagent of the ligand will be used to functionalize a chlorine terminated Si(111) surface and further metallated with cobalt (II) iodide. Comparative electrochemical experiments will be done on both complexes along with photoelectrochemical experiments on the functionalized silicon surface. The potential catalytic properties of each complex for hydrogen evolution and the silicon surface's enhancement or detriment on these will be studied.

Inkjet Printing of Conducting Polymers

Author(s): Pablo D Benalcazar
Mentor(s): Winnie Dong
Institution: California State Polytechnic University, Pomona, Pomona CA

Recently, there has been a strong market demand for thin, flexible and bendable conductive polymers. Poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate) is probably the most promising of currently known conductive polymers in a number of applications due to their reasonably high conductivity, good stability of the oxidized state and ease of processing. The primary goal of this project is to study and expand the use of inkjet printing as a tool for direct patterning of conducting polymers. The patterning and characterization of PEDOT:PSS as a coating on regular printing paper using an Inkjet printer will be demonstrated and discussed. The incorporation of PEDOT:PSS on paper allows for the development of a flexible and bendable, soft and free-standing "circuit board". In addition, using an Inkjet printer we will be able to draw selective patterns and designs where light emitting diodes can be attached and this will develop into a mechanically flexible and bendable display such as a roll-up display or active matrix displays.

Christian and Feminist? The Competing Views on Feminism in Christian America and its Future

Author(s): Bryanna J Benedetti
Mentor(s): Joyce P Kaufman
Institution: Whittier College, Whittier CA

This paper explores how American young women in different Christian denominations inherit and adopt certain value systems, especially with regard to feminism and reaction, or backlash, to feminism. I will examine both the correlation and the tension between feminist values and conservative (or *anti-*) feminist values, both of which find ties to Christian values, and attempt to understand how two seemingly opposing views can be grounded in one

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faith. Recognizing the time and logistical limitations of the project, I will focus on Mormon and Catholic involvement in the feminist movement within the last 50 years and the opinions of youth within these denominations. Creating and using a literature review, I will employ the history of the feminist movement and the history of the two chosen denominations to introduce the issue, and then examine the tension between Christian feminism and Christian feminist backlash. Additionally, I will employ data collected through interviews with Mormon and Catholic young women about their approaches to feminism, to investigate how the youth are dealing with this tension in their churches and to speculate the future of these religions, in regards to feminism. The paper attempts to understand how Christian values, specifically Catholic and Mormon values, support both feminism and backlash to feminism, and to what effect this tension has on the future of youth of those two churches.

Synthesis and Characterization of the Photoactive Ligand [Ru(bpy)₂(5-pyCONHphen)]²⁺

Author(s): Lauren M Bernau, Michelle T Haas
Mentor(s): Stephen M Contakes
Institution: Westmont College, Santa Barbara CA

We are investigating the preparation and properties of [Ru(bpy)₂(phen)]²⁺ containing axial-ligands for square planar oxygen-binding complexes. Because the Ru-diimine group may be used to photoreduce and activate bound oxygen we hope to use these ligands to prepare functional oxidase mimics. So far we successfully prepared the 5-pyCONHphen and reacted it with Ru(bpy)₂Cl₂H₂O to form [Ru(bpy)₂(5-pyCONHphen)]²⁺. Compounds 1 and 2 were characterized using ¹H NMR, ESI-MS, and UV-vis spectroscopy. Compound 2's photochemically-relevant Ru^{3/2+}, Ru^{2+/+}, Ru^{3/2+*}, and Ru^{2+/+} potentials were determined by cyclic voltammetry, UV-vis spectroscopy, and emission spectroscopy while the lifetimes and quantum yields of the excited state were determined using transient and steady-state emission spectroscopy, respectively. These experiments indicate that 2's photophysical properties are comparable to other ruthenium-diimine complexes. We are currently studying the ability of 2 to form adducts with Co(salen) and Fe(*meso*-tetraphenyl porphyrin).

Understanding Alienation and Sexuality through a Marxist Lens in Brian Vaughan and Pia Guerra's Graphic Novel *Y: The Last Man*

Author(s): Tiffany Bertram
Mentor(s): Bryan Rasmussen
Institution: California Lutheran University, Thousand Oaks CA

The influence of the modern comic cannot be over stressed as it acts as a medium through which a voice for current

issues can be heard, perhaps more so than its fellow novels, because it can doubly express ideas through the written word and visual realm. One such graphic novel is "Y: The Last Man" written by Brian K. Vaughn and penciled by Pia Guerra. The criticism revolving around "Y: The Last Man", has been focused on heteronormativity and sexuality, as discussed by Lyndsay Brown in her article "Don't Be A Hero Yorick: Productive Motion in 'Y the Last Man'". My argument differs from Brown's in that it discusses Marxism and sexuality, and is working to progress the understanding of Marx's theory of worker alienation. My thesis revolves around the protagonist, Yorick Brown, who is one of the few remaining sources of sperm and is therefore the last link to traditional reproduction. The high demand placed upon his sexual product makes him literally a commodity. The commodification of Yorick's sexuality is the source of his alienation from both society and himself. This paper analyzes Yorick's responses to the communistic and capitalistic economies, paying particular attention to his experiences in capitalistic cultures. It does so in order to articulate an important aspect of Marxist literary criticism by furthering understanding of graphic novels as vessels of contemporary commentaries of visual and written expression. The voice of this piece speaks to the modern dilemma in the sexual alienation of men and women, namely, the reduction of sex to a product and human sexuality as a means to that product.

Studying the Role of N-Glycans of Nipah Virus Envelope Proteins on Membrane Fusion and Antibody Neutralization

Author(s): Scott B Biering, Andy Vu, Andrew Huang
Mentor(s): Benhur Lee
Institution: UC, Los Angeles, Los Angeles CA

Nipah Virus (NiV) is a paramyxovirus capable of causing a 40 - 90% mortality rate in humans. NiV is a current bioterrorism threat agent, making it of particular research interest. NiV has two glycoproteins utilized to enter host cells. The G (attachment) protein attaches to the cell surface by binding the receptor ephrinB2 or ephrinB3, and in turn triggers the F (fusion) glycoprotein, which carries out membrane fusion during viral entry. We are interested in elucidating this triggering phenomenon being carried out by G. Our approach is to study the N-glycans on G, which we hypothesize shield the virion from the host immune response. In order to test our glycan-shield hypothesis, we mutated the G glycoprotein to remove N-glycan sites, generating multiple single and double N-glycan deletion mutants. We then tested how these mutations affected antibody neutralization, cell surface expression and fusion syncytia levels relative to the wild type G protein. Our results suggested several mutant pseudotyped virions lacking single N-glycans were neutralized more efficiently than WT, supporting our original hypothesis. Results for the double N-glycan mutants will be presented, and we hypothesize they will show a greater sensitivity to neu-

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tralization than WT or the single deletion mutants. Lastly, we have observed that the removal of certain N-glycans affects the levels of viral fusion, even though the mutant proteins express at near wild-type levels at the cell surface. Our results indicate that N-glycans protect the G protein from the immune response, but also affect the efficiency of F triggering, which initiates membrane fusion.

Science and the British Public in Gothic Fiction

Author(s): Eric J Biggerstaff

Mentor(s): Julie Smith

Institution: Pepperdine University, Malibu CA

My paper details the evolution of popular British sentiments concerning science articulated in *Dracula* and *Frankenstein*, works of Gothic fiction composed and widely read during the nineteenth century. During this time, Britons saw the country experience change politically, economically, socially and technologically with degree and speed unprecedented in its history. Rapid and sweeping advances in scientific fields such as medicine and industrial technology yielded an abundance of knowledge that resulted in a significant surge in humanity's perceived power over nature, a circumstance that edified the Victorians' emerging identity as discerning and practical while helping bury Romanticism, propelling Britain into modernity. However, public reaction to the great strides made in science was not harmonious but was marked by a conflicted ambivalence. Though few questioned the obvious benefits of fostering scientific understanding, its ever-increasing presence in Britons' lives became almost obtrusive, leading to sober reflection on the implications of excessive scientific pursuit. Checking its progress was unlikely, and reversing it was out of the question, so if Britons were to live comfortably with science, they had to find a way to come to terms with it. *Frankenstein* and *Dracula*, written respectively at the beginning and end of the century, present a great opportunity to consider the popular reimagining of science that occurred during the 1800s: the public anxiety about science crystallized in both Shelley and Stoker's novels illustrates a shift in British perception of science as threatening to science as accommodating. The novels' heavy incorporation of nineteenth-century scientific advances, both real and imaginary, as well as the spirited contemporaneous reaction to the novels, indicate the resonance they achieved with Britons and make them useful barometers of public sentiment regarding science.

Growing Microalgae for Biofuel in Wastewater Media

Author(s): Kathleen R Bishop

Mentor(s): Iraj Nejad

Institution: Mount San Antonio College, Walnut CA

Algae production as a source of renewable fuel is a promising new prospect. Research is being done to find ways to make algae oil as cost effective and viable as petroleum. In this project, experiments are done at Cal Poly Pomona growing various strains of a type of microalgae called *Chlorella vulgaris* in two types of wastewater media. The medias are prepared identically except one contains glucose. It is hypothesized that the glucose may in fact enhance the algae growth; however a glucose rich media also provides a suitable environment for bacterial growth that may out-compete the algae cells. The samples were grown indoors inside glass flasks using artificial light. Data considered relevant to analyzing the algae productivity was collected. For instance, absorbance is measured to indicate the thickness of algae cells in the water. The goal of this part of the experiment is to test the productivity in glucose rich water as opposed to the same media containing no glucose. After a five day trial, it was determined that the glucose rich water was a better media for algae growth. The glucose media was then tested further to determine exactly which components in the water the algae were using. The glucose media samples were transferred into larger containers also kept indoors under artificial lights. Measurements of the concentrations of certain dissolved compounds, such as phosphate, began. These measurements indicates specific quantities of certain nutrients being utilized by the growing algae. This portion of the project lasted another five days in which all the algae samples continued to thrive. Once this experiment was complete, the algae were transferred to their final destination in out-door ponds.

The One Who Brings the Color: Lancelot's Role in Modern Arthurian Legend

Author(s): Katharyn R Blair

Mentor(s): Julianne Smith

Institution: Pepperdine University, Malibu CA

Variations of Arthurian legend, such as Thomas Malory's *Morte d'Arthur*, Tennyson's *Idylls of the King*, and T.H. White's *The Once and Future King*, have intrigued readers over the centuries. The legends in English represent the struggle between dutiful loyalty to others and passionate loyalty to self, realized by the most famous love triangle in history: Lancelot, Guinevere, and Arthur. The Arthurian texts mentioned above characterize Arthur as loyal and dutiful to others, and Guinevere as loyal to passion and self. Where then, does this leave Lancelot? Is he a moral degenerate for stealing his best friend's wife, or a hero for following his heart? Lancelot is a hybrid of these two seem-

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ingly incompatible virtues, a fact that is the source of all his inner-turmoil and confusion. He is neither as pure as Arthur nor as singularly passionate as Guinevere, yet he has elements of both. This realization makes him a sympathetic and relatable character, for in this way he may be the most "human" of all Arthurian characters. Lancelot remains consistent in this role in the most modern, popular versions of the story: caught between two opposite figures, with an agonizing allegiance to both. Neither white nor black, he is, as Tennyson puts it, the one who "brings the color."

The Effects of Ischemic Preconditioning on Pulmonary Parameters and Exercise Performance at Altitude

Author(s): Ross C Blanchard

Mentor(s): Ben Aronson

Institution: University of Redlands, Redlands CA

One of the limiting factors in aerobic exercise is the ability of the cardiovascular system to deliver blood and oxygen to working muscles, which is in turn limited by the cardiac output and the oxygen carrying capacity of the blood. Thus, any factors that augment or decrease maximum cardiac output with exercise will significantly affect performance in extreme environments. Ischemic preconditioning (IPC) is one of the most powerful protectors of heart muscle. IPC is performed, by cutting off circulation to an extremity with a blood pressure cuff intermittently for four 5 minute periods a week before testing. We are to evaluate the effects of IPC on heart and blood pressures and to high altitude oxygen deficiencies and exercise, and also to identify upregulated protein expression due to IPC. This will provide a better understanding of the molecular and metabolic changes that occur with exercise in extreme environments, including identification of biomarkers that have never been linked with exercise and environmental stress. This summer, subjects are being taken to 12,000 ft and will run 7.5 miles in distance, 2,500 ft in elevation, with and without ischemic preconditioning on two separate instances, serving as their own controls. Blood draws, oxygen delivery to muscles, pulmonary and blood pressures, brachial artery dilation, oxygen saturation, right ventricular function, mental status, and target accuracy will be measured at altitude, and/or at ground level. Testing will be done through appropriate means - pulmonary pressures, brachial artery dilation, and right ventricular function through echocardiography; blood pressure with sphygmomanometers; oxygen delivery and saturation through VO₂ max tests at sea level; mental status through standardized tests; and target accuracy through laser pointer accuracy. Results showed a 6.3% improvement in exercise performance, as well as significant improvements in target test, pulmonary pressures and brachial artery dilation as well.

The Relationship between Childhood Sexual Abuse, Early Maternal Attachment and Sexually Risky Behaviors

Author(s): Stephanie D Bolanos

Mentor(s): David Chavez

Institution: CSU, San Bernardino, San Bernardino CA

Childhood sexual abuse has been associated with participation in risky sexual behavior in adulthood. Research examining protective factors potentially moderating this relationship is limited. Our current study examines the moderating role of early maternal attachment between childhood sexual abuse and risky sexual behaviors in a sample of college women. *The Childhood Trauma Questionnaire (CTQ)* (Bernstein, Fink, Handelsman, & Foote, 1994), was utilized to assess childhood sexual abuse. Armsden and Greenberg's (1987), *Inventory for Parent and Peer Attachment (IPPA)* was used to examine quality of early maternal attachment. The *Sexual Behavior Questionnaire (SBQ)* (Chavez and Stockwell, N.D.), was employed to measure sexually risky behaviors along an age continuum. We expected that a secure early maternal attachment bond would moderate the relationship between childhood sexual abuse and engagement in sexually risky behaviors. Preliminary analysis demonstrated a relationship between quality of early maternal attachment and childhood sexual abuse, as well as risky sexual behaviors in the expected directions. However, early maternal attachment was not found to be a significant moderator for the relationship between childhood sexual abuse and risky sexual behaviors, due to our finding of no relationship between childhood sexual abuse and sexually risky behaviors. Our results suggest that maternal attachment quality should be further examined as a possible preventive factor of childhood sexual abuse.

Silencing of the Rheb Gene in Mammalian Cells Using RNA Interference

Author(s): Ashley R Bonneau

Mentor(s): Nitika S Parmar

Institution: CSU, Channel Islands, Camarillo CA

The insulin/Rheb/mTOR pathway has been implicated in a variety of cancers. The activation of mTOR (Mammalian Target of Rapamycin) is regulated by an upstream G-protein, Rheb. Two Rheb genes exist in mammalian systems Rheb1 and Rheb2 (RhebL1). Although Rheb1 and Rheb2 share significant sequence homology we hypothesize that Rheb2 may have distinct functions of its own and may not be a redundant Rheb gene as is presently believed. Previously, Rheb 2 has been shown to be tissue specific while Rheb1 is expressed ubiquitously. To elucidate the function of Rheb2, gene silencing using RNA interference was utilized. Both Rheb1 and Rheb2 were expressed individually in human cell lines as GFP-fused proteins. Expression was confirmed via fluorescence microscopy. A variety

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of different commercial synthetic siRNAs toward both Rheb1 and Rheb2 were tested at different concentrations (0-100nM) for different periods of time (24, 36 and 48h) to optimize most suitable conditions for silencing. Endogenous Rheb1/2 was silenced either individually or in a dual manner. Effect of single and double silencing on growth profiles of cells was analyzed via MTT cell viability assays. Effect on mTOR activation was studied using immunoblotting and probing for phosphorylation status of downstream effectors (phosphoS6 and phosphoS6 kinase). This study shows for the first time that Rheb2 does not impact the mTOR pathway in the same way that Rheb1 does and provides exciting data that reinforces our hypothesis that Rheb2 may in fact have specific roles not attributed to Rheb1. This is also the first report to simultaneously study endogenous versions of Rheb1 and Rheb2 rather than over-expressed forms of the same and provides a true profile of natural signaling conditions within a cell.

Lilys

Author(s): Courtney B Branch
Mentor(s): Joseph Piasentin
Institution: Pepperdine University, Malibu CA

Flowers intrigue me. They bring comfort, healing, happiness, and then there is their cycle - the reincarnation of life. The process and motions that go into the painting of a flower, as a flower, can have a cycle, and some times also a reincarnation. When beginning a painting I never have a picture in my mind, I simply start. Building through perceptual responses, the paint leads me to jump across the canvas applying layers and textures that are looking to draw out emotion in me and perhaps, in the viewer. Pushing realism towards abstraction, I am looking at flowers and learning about myself.

Excavation

Author(s): Emily J Branch
Mentor(s): Joe Piasentin
Institution: Pepperdine University, Malibu CA

Paint can be manipulated in a variety of ways. The way it is handled by the artist affects the response of the viewer. This painting is about adding and subtracting. Although the subject is three pots on a porch, the focus of the work is composition and texture. I mainly explore the cubist concept of breaking up a flat picture plane with separate, multifaceted areas of paint. The three-dimensionality of the objects and the depth of space are unimportant. Instead, the painting is about the exciting unearthing of what lies beneath the represented scene. I vigorously carved out sections of paint like pieces of a puzzle, and reveal something spontaneous. The painting also has playful bright colors on top of and against one another. This layering and scraping of materials invites the viewer to participate in the painting's evolution.

Isolation of Saccharides in Dairy and Soy Products by Solid-Phase Extraction Coupled with Analysis by Ligand-Exchange Chromatography

Author(s): Kelsey R Brereton
Mentor(s): David B Green
Institution: Pepperdine University, Malibu CA

Consumer safety and quality assurance requires accurate analysis of some components of dairy and soy products prior to distribution. Most current methods of sample preparation for saccharide analysis in dairy and soy products can be time consuming and often require the use of a variety of hazardous reagents. We have developed a method to quickly and quantitatively isolate the saccharides from a variety of dairy and soy products utilizing reversed-phase solid phase extraction to remove fats, fatty acids, and lipids followed by desalination and deproteinization by ion-exchange solid phase extraction. Analysis of the isolated saccharides was performed by ligand-exchange high performance liquid chromatography. The method presented requires no prolonged heating (thus protecting the saccharides from hydrolysis), uses reagents no more hazardous than dilute acetic acid, and realizes a factor of two to three in time savings over existing methods. The isolation and analysis of monosaccharides (glucose, galactose and fructose), disaccharides (lactose and sucrose), and polysaccharides (raffinose and stachyose) from dairy products (whole and reduced fat milk, yogurt, and lactose-free), infant formula (powdered and premixed), and soy beverages were studied in this investigation with recoveries ranging from 90%-110% in all products studied, except powdered infant formula. We also applied the method to quickly discriminate authentic soy milk from a soy beverage branded as soy milk.

Color and Communication for the 21st Century Artist

Author(s): Lindsey E Brittain
Mentor(s): Terry Spehar-Fahey
Institution: California Lutheran University, Thousand Oaks CA

The purpose of the project was to complete an in depth study of the history of color in the visual arts and communication fields and to produce a body of creative work based on color manipulation that would elicit emotional responses to the various color combinations. This study addressed biological, technological, and cultural influences on artists' use of color and viewers' responses to that art. The research included a review of the literature for contemporary thinking on the biology of sight and the ramifications that biology has on viewers' responses to visual stimuli. It also reviewed the technological advances in pigments that have occurred throughout history and the influence that pigment quantity and quality has on the look of images. Cultural and social implications for the

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meanings of colors were also addressed in the research. I created a body of work focused on my intuitive, personal response to color using informed judgment when experimenting with juxtapositions of hues in order to maximize the viewers' emotional responses to the work. I chose a theme and produced six finished paintings. The project concluded with a public display of the creative work. It was an interactive art show, where surveys were conducted to collect data from the audience on their individual physical, intellectual, and emotional responses to the color before them. The viewers were asked to describe their sex, their cultural background, and their age: factors that are known to affect responses to color. The project sought to find a correlation between my emotional intent in the creation of the piece and the viewer's reception of the message and found that my predicted effects were supported by viewers' responses.

Life Purpose & Personal Relationships: Implications of Hope

Author(s): Brandon M Brown

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

Hopes impact on an individual's internal state has varied vastly and has been studied widely. Some researchers have concluded that hope is driven by our thought process, and our ability to create and pursue our goals. Others have suggested that hope is building on what an individual already considers satisfactory. The current study examines the relationship between hope and life purpose. More specifically, it was hypothesized that hope would be more important to an individuals' sense of purpose than satisfaction with personal relationships. The research is based on a sample ($n = 1034$, $M_{age} = 37.71$ years, age range: 18-91 years) of community dwelling adults in Southern California. The first step in the analyses was to construct four item measure of life purpose by combining items that assessed respondents' place in society, life purpose, life consistency, and life satisfaction (Cronbach's $\alpha = 0.84$). The next step utilized a hierarchical regression model to assess the ability of hope (measured by the Adult Dispositional Hope scale) to account for variance in life purpose beyond that attributable to demographic variables and personal relationships. The results were significant ($F_{(13, 1034)} = 20.42$, $p < 0.001$, $R^2 = 0.21$), hope made a significant unique contribution despite the presence of both demographic variables as well as several measures of personal relationships satisfaction. Implications for both hope and personal relationship research areas are discussed.

Characterization of Gene Transcripts from the Tarsi of the Arboreal Tarantula, *Poecilotheria regalis*

Author(s): John Carlo Brown, James Starrett

Mentor(s): Cheryl Hayashi

Institution: UC, Riverside, Riverside CA

Spiders are well-known for their ability to produce silk from glands in their abdomen and utilize the silk for various purposes. Less well-known is that silk-like secretions have also been observed from the tarsi ("feet") of species of tarantulas. These secretions have been proposed to help prevent these spiders from falling and assist in mobility. Genes encoding the silk produced in the abdomen have been characterized for a number of spider species, but no one has determined what genes are expressed in the tarsi of spiders. Thus, it is unknown if the genes that encode for the secretions produced in the tarsi of tarantulas are similar to those that produce silk in the abdomen, or whether novel genes encode the tarsal secretions. To address this issue, my project involves dissecting tarsi from *Poecilotheria regalis* (arboreal Indian Ornamental tarantula), isolating expressed genes in the form of messenger RNA (mRNA), converting mRNA into complementary DNA (cDNA), and cloning cDNA into plasmids. The clones are arrayed into a library and plasmids are selected for DNA sequencing. The resulting nucleotide sequences are analyzed with methods such as BLAST, which seeks significant matches to previously characterized genes. Thus far, I have identified tarsal transcripts that correspond to genes generally expressed in cells (housekeeping genes) and have not found transcripts that match spider abdominal silk genes. There are also potential transcripts that may be novel genes and could possibly code for structural proteins (silks are structural proteins). By continuing this research, I hope to further understand the genes that underlie the silk-like secretions of tarantula tarsi.

From the U.S. to Africa and Back Again: Discovering Ghanaian Contemporary Visual Arts

Author(s): Shelley A Bruce

Mentor(s): Patricia de Freitas

Institution: California State Polytechnic University, Pomona, Pomona CA

The work of artists in Ghana and within the greater African continent is a rapidly growing topic of interest, investment and debate. This study seeks to investigate the elusive history, conceptual discussions, and emerging development of contemporary arts in Ghana, a country internationally recognized for its unique history and culture. The exploration is done using various linked perspectives, which includes the views of artists, scholars, buyers and sellers of Ghanaian art, as well as that of the researcher. Significant to this study is a constant awareness of this researcher's "outsider" position. This self-reflective positioning is criti-

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cal when discussing art, a subject intrinsically influenced by the power of perception. Utilizing the concept of "gaze" as a theoretical framework, the study examines developments and/or dilemmas encountered when discussing Ghanaian art from African and non-African perspectives. Furthermore, emphasizing the importance and integration of "insider" and "outsider" views when examining Ghanaian art may help scholars rethink their overarching academic Western art discourses, those so often based on unquestioned and stereotypical assumptions about Africa and African culture.

Happiness Can Be Achieved through Family

Author(s): Sarah E P Bryan

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

Research has shown that quality of life can be affected by family ties. For instance, many parents have stated that having a close relationship with their children even in adulthood was essential. Several other studies have indicated that personal happiness relies on how well one is doing in regards to family. There is also some evidence that for both boys and girls it is easier to communicate with their mothers as opposed to fathers. The present study determines if there were relationships between quality of life and family closeness. A survey was designed and administered to adults from a large Southern California county ($n = 65$). It is hypothesized that positive family bonds were related to positive quality of life. Quality of life was assessed using the Delighted-Terrible scale; family closeness was assessed utilizing items created by the research team. Using a hierarchical regression model, the results supported the hypothesis. Respondents who were closer to their mother had significantly higher quality of life when compared to those who were not close to either parent. Interestingly, this pattern was not found for fathers. This study extends the existing literature by highlighting the importance of a mother's communication on a child's quality of life evaluation.

Comparison of Freeway Terminal Junction Design Alternatives

Author(s): Giovanni A Bryden

Mentor(s): Wen Cheng

Institution: California State Polytechnic University, Pomona, Pomona CA

Freeway interchanges are integral parts of our transportation system. A well designed, properly implemented freeway interchange can add to the safety of a freeway corridor and redirect traffic in an efficient and cost effective manner. There is fairly extensive literature focused on methods and types of interchange designs. In comparison, considerably less research has been dedicated to evaluat-

ing the performance of various interchange designs. The study centers on the employment of a simulation method to conduct comprehensive comparisons of two types of interchange designs (Types F-5 and F-6) where one freeway terminates at the junction with another freeway. To carry out the performance comparison, project data including traffic volumes, planimetric and topographical information, etc. were first collected from Caltrans. An electronic design of the two types of freeway terminal junctions was then created using Microstation and InRoads. To ensure the fair comparison of the two junction types, the same design elements allowed by Caltrans Highway Design Manual standards were used which include various side slopes, shoulder widths, median cross slopes, and so on. The geometric design was followed by a cost analysis. Subsequently, the designs of the two junction types were modeled using the Synchro 7 software package. Performance data such as volume to capacity ratio, Intersection Capacity Utilization (ICU) level of service, and control delay were then obtained and compared through various simulation runs. The results indicate the two types of junction designs illustrate both advantages and disadvantages in terms of different performance criteria.

Does Crash Underreporting Significantly Impact the Identification of Crash-Prone Locations?

Author(s): Giovanni A Bryden

Mentor(s): Wen Cheng

Institution: California State Polytechnic University, Pomona, Pomona CA

Hot spot identification (HSID) plays a significant role in improving the safety of a road network. Numerous hot spot identification methods have been developed and proposed in the past. Most of them rely heavily on official crash statistics to conduct HSID. Crash underreporting, along with many other issues, has long been recognized as a threat to the accuracy and completeness of historical traffic crash records. As a natural continuation of a previous study, the paper intends to evaluate the exact influence underreported crashes might have on HSID. To conduct the evaluation, five groups of data gathered from Arizona Department of Transportation (ADOT) over the course of three years are adjusted to account for fifteen different levels of underreporting. Three identification methods are utilized: simple ranking (SR), empirical Bayes (EB) and full Bayes (FB). Various cutoff levels to establish hotspots are explored. Finally, two evaluation criteria are compared across HSID methods. The results illustrate that the identification bias due to crash underreporting may be significant. Comparatively speaking, the crash underreporting has the largest influence on the FB method, and has the least influence on the SR method. Additionally, the impact appears to be positively related with the percentage of the underreported PDO crashes, but inversely related with the percentage of the underreported injury crashes.

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This is significant because it establishes that although PDO crashes are seen as the least severe, they have the most significant influence on hot spot identification.

Parental Education and its Relation to Self Accomplishment

Author(s): Corey Bush

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

Parental Education and its effect on educational attainment is a topic that has been studied numerous times in the past (Flouri & Eirini, 2008). Some studies have concluded that parental practices and values are associated with academic self-regulation in college students (Strage, 1998), while others argue that parents' educational attainment is related to children's achievement through the beliefs and behaviors of parents (Davis- Kean & Pamela, 2009). The present study expands on this research by examining the correlation between Parental Education and Life Accomplishments utilizing a sample of community dwelling adults in Southern California, the reports were based on analyses from a sub-sample of a larger survey ($n = 76$). It was hypothesized that parental educational levels would relate with success in adult life and create a better life for the subject. Results supported this in that respondents did achieve higher levels of educational success related to their parent's success in the educational system. In addition, they reported increased likelihood of accomplishing their goals. The discussion focuses on people's levels of education in relation to their parents educational level, and their self- reported success in life because of it.

The Literary Construction of Asian Hybrid Identities

Author(s): Juan P Bustos

Mentor(s): George Da Roza

Institution: Whittier College, Whittier CA

Works such as *Monkey Hunting* by Cristina Garcia, *Cuentos Completos* by Siu Kam Wen, *Brazil-Maru* by Karen Tei Yamashita, *Flores de un solo día* by Anna Kazumi Stahl, and *La Isla de los Amores Infinitos* by Daina Chaviano contain characters that function and contribute to the construction of a "third space" that speaks not of cultural displacement but rather reverse displacement which ultimately leads to a hybrid identity. A hybrid identity is an identity that can come from a multitude of formations (i.e. ethnically and/or culturally) because it is not one or the other but both or more. Cultural displacement occurs when an individual cannot associate with a culture and the practices associated with it; or when a person perceives the individual unable to associate with that culture. Reverse displacement is when an individual can feel associated with a specific culture but the people within that

culture cannot associate with that person. The third space, on the other hand, is a terrain that has ample space to move around with a tendency to rupture categories of race, gender, sexuality, class, nation, and empire. The purpose of this study is to analyze to hybrid identities and examine the function of Asian Latin American characters as methods that perpetuate or subvert accepted stereotypes and/or prejudices within the Latin American context in order to demonstrate how the experiences of the Asian immigration into Latin America replicates a transnational experience of diasporic groups. Since this study is still in its preliminary stages, the presentation will focus on the novel *Monkey Hunting* by Cristina Garcia.

"I Would Prefer Not To": Fostering Humanity through Negation in Melville's "Bartleby"

Author(s): Alison R Caditz

Mentor(s): Warren Montag

Institution: Occidental College, Los Angeles CA

Interpretations of Herman Melville's short story "Bartleby" are as varied as they are numerous. Many critics understand the tale to be an autobiographical allegory of Melville's disenchantment with the writing industry, a critique of Wall-Street, or a satire of the author's contemporaries. I reject these interpretations which superimpose external sources to derive meaning. Rather, I argue that the central message is immanent to the story itself, and offer a hermeneutical approach which directly addresses both what the text says, and what it does not. "Bartleby" is replete with negation: that which is destroyed, denied or simply does not appear. The primary and most stirring occurrence of negation in the text is Bartleby's recurring utterance, "I would prefer not to." In five words, Bartleby threatens the narrator's very existence, destroying the orderly walls of his systematic life. Nevertheless, I argue that affirmation and negation are inextricably linked, and frame this idea within the philosophies of Derrida, Deleuze and Hegel. Bartleby ultimately represents a positive negation of the self, and his death, the ultimate negation, demonstrates that only annihilation and negation allow for recognition of the human condition. Through a formal analysis of the text, a linguistic examination of how the affirmative and the negative combine syntactically, this paper explores the possibility that negation fosters the recognition of human dignity and compassion.

A Study of Water Quality and Nano Filtration Membrane Systems in Ghana

Author(s): Thomas Marc Cahuzac

Mentor(s): Adrian Hightower

Institution: Occidental College, Los Angeles CA

Throughout 2009 and 2010, a water filtration system, which uses a nano filtration-membrane was designed.

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The goal of the design was to optimize productivity while keeping energy requirements as low as possible, in hopes of providing clean water to the population of Ghana. This system enabled us to determine that water sources in Ghana could be effectively treated to supply the population of major cities using a pressure-driven nano filtration membrane system. Although further testing, including biological and physical tests, is required before it can be determined that the water treated by our system is potable, preliminary tests enable us to say that this is most probably the case. The water, after filtration, regardless of its source had a turbidity below 0.5 NTU, which is the international standard in most developed countries. The system also reduced the concentration of total dissolved solids by 5.6%, the conductivity by 4.5% and eliminated all traces of iron in the water. Data were also acquired from treatment plants in Ghana, including daily physical and biological tests results, which enabled us to make a comparison between our system and the system currently being used in Ghana.

Terpene Content of Common Local Vegetation

Author(s): Kiara N Calbart

Mentor(s): Nicole Bouvier-Brown

Institution: Loyola Marymount University, Los Angeles CA

It is important to identify plant species that emit large amounts of biogenic volatile organic compounds (BVOCs) that play a significant role in air quality. Therefore, this experiment focuses on the emissions of native and non-native plants that are commonly grown in residential neighborhoods or planted along roadsides. Analysis of BVOCs in the leaf content will help identify potential emitters. Branches from the three native plants and four non-native plants were collected in the Loyola Marymount University campus neighborhood. Leaves and flowers were carefully removed from the branches, freeze-dried, and ground. BVOCs were extracted from one gram of each sample with cyclohexane. The filtered extract was then analyzed using a gas chromatograph mass spectrometer (GC-MS). Data analysis focused on quantifying terpenes due to their reactivity in the atmosphere. The native plants showed very little terpene content, and if terpenes were present they tended to be sesquiterpenes. The non-native plants contained significantly more terpene compounds, with a larger percentage of monoterpenes and oxygenated monoterpenes. Monoterpenes are more volatile and thus more likely to be emitted into the atmosphere. The results presented here indicate that humans may have dramatically changed the suburban air quality by simply planting non-native vegetation.

A Magnetic Angle Changer for Deflecting Low Energy Electrons

Author(s): Colin F Campbell

Mentor(s): Murtadha A Khakoo

Institution: CSU, Fullerton, Fullerton CA

We will present the design and implementation of a Magnetic Angle Changer (MAC). A set of concentric cylindrical electromagnets used in low energy electron spectrometre experiments to deflect scattered electrons. The use of a MAC will allow the gathering of small angle and back scattered electrons, allowing differential electron scattering experiments to cover the full 180° scattering range.

Consumer Culture and Childhood: The Image of the Child in Toni Morrison's Adult Novels and Children's Fiction

Author(s): Asha Canady

Mentor(s): Elizabeth Chin

Institution: Occidental College, Los Angeles CA

This research examines Toni Morrison's commentary on the relationship between consumer culture and its influence on the construction of childhood. Morrison's work is perfect to examine for the following reasons: her influence and acclaim within the discourse on American literature, her use of children as primary characters in both her adult and children's literature, as well as a consistent amount of work to use as a point of reference. For the purposes of this presentation I will be comparing and contrasting *The Big Box* as well as *The Bluest Eye*. I ultimately argue that Morrison is aware, of what one critic describes as the dual audience, and makes a clear and deliberate statement to adult consumers about their role in the development of childhood.

Synthesis of a Wittig Reagent Containing Hydroxyl Groups from a Cyclic Carbonate

Author(s): Kelsey D Cannon

Mentor(s): David F Marten

Institution: Westmont College, Santa Barbara CA

Wittig reagents are common compounds used in organic synthesis for the highly selective formation of alkenes. Chiral auxiliaries are components of molecules which help direct the selective formation of one stereoisomer in a chemical reaction. It has been our objective to prepare chiral auxiliaries that contain reactive groups (like hydroxyl or amine) in substrate alkenes produced from a Wittig reaction. The idea is that there might be a more significant influence on the chirality transfer process, in an addition reaction on a remote alkene, if one of these groups (alcohol in the current case) is present. We found that the tradi-

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tional method for formation of a stabilized Wittig reagent possessing a remote hydroxyl group, did not work and a side reaction of reduction predominated. However, when a cyclic carbonate is used with methylenetriphenylphosphorane, the desired stabilized ylide is produced in high yield. The objective of this project was to see if additional stabilized ylides could be prepared with hydroxyl groups present in a chiral auxiliary. An additional example of this was in fact accomplished by preparing a diol derived from (-)methyl mandelate by reaction with methylmagnesium iodide, producing 1-phenyl-2-methylpropane-1,2-diol {PhCH(OH)C(OH)(CH₃)₂}. The diol was converted to the cyclic carbonate through treatment with carbonyldiimidazole (CDI), and this produced the desired Wittig reagent, after reacting it with methylenetriphenylphosphorane. Subsequent treatment with *p*-tolualdehyde produced the expected α,β -unsaturated ester [ArCH=CH-CO₂-C'HPhC(OH)(CH₃)₂]. We will now explore the selectivity of addition of an organometallic reagent to this alkene.

Effects of Urbanization on North Carolina State University's Campus Since the 1970's

Author(s): Adrianna Cardinal-De Casas

Mentor(s): Rob Dunn

Institution: North Carolina State University, Raleigh NC

Urban landscapes are becoming more common all over the world. Often urban disturbance is associated with the presence of exotic and invasive species. Indicator taxa provide excellent models for measuring the effects of disturbance on the establishment of invasive species. Ants have been considered a good taxon for such purposes due to their diversity, abundance, ease of collection, and ecological relevance. A 1973 study of the ant communities occupying North Carolina State University's campus revealed 56 species distributed in several habitat types. In this study we examined how the increase in urbanization and the influx of invasive species have impacted ant diversity over the past 40 years. We hypothesized that the introduction of both exotic and invasive species of ants and the urbanization of campus should decrease the number of native species present. We used baiting traps to census ant communities in five different habitats. During this study we collected 19 species. The most common species collected was the invasive species *Solenopsis invicta*, not found 40 years ago. The highest species richness was observed in the forest habitat while the four other habitats (lawn, shrub, isolated tree, paved walkways) were not significantly different from each other. Our results suggest that conservation of forest habitats within urban matrix is important to preserve native species diversity.

Physical Activity, Acculturation, and Psychosocial Well-Being During Pregnancy and Postpartum

Author(s): Kjirsten Carlson, K Gallington, K Fertala, A Uhrinak, S Dunn

Mentor(s): Cooker Perkins

Institution: Pepperdine University, Malibu CA

Physical activity during pregnancy and postpartum is associated with better maternal health outcomes. Correlates of physical activity during pregnancy and postpartum are not well understood in Hispanic women relative to level of acculturation or psychosocial well-being. Apparently healthy Hispanic women (18-35 yr) between 1-6 mos. postpartum were recruited from a tertiary care clinic in Ventura County, California. Subjects completed a written questionnaire (translated into Spanish) in order to assess physical activity (Kaiser Physical Activity Survey) and level of acculturation. Medical records were obtained for clinical data including gestational anthropometrics and Patient Health Questionnaires (PHQ-9). All results are expressed as mean \pm standard deviation. In the current sample of women ($n = 33$), the mean for each of the three sub domains (household/caregiving, active living habits, and sport/exercise) of physical activity as well as overall total physical activity was higher during pregnancy than the postpartum period ($\pm SD$; 7.8 \pm 1.4 and 6.6 \pm 1.6, respectively). Total physical activity during pregnancy was significantly related to total physical activity in the postpartum period ($r = 0.7$; $p < 0.05$). Depression score during the 3rd trimester was significantly related to *household/caregiving (HCI)* activity during early postpartum ($r = 0.55$; $p < 0.05$) when controlling for parity. Age of arrival into the U.S. was related to level of acculturation ($r = 0.66$; $p < 0.005$) and a non-significant trend between level of acculturation and *active living habits* was found. Hispanic women who had higher depression scores during the 3rd trimester of pregnancy were more likely to have higher levels of household/caregiving activity early in the postpartum period, independent of parity. It is possible that some domains of physical activity (household/caregiving) may not have the same positive relationship on psychosocial well-being.

Role of Potassium Channels in Mediating Endothelium-Dependent Dilation

Author(s): Matthew R Carter, Eric Gray, Han D Lee

Mentor(s): Jeffrey Jasperse

Institution: Pepperdine University, Malibu CA

Increases in tissue blood flow are mediated by dilation of arteries. Dilation is frequently coordinated by communication between endothelial and smooth muscle cells in the arterial wall. Nitric oxide (NO) and prostacyclin (PGI₂) are well-known signaling molecules, but inhibition of nitric oxide and prostacyclin only partially blocks

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endothelium-dependent dilation. The remaining dilation may be due to one or more endothelium-derived hyperpolarizing factors (EDHF). We tested the hypothesis that K⁺ channels (specifically K_V, K_{ATP}, K_{IR} and the Na-K pump) may mediate the EDHF response. Rat soleus feed arteries (n=37) were isolated, cannulated and pressurized at 90 cm H₂O. Acetylcholine (ACh) dose response curves (10⁻⁹ - 10⁻⁴ M) were performed in the absence and presence of various K⁺ channel inhibitors and in conjunction with inhibition of NO and PGI₂ production. In the first group, ACh caused an 87.3 ± 2.8% dilation, which was reduced by K_V inhibition to 80.1 ± 3.5% dilation, and reduced further by combined K_V and K_{ATP} inhibition (41.5 ± 7.5%). In the second group, ACh caused 80.6 ± 7.2% dilation. NO and PGI₂ inhibition reduced dilation to 31.4 ± 9.5%. Inhibiting K_V as well as NO and PGI₂ did not further significantly decrease the dilation, but adding combined K_V and K_{ATP} inhibition reduced ACh dilation to 8.3 ± 3.7%. In the third group, ACh caused an 82.6 ± 3.5% dilation, which was not reduced significantly by Na-K pump inhibition. Coupled Na-K pump and K_{IR} channel inhibition reduced dilation to 64.6 ± 5.9%. NO and PGI₂ inhibition reduced dilation to 32.7 ± 7.9%. Combined Na-K pump, K_{IR}, NO and PGI₂ inhibition reduced dilation to 16.4 ± 3.9%. Collectively, these data indicate that K_V, K_{ATP}, K_{IR} and the Na-K pump all contribute to EDHF dilation.

Changing Hearts: The Future of the Environmental Movement

Author(s): Emily R Casey

Mentor(s): Chris Doran

Institution: Pepperdine University, Malibu CA

For many, the environmental movement is a consumer fad with very little intellectual or emotional investment. Generally, sustainability is deemed a “good thing” but given low priority at both the personal level and the public policy level. In this paper, I argue that environmentalism must be modified to meet the needs of the general populace in order to gain momentum as a contemporary political movement. In other words, I question how the environmental movement can attract the massive number of active members necessary to change public policy. I contend that this movement will need to adapt to the public in two ways. First, I suggest that it should transition to an anthropocentric, or human-oriented, angle when introducing people to the merits of sustainability. While biocentric ethics, or the recognition of the intrinsic value of all life forms, is an essential component of sustainability, I maintain that a clear emphasis on human life will be more compelling for potential new members. I demonstrate that the human impact of the BP oil spill has roused recent public interest in environmentalism. Second, I explore the unique capacity of faith communities in the United States to change hearts and unite believers into political action. I demonstrate that Christian communities in the past have changed public policy by relentlessly

pursuing human rights violations, namely in the abolitionist and civil rights movements. Similarly, I hold that Christian communities should champion the cause of sustainability as part of a larger social justice issue.

Flower Preference and Visit Duration of European Honey Bees (*Apis mellifera*) on Seedless Watermelon (*Citrullus lanatus*)

Author(s): Jacob Cecala

Mentor(s): Joan Leong

Institution: California State Polytechnic University, Pomona, Pomona CA

The European honey bee (*Apis mellifera*) has long been considered the most important pollinator in agricultural ecosystems. Much attention is being paid to honey bees in light of recent, dramatic population declines due to Colony Collapse Disorder. Previous research on the pollination of the monoecious watermelon plant (*Citrullus lanatus*) suggested bee foraging behavior differed among individuals based on whether they carried clumps of pollen on their hind tibiae or not. Thus, we investigated whether bees carrying pollen foraged differently than those that did not. We hypothesized that pollen-carrying bees would have a greater affinity for male flowers, while bees without pollen would prefer female flowers. Honey bees were categorized as either pollen foragers (carrying pollen) or nectar foragers (lacking pollen). Random bee visits to watermelon flowers were recorded with regard to the sex of the visited flower and the duration of the visit, which was used as an indication of preference for that flower. A longer visit was interpreted to mean that the bee perceived the flower as having more resources related to its foraging tendencies. The sex ratio of flowers visited by individual bees was also recorded, as well as the sex ratio of male and female flowers in the watermelon field. Our results indicate that honey bees do not seek out specific sexes of flowers, but rather visit randomly with respect to flower sex. However, nectar foragers spent significantly longer periods of time foraging on female flowers, which are known to offer more abundant and easily accessible nectar. Not surprisingly, pollen-producing male flowers received longer visits from pollen foragers. These results are fairly consistent with our initial hypotheses. Longer visits on female flowers by bees not specifically foraging for pollen may serve to increase stigmatic pollen deposition.

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Phylogeny From Select Subsets of the Pangenome

Author(s): Nicholas P Celms, James Nulton, Peter Salamon

Mentor(s): Robert A Edwards

Institution: San Diego State University, San Diego CA

The pangenome, the complement of all genes, has been calculated for different taxonomic groups that have sufficient numbers (>2) of sequenced genomes. The selection of genes that contribute to an organism has been mathematically modeled as individual pools of genes with a probability of selection. Some genes occur in pools with a high probability of selection, as they are found in all of the genomes that contribute to a group, whereas genes found uniquely in one or a few genomes have a very low probability of selection. These pools then serve as a predictive model of the expected total pangenome size, and lead to a predicted saturation curve for new genes. This saturation curve helps estimate the sequencing required to confidently claim that all genes of a pangenome have been sequenced. A matrix defines the pangenome for a sample set with genes as columns, and strains as rows. Properties of this matrix lead to a novel approach to phylogeny. Each set of genes with identical column vectors is defined as a clique. Cliques represent gene sets with direct implication for determining phylogenetic proximity between strains. Mobile genetic elements commonly form cliques, such as phages and plasmids. A clan is defined for each clique as the set of strains in which the genes of the clique exist. If one of the genes in a clique is found in a given strain, then the entire clique is found in that strain too. Conversely, no protein that is present in a clique is present in a strain without the other members of its clique. Cliques and clans are used to generate splits networks, which reproduce phylogeny among the strains. Though phylogenetic networks are not a new approach, our application to bacteriophage datasets will lead to new conclusions about the phage proteomic tree.

Does Size Really Matter? The Application of Allen's Rule to Cetacean Flippers

Author(s): Jill K Cepela, Jessica Martin, Annalisa Berta

Mentor(s): Peter Salamon

Institution: San Diego State University, San Diego CA

Allen's Rule states that endothermic animals in colder climates have appendages with smaller surface areas in comparison to body size than similar endothermic animals in warmer climates. A larger surface area will release more heat, and therefore energy, than a smaller surface area. This rule has not been tested in the marine mammal order Cetacea, which includes whales and dolphins. The goal of this project is to test this rule in Cetacea by comparing the ratio of flipper length and width to body length and water temperature corresponding to the median lati-

tude of the calving location. Habitat latitudes specific to the calving period were chosen as a measurement to control for species in this group that are migratory in attempt to reduce error associated with migration. A regression analysis was conducted in order to test this relationship. This analysis will provide evidence into the morphological significance of differing appendage sizes based on habitat climate. Preliminary results indicate that Cetacea do not abide by Allen's Rule, as the regression analysis did not show any relationship between flipper size in relation to body length and temperature. This observation leads to speculation on the validity of Allen's Rule.

Quantification of Provitamin A Carotenoids in Corn Using Thin Layer Chromatography and Densitometry

Author(s): David Y Chang, Sam Tossi, Nhi Bui, Demian Choi, Saadia Hasan

Mentor(s): Roman Ferede

Institution: Santa Monica College, Santa Monica CA

Vitamin A deficiency (VAD) is prevalent in most developing countries. It has been shown that increasing provitamin A carotenoid (vitamin A precursors) content in staple crops such maize can minimize this deficiency. At present there is a worldwide effort to increase the content of the provitamin A carotenoids of staple crops through selective breeding. This study was conducted to develop a rapid, efficient and inexpensive screening method for extraction and quantification of the major provitamin A carotenoids in corn. The carotenoid components of two different inbred lines of corn were extracted using ethanol followed by saponification at 80 °C. The mixture is then subjected to liquid-liquid extraction. Ultraviolet/visible (UV/Vis) spectroscopy was used to obtain the absorbance of the mixture at I_{max} at 450 nm. The total carotenoid contents were calculated to give 19- 25 mg/g. Thin Layer Chromatography (TLC) technique was used to separate the major provitamin A carotenoids. The provitamin A carotenoids, a and b-carotene, and b-cryptoxanthin were identified using retention factor (R_f). The TLC plate was then scanned using Epson V300 scanner and the spots were quantified using Image J's Gel analysis tool by transforming the scanned spots into plotted intensity profiles. The relative and absolute concentrations obtained for provitamin A carotenoids using this method were about 20%- 25% lower than the concentrations obtained using High Pressure Liquid Chromatography (HPLC) in an independent lab. One of the major reasons for lower concentration is due to rapid degradation of the carotenoid on TLC plate. Even though quantification of carotenoids using TLC and densitometric technique is not as precise as the HPLC method, it is a rapid, efficient and inexpensive method for screening hundreds of experimental corn samples before subjecting them to a much more expensive and time consuming HPLC analysis.

Abstracts

Biochemical Investigation of Phenotypic Variance in *Bdellovibrio bacteriovorus* 109J at High Cell Density

Author(s): Evan W Chang, Rebecca Landry

Mentor(s): Eileen Spain

Institution: Occidental College, Los Angeles CA

Preliminary data regarding the biochemical investigation of phenotypic variance in *Bdellovibrio bacteriovorus* 109J is presented. Of the two phenotypes of *B. bacteriovorus*, there is a large volume of information about the Host Dependent *B. bacteriovorus* phenotype life cycle. However, little is known regarding the life cycle of the Host Independent phenotype of *B. bacteriovorus*, which has been shown to secrete a long-chain isoprenoid compound which may have a role in the prey-independent lifestyle. Host Independent *B. bacteriovorus* (HI-B) was successfully “flipped” from Host Dependent *B. bacteriovorus* (HD-B) by isolating HD-B prey lysate on a 0.45 µm sterile polycarbonate filter suspended on a nutrient-rich LB agar plate. DNA from “Flipped” Host-Independent *B. bacteriovorus* 109J was isolated using a QIAgen DNeasy® Blood & Tissue Kit. Successful Polymerase Chain Reaction (PCR) was applied with primers designed with BLAST analysis, amplifying segments of the following genes in 109J: Bd2269 (putative serine protease), Bd0108 (hit locus), and Bd1626 (isopentenyl pyrophosphate isomerase). The genes of interest were visualized with Gel Electrophoresis, where *E. coli* prey presence did not affect the gene amplification of host-independent *B. bacteriovorus*. Real-time Polymerase Chain reaction will be applied in a future experiment to monitor relative gene expression of Bd1626 and other genes related to downstream isoprenoid synthesis in HD vs. HI-*B. bacteriovorus* to gain a greater molecular understanding of isoprenoid biosynthesis in *B. bacteriovorus*.

Quantifying Hydrocarbon Microseepage over Oil and Natural Gas Deposits in Baldwin Hills, Los Angeles

Author(s): Kylee R Chang, Roger Baril, Michael Hull

Mentor(s): Lambert Doezena

Institution: Loyola Marymount University, Los Angeles CA

Microseepage rates of light (C_2 - C_5) alkanes were measured over known oil and natural gas deposits in the Baldwin Hills in Los Angeles. Samples were collected at Kenneth Hahn Recreational Area and Culver City Park. Microseepage was measured using aluminum flux chambers and 2 L stainless steel canisters and quantified with gas chromatography using flame ionization detectors (GC-FID). Flux was determined by simultaneously taking a reference sample of ambient air at the time of deployment of the flux chamber and using the reference as a background concentration. Chambers were deployed over different areas of the parks near the Inglewood oil fields, including areas

over known fault lines. Maximum fluxes of 103 ppb $hr^{-1} m^{-2}$ for ethane, 242 ppb $hr^{-1} m^{-2}$ for propane, 358 ppb $hr^{-1} m^{-2}$ for n-butane, 173 ppb $hr^{-1} m^{-2}$ for isobutane, 218 ppb $hr^{-1} m^{-2}$ for n-pentane, and 262 ppb $hr^{-1} m^{-2}$ for isopentane were observed. Locations that exhibited the largest flux rates were near known faults. Ratios of these gases to each other also show consistency with other studies that have quantified light hydrocarbon seepage over thermogenic areas. The observed fluxes suggest that natural emissions from oil and natural gas deposits could be an underestimated part of the global and regional (LA) hydrocarbon budgets.

FitBaby: A Mobile Device for Supporting the Care of Premature Infants at Home

Author(s): Yuja Chang

Mentor(s): Gillian R Hayes

Institution: Mount San Antonio College, Walnut CA

Studies have shown that diagnosing health issues early can lead to better long-term outcomes, especially in our population, premature infants. However, it can be hard to detect these problems after the infants go home, because parents can have trouble understanding and recognizing them in terms of both identifying problems and introducing false positives. The non-professional caregivers such as parents may provide unclear information to the clinicians which cause the health providers having difficulty in giving treatments. FitBaby is a smart phone application that allows the caregivers to provide accurate daily information about high risk premature and low birth weight infants. The data will be stored in the Microsoft HealthVault server so the clinicians can have access to them. There can be many barriers to proper care for premature infants, including transportation and language issues. FitBaby is designed to allow caregivers to access and provide data at a distance that clinicians can use to support care of these infants. Based on focus groups and interviews with families, providers, and other experts, FitBaby has been designed to record data about five issues: weight, diapering, caregiver stress, appointments, and communication between parents and their infants. Some of the categories are collected once a week and others are collected multiple times a day. The survey only contains simple questions that ensure the caregivers' understandings of the information. This mobile phone system easily allows clinicians and caregivers to monitor infant status leading to improved feelings of self-efficacy by the parents and improved health outcomes for the infant.

Abstracts

Advancing Microfluidic Devices for Continuous Real-time Biosensing Applications

Author(s): Kenny Chau, Srigokul Upadhyayula
Mentor(s): Valentine Vullev
Institution: UC, Riverside, Riverside CA

The aim of this project is to develop a high-throughput spore sensing device by incorporating magnetic trapping in microfluidic channels. The immediately available systems for real-time detection are deficient in their Boolean natures, excessive time and reagent consumption, and limited sensitivity in the overall scope of detection. A staining kinetics approach, previously developed in our lab, allowed us to detect and identify bacterial organisms from the unique time constants that are species specific and concentration independent (Thomas et al. *Langmuir* 2010, 26, 9756-9765). Surface-modified paramagnetic beads adhere to bacterial spores when mixed in a microfluidic chip. Using magnetic traps in the microchannels, we capture the spore samples and investigate their staining kinetics at a single-cell level. By removing the magnets, we release the entrapped beads and spores and wash the channel preparing the device for the next detection cycle. This ‘recycling’ feature of our chip design allows for continuous sampling of spores for immediate detection. Moreover, magnetic trapping in microfluidic systems will drastically improve the sensitivity of our technique by effectively eliminating the minimum-endospore-concentration requirement. Coupling magnetic trapping and surface modification of beads in microfluidic devices allows us to image and differentiate the staining kinetics on a massively parallel single-spore level, thereby enabling the ability to continuously sample heterogeneous mixtures of spore species. This research will help us develop tools with the ability to address the low sensitivity of current detection method, and the critical time requirement for accurate identification of various spores.

Determining the Energetics of rIAPP and CGRP Lipid Membrane Binding Using Circular Dichroism Spectroscopy

Author(s): Hirak T Chavda
Mentor(s): Sajith Jayasinghe
Institution: CSU, San Marcos, San Marcos CA

The misfolding, aggregation, and membrane interaction of the 37-residue human Islet Amyloid Polypeptide (hIAPP) is thought to play an important role in type II diabetes. Both rat IAPP (rIAPP) and the calcitonin gene related polypeptide (CGRP) share high sequence similarity with hIAPP but do not aggregate or cause disease. All three peptides interact with lipid membranes and given the sequence similarity of rIAPP and hCGRP to hIAPP, they may serve as valuable comparative model systems for investigating the nature of hIAPP-membrane interaction. We observe that CGRP causes higher leakage, compared

to hIAPP, in the presence of membranes containing the negatively charged lipid phosphatidylserine (PS). In order to properly compare the differences in their ability to cause membrane disruption we have measured the energetics of hCGRP and rIAPP interaction with membranes containing 10, 33 and 66 mol% PS using lipid titration experiments together with circular dichroism spectroscopy. We find the free energy of partitioning of hCGRP to be -31.4, -34.5, and -36.7 kJ/mol while that of rIAPP to be -33.5, -38.1, and -38.7 kJ/mol (to membranes containing 10, 33, and 66 mol% PS) respectively. The differences in free energy of partitioning between hCGRP and rIAPP do not appear to be sufficiently different to account for the differences in their ability to cause membrane leakage. The differences in membrane disruption may be due to the manner in which the peptides interact with the membrane.

Magnetic Nanoparticles for Water Remediation

Author(s): Michelle Chebeir, Claudia Bracamontes
Mentor(s): Tanya Faltens
Institution: California State Polytechnic University, Pomona, Pomona CA

Despite the technological advances of the 21st century, creation and conservation of clean water is a growing worldwide problem. New methods of water treatment are necessary to increase the supply of clean water. One new treatment method uses ferrofluids to extract oils and metals from industry wastewater. Ferrofluids are colloidal suspensions of magnetic nanoparticles. These particles can be coated with a layer of another material that acts as a scavenger or microscopic “sponge” for the unwanted chemicals. The magnetic composite particles would freely circulate through the wastewater, collecting the waste components until application of a magnetic field draws them out of the solution. In this work, we are tailoring the dimensions and structural properties of the composite magnetic nanoparticles to optimize the extraction efficiency of waste material from water. Our design utilizes a core-shell structure that has a magnetite (Fe_3O_4) core coated by a porous silica shell that is formed by the sol-gel process. Various molecules can be attached to the silica shell to bind different types of waste. Changes in pH, ratio of the silicon alkoxide to catalyst, water ratio, and the amount of ultrasonic energy added during the silica gelation process can affect the way the sol-gel structure forms, changing its pore size distribution and overall porosity. Preliminary results to be presented include the effect of synthesis pH and addition of ultrasonic energy on the magnetorheological characteristics of the magnetite cores, and the effect of the silicon alkoxide to solvent ratio on the structure of the silica shell. Future work will measure the effectiveness of different surfactants on the extraction of oil and metals by these composite magnetic nanoparticles.

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Impact of Traffic Signal Controllers on Travel Time

Author(s): Wen Cheng

Mentor(s): Wen Cheng

Institution: California State Polytechnic University, Pomona, Pomona CA

Control of vehicle movements in the U.S. via traffic signals has been in place for over a century. A large number of types of traffic signal controllers have been proposed and developed in the past. Among them, four types of signal controllers most used today include Pretimed, Semi-Actuated-Uncoordinated, Fully-Actuated-Uncoordinated, and Fully-Actuated-Coordinated. The study focuses on the evaluation of performances of the four types of traffic signal controls from different aspects. The evaluation is conducted based on VISSIM simulation and under different traffic volume scenarios using real-world traffic data collected from the City of El Monte during morning and afternoon peak periods. Both isolated intersection and arterial levels are explored. Alternative evaluation criteria are employed which include the average intersection delay per cycle length and overall intersection delay over peak hours. Additionally, the modeling technique is utilized to establish the relationship among the level of service, traffic signal controller type and other intersection-related features including number of lanes, presence of left-turn lanes, presence of medians, and so on. Taking into account the nominal nature of the level of services, multinomial logit model is selected to conduct the evaluation. The results indicate that Fully-Actuated-Coordinated outperforms the other three types of signal controllers when the travel volumes on minor streets are much smaller than those on major streets. The multinomial logit modeling results also reveal the superior performance associated with the Fully-Actuated-Coordinated control compared with other three types of controllers.

Exploration of Historical Development of Crash Hazardous Location Methods

Author(s): Henry Chi

Mentor(s): Wen Cheng

Institution: California State Polytechnic University, Pomona, Pomona CA

Identifying 'sites with promise', also known as black spots, hot spots, or high-risk locations, has received considerable attention in the literature. This is not surprising, since there is public and professional pressure to allocate safety investment resources efficiently across the transportation system and to invest in sites that will yield safety benefits for relatively modest cost. A review of the literature reveals a rather disparate and non-cohesive collection of papers regarding the hot spot identification problem. Some papers address regression to the mean issues, while others address crash outcome vs. total crash modelling.

Yet others discuss the application of Bayesian methods, while others try to make sense of cross-sectional data. There are papers that discuss pattern recognition and its role in hot spot identification and papers that address issues surrounding crash severity. The collection of papers addresses the multitude of issues surrounding hot spot identification; however, a survey paper addressing HSID from a comprehensive perspective is lacking. The objective of this presentation is to provide a concise survey of hot spot identification issues and research. Furthermore, the presentation intends to discuss the evolution of hot spot identification issues and illuminate contemporary issues. The investigation of HSID development trend in U.S. is expected to shed some insights into the future directions of hot spot identification practice.

Indigenous Women and the Environment

Author(s): Olivia M Chilcote

Mentor(s): Jocelyn A Pacleb

Institution: California State Polytechnic University, Pomona, Pomona CA

Scholarship on globalization has brought important attention to its negative impact on women throughout the world. However, an area that is often overlooked is the focus on Indigenous women and the environment. My research addresses how patriarchal ideologies have made Indigenous women targets of environmental racism; furthermore, I examine the disproportionate power distribution that perpetually leaves Indigenous women voiceless to defend themselves and their people. In my paper, I define "Indigenous women" as females who belong to a group of people who identify with their original territories and traditions which developed prior to exposure of civilization linked with Western culture. "Environmental racism," a central focus throughout my paper, is defined as an enactment or enforcement of any policy, practice, or regulation that unnecessarily affects the environment of Indigenous peoples and their communities at a disproportional rate when compared to affluent communities. Indigenous women from areas in North America, South America, Asia, Africa, and Australia have been studied for the purpose of showing interconnectedness between all Indigenous women and the destructive nature of globalization. Through my research, I have found that a poor environment, combined with continuously declining populations, causes Indigenous women to be faced with an overwhelming amount of responsibility to continue the survival of their people. My research involves an in-depth analysis of documented cases, secondary sources, and testimonials from Indigenous women. Based on my findings, my research provides scholarly work on the implications of globalization and brings attention to groups of Indigenous women who will likely disappear.

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Anatomical Characterization of Light-Induced Gene Expression in the Mouse SCN

Author(s): Andrew M Chiu, Andrew M Vosko
Mentor(s): Christopher S Colwell
Institution: UC, Los Angeles, Los Angeles CA

The robust expression of the neuropeptides vasoactive intestinal peptide (VIP) and arginine vasopressin (AVP) in distinct divisions of the suprachiasmatic nucleus of the hypothalamus (SCN) have implicated their possible roles in the mammalian circadian system. The AVP-ergic region of the SCN is thought to be involved with generating robust, endogenous oscillations, while the VIP-ergic region is thought to be involved in relaying environmental cues and synchronizing neurons within the nucleus. We sought to characterize how light cues, which normally resynchronize the "clock" within the SCN, are differentially transmitted in the absence of VIP. Using immunohistochemistry and *in situ* hybridization, we examined light-induced changes in expression of the clock gene *mPer1* among different regions of the SCN in wild type and VIP knockout mice, focusing on neuropeptide expression and SCN topography. Our initial results suggest that there are indeed discrete subpopulations within the SCN characterized by VIP and AVP involved with different aspects of the light-based resynchronization of the circadian clock. Our data will hopefully shed further light on how VIP and AVP function within the circadian timing circuit.

Russian Art and its Role as a Bridge between Western and Eastern Art

Author(s): Yearin Cho
Mentor(s): Walter Richmond
Institution: Occidental College, Los Angeles CA

Historical and geographical evidence pinpoints Russian art as exhibiting possible stylistic intersections between two different artistic visions: the Eastern and the Western. This research project examines the paintings of Natalia Goncharova, circa 1910, with particular emphasis on her Primitivism in order to determine the elements of the East and the West in her work. This research took place in St. Petersburg and Moscow, Russia, where she is considered the forerunner of the Russian avant-garde movement. Goncharova herself, in her prologue in *One-Man Exhibition 1913* acknowledged her attempts to revive Eastern style in a time when Western style dominated. She insisted that her use of *kamennye babu* exemplified Scythian art, which she interpreted as Eastern. My interviews at Hermitage, however, suggested that *kamennye babu* was not Scythian art, but belonged to Turkic cultural legacy. The geographic parameters of the Scythians, then, cause debate as to its Eastern or Western provenance. My approach then was to examine her work to see if there were other elements that embody the Eastern and the Western.

Her French contemporaries, who influenced her work, already had been integrating Eastern elements into their art; thus, the route of Goncharova's Primitivism likely came through the French *Japonisme*, not through the Scythians. I have concluded that the integration of the two art styles in Goncharova's paintings should be evaluated in terms of *Japonisme*. This approach ultimately implies that her Eastern component was rooted in the Japanese impact on French Post-Impressionists, rather than from purely Eastern sources.

Effects of Propanolol On Reproductive Parameters Of Fathead Minnow *Pimephales promelas*

Author(s): Ree Choe, Varenka Lorenzi
Mentor(s): Daniel Schlenk
Institution: UC, Riverside, Riverside CA

Pharmaceuticals such as propanolol are not entirely removed by sewage treatment plants and occur at low concentrations in streams and rivers. The purpose of the experiment was to investigate the effect of propanolol on the reproduction of the fathead minnow *Pimephales promelas*. Propanolol is a beta-adrenergic receptor antagonist and is used to treat high blood pressure and heart diseases by reducing the muscle contraction and lowering the heart rate, respectively. There is also evidence that propanolol is an antagonist of the serotonin receptor, which is important in reproductive behavior. One male and two females were placed in each tank and exposed for 21 days to 0.1 µg/l, 1 µg/l, 10 µg/l of propanolol, and ethanol as solvent control. Spawning frequency, fecundity, fertilization success, time to hatch, time to all hatch, and hatchability were the reproductive parameters measured to determine the effects of the drug. Minnows exposed to the medium propanolol dose showed lower spawning frequency and fecundity. Eggs exposed to either the low or high propanolol dose had lower fertilization success. There was no effect of propanolol on egg hatchability and clutch size but eggs exposed to the low dose took longer to complete hatching. In future studies, the brains from the males will be used for a microarray analysis to quantify differences in mRNA expression between exposed fish and controls. Our data support the hypothesis of an adverse effect of propanolol on the reproductive success of *P. promelas*.

Sulfhydryl Modification of Human Gamma-Aminobutyric Acid (GABA) Transporter Isoform 1

Author(s): Ye E Choi, Jaison J Omoto, Matthes J Maestas
Mentor(s): Sepehr Eskandari
Institution: Mount San Antonio College, Walnut CA

Gamma-aminobutyric acid (GABA) is the most abundant neurotransmitter in the brain (Kvist et al, 2009). For an example, GABA molecules are released into synapses

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during an epileptic seizure to bring it under control. After GABA uptake of receptors on post-synaptic neuron, GABA transporters (GAT) transport excess GABA molecules back into pre-synaptic neuron and glial cells. cRNAs of Human GAT 1 isoform, hGAT1 wild type (WT) and hGAT1 C74A, which cysteine 74 is replaced with alanine, were injected into *Xenopus* oocytes. hGAT1 WT and hGAT1 C74A were labeled with 2-(trimethylammonium) ethyl methanethiosulfonate (MTSET) under various conditions: varying concentrations of MTSET, duration of labeling, and solvents. When labeled with MTSET, hGAT1 WT loses its transporter function. Valproate buffer was the most effective solvent for MTSET labeling allowing nearly 100 percent inhibition. On the other hand, MTSET labeling had no effect on hGAT1 C74A. This result suggested that cysteine 74 is the only functionally active cysteine exposed to the extracellular space.

Deconstructing the Music Video Narrative in Lady Gaga's "Telephone"

Author(s): Kristine Chong

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

This research paper takes a closer look at the music video for Lady Gaga's hit song, "Telephone" (2010). I investigate the narrative and formal elements of "Telephone" because the music video is comprised of several narrative segments, but the video as a whole does not tell a continuous narrative story. Music videos today use classical Hollywood film techniques, but break too many rules to tell linear stories like their cinematic counterparts. The discrepancy between the narrative and non-narrative parts creates a tension that piques the interest of the spectator, but also keeps the audience on the fringe of an informal diegesis. I deconstruct "Telephone" by extending Carol Vernallis' book, *Experiencing Music Video: Aesthetics and Cultural Context* (2004), agreeing with her observations. Vernallis explains how classical Hollywood editing and cinematic techniques used in music videos imply meanings that differ from those traditionally developed in films. Quick cuts of discontinuous imagery keep the viewer in the present moment, while the music and lyrics guide the viewer into an unpredictable audio-visual experience. Interestingly, the multifaceted narrative of "Telephone" pays homage to a couple Hollywood films (Ridley Scott's *Thelma and Louise* and Quentin Tarantino's *Kill Bill*) and integrates real life controversies as well as dance sequences to capture the viewer's attention. Together, the music, imagery, and lyrics are purposefully stitched together to sell Lady Gaga's song and her image. My research adds to the larger discourse of music videos by discussing innovative trends in narrative and formal structure, as represented by Lady Gaga's "Telephone." My work is important in analyzing how "Telephone" projects an audio-visual experience different from classical Hollywood films, outlining how Lady Gaga is represented in

her video, and time-stamping the possibilities of music video narrative structures today.

A Proposal to Clarify the Effects of Flavor Expectations on a Food's Perceived Taste

Author(s): Deborah K Chun

Mentor(s): Carmel A Levitan

Institution: Occidental College, Los Angeles CA

The appearance of food helps guide a consumer's expectation of taste, but it is the prior experiences of the taste buds that foster perceptions of taste. Color and odor are unique and significant to being able to conjure up specific expectations of flavor (Cardello, 2007). Top-down processing refers to "[an] aspect of recognition [that] begins at the "top" ... at a conceptual level, guided by knowledge, expectations, and other psychological factors," and this applies to food (Bernstein et al., 2000). Correspondingly, people associate colors with past experiences and develop flavor expectations before they even taste a food/drink (ex: the color purple with grape flavor). Though research conducted thus far supports the fact that colored drinks are associated with specific flavors, "...whether the flavor expectations held by an individual do indeed lead to the misidentification of a food or drink's flavor or aroma..." remains unclear (Zampini et al., 2007; Spence et al., 2009). Twenty-five participants each ate two rounds of eight flavor/color Rice Krispie Treat combinations: one round blindfolded and the other with sight. A repeated measure of ANOVA was performed with sight and consistency as factors for all four flavors collapsed together. Both sight and consistency had two levels: blindfolded and sighted, vision and consistency. The consistency factor ($F(1,22) = 23.926, p < 0.0005$) and the interaction between sight and consistency ($F(1,22) = 16.533, p < 0.0005$) were significant. The sight factor, however, was not ($F(1,22) = 1.451, p = 0.231$). In comparing participants' flavor expectations of colored Rice Krispie Treats in correlation with their perceived tastes, the results show that the presence of color can create the illusion of tasting a flavor that matches the color of a food, regardless of whether that flavor is similar or discrepant to the actual flavor.

Material Properties of Gluten-Free Cakes

Author(s): Caralee Churchill, Jem de los Reyes

Mentor(s): Tanya Faltens

Institution: California State Polytechnic University, Pomona, Pomona CA

The goal of this study is to determine the quantifiable material properties that make a great cake, and use that information to determine a suitable and accessible gluten-free substitute for wheat flour in cake. Currently, about 1% of the US population and 0.5% of the population worldwide suffers from celiac disease, an autoimmune disorder

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triggered by the consumption of gluten. Gluten is a protein found in wheat, rye, barley, and oats that is responsible for much of the structure and properties of traditional wheat-based baked goods. Eliminating gluten from the diet can be a challenge as there are limited good quality gluten-free replacements on the market. In baked products, such as cake, gluten plays an important role in the texture, taste, and color. The absence of gluten gives the cake a crumbly texture, poor color, as well as poor crust. In this work, a basic recipe for vanilla cakes consisting of flour, eggs, butter, baking powder, and vanilla extract is modified. Soy flour, sweet rice flour, and white rice flour are individually substituted into the recipe and several variables, including porosity, bulk density, and matrix densities of the resulting cakes are measured and compared to the values for wheat flour cupcakes. It was concluded that white rice flour was the best substitute for wheat flour. The white rice flour was found to have bulk densities in the range of 0.368 to 0.410, which was the closest of all of the gluten-free flours tested to wheat cake's bulk density of 0.336. In addition, the white rice flour cakes had the closest porosities (0.445-0.505 compared to 0.507) and comparable matrix density. Therefore future work will focus on white rice flour cakes. Processing of the rice flour and batter will be varied to further achieve a cake with wheat flour qualities. White rice flour was preheated at several temperatures (250 °F, 300 °F, 350 °F). A texture analyzer will also now be used to measure force vs. distance which can then be used to calculate cohesiveness, hardness, springiness, and chewiness for further comparison purposes.

On the Nature of Romantic Love

Author(s): Justin Clardy
Mentor(s): Mason Marshall
Institution: Pepperdine University, Malibu CA

What is romantic love, if it is something more than just infatuation or lust, for example? Philosophers have struggled to answer this question satisfactorily. It is natural to think we are attracted to other people because they have qualities we value. But the classic view on which romantic love is an appraisal of value faces a well-known and formidable problem. If, for example, I am attracted to Jane because she is smart and beautiful, then we have to ask whether it is intelligence and beauty that I value, rather than Jane herself. And if intelligence and beauty are what I esteem, then it seems that Jane is fungible: if I find someone else who is smarter and more beautiful than Jane, it would be not only tempting but also *most sensible* to exchange Jane for the other person. Yet if I regard Jane as fungible, how can it be the case that I genuinely love her? In light of this problem, philosophers have generally shied away from the appraisal view, developing a range of alternatives to it. But the alternatives face problems of their own. Most notably, they fail to explain why we are romantically attracted to some people and not others. So we should favor the appraisal view if the concern about fungibility can be adequately ad-

dressed. And I think it can be. In this paper, I explain why, arguing ultimately that the appraisal view is superior to its competitors. Though a few philosophers have defended the appraisal view in recent years, my argument is significantly different from theirs insofar as I defend a sort of rational egoism, as it is called: I argue that, in appraising the value of other people's qualities, we can act out of self-interest to a certain degree while still displaying genuine love.

The Application of Acoustic Resonance Spectroscopy to the Testing of Milk Fat in the Dairy Industry

Author(s): Jeremy M Clark
Mentor(s): David J Saiki
Institution: CSU, Bakersfield, Bakersfield CA

The experimental results of an Acoustic Resonance Spectroscopy (ARS) experiment that uses piezo-transducers to generate broadbanded (0-20 kHz) Gaussian white noise that subsequently excites resonances in a quartz rod and sample will be presented. The details on the construction, acquisition, Fourier transformation and processing of data will be discussed. Recent calibration data that describes the usefulness of this technique applied to sugar and milk samples points towards the rapid and accurate nature of this technique to analyze a variety of samples that would ordinarily be difficult to study with conventional spectroscopic methods in labs with limited budgets. The application of this technique to studying Milk samples may help to reduce the monetary and time cost of testing milk fats.

An Analysis of Fiscal vs. Monetary Variables' and Their Effect on the US Economy

Author(s): Aaron H Coleman
Mentor(s): Geetha Rajaram
Institution: Whittier College, Whittier CA

This study is an econometric analysis of the impact of fiscal vs. monetary policy on economic growth from 1945-2009 on a quarterly basis. The study was conducted using multiple time series multi-variable regressions and statistical analysis. The analysis shows positive consumption shocks as the main driver for economic growth. It found that for every dollar increase in personal consumption of non-durable goods, GDP was expected to increase by \$12.14. For every dollar increase in personal consumption of durable goods, GDP was expected to increase by \$8.865. All results were found significant at a 95% confidence level. Furthermore, increases in disposable personal income were found to be the predominate force in increasing consumption. The results showed that for every dollar increase in disposable personal income that \$0.94 was consumed. Policy should be directed toward providing tax breaks for low to middle income families who have a

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higher marginal propensity to consume than people in the high income brackets. People also tend to stop buying non-durable goods in times of economic contraction; therefore, subsidies to lower the cost of non-durable goods for the consumer are advocated. The monetary policy showed that increases in the money supply are the main monetary force for promoting economic growth. For every dollar increase in the money supply, GDP was estimated to increase by \$4.91. The best way to increase the money supply is to lower the federal funds rate. However, further research is still being conducted to estimate the dynamic effects of changes in the federal funds rate. Policy in times of economic decline should be to decrease the federal funds rate to increase the money supply. The analysis and policy advocated in this paper does not recognize the business cycle; therefore, policy stimulates growth are encouraged predominantly in times of economic contraction.

The Art of Stuart Davis: Musically Inspired Abstraction

Author(s): Breanna A Collazo

Mentor(s): Cynthia Colburn

Institution: Pepperdine University, Malibu CA

In this paper, I explore the influence of jazz music on the art of American modernist painter, Stuart Davis (1892-1964). Four of Davis' paintings, *Egg Beater V* (1930), *Swing Landscape*, (1938), *Report from Rockport* (1940), and *Hot Still-Scape for Six Colors-7th Avenue Style*, (1940), show use of tonality and construction of space that initially sparked my interest in this topic. Contextual and compositional analysis of the four pieces reveal a fundamental shift in his art, due to the influence of Jazz music played in the artist's professional and personal life. The early 1920's saw Davis painting literal elements of the Jazz movement but during the 1930's he went through a major stylistic change. By the 1940's Davis' work had completely changed in every aspect. Davis started to connect with the musical genre on a more organic level, linking the concept of "color-space theory", a popular element of modern art at the time, to the musical theory and construction of a jazz song. In *Report from Rockport*, we see the first examples of this new concept. Davis purposefully grouped certain colors together to either highlight or fade their effect. This thought process is similar to the set up of a jazz band. Grouping certain instruments together can create the same effect of highlighting certain or fading certain sounds. As a result of Stuart Davis' innovative thinking, he was able to create his own subgenre within the Abstract movement.

African-American Global Citizenship: An Analysis of James Weldon Johnson on the International Stage

Author(s): Jonathan Collins

Mentor(s): Delores Stephens

Institution:

Global citizenship is status that transcends national citizenship, exploring an individual's ties to multiple states. The full rights that accompany national citizenship have eluded African-Americans during the majority of American history through laws and societal restrictions. This paper uses racial politics to examine the significance of African-American global citizenship by highlighting the importance of race and identity in the development and work of James Weldon Johnson through the application of the Race Cycles Model. James Weldon Johnson was an acclaimed educator, writer, diplomat, and activist, who emerged during the early 20th century. This study analyzes Johnson's childhood development, adult experiences, and professional endeavors, highlighting him as a transnational activist in order to implicate the vital components of which African-American global citizens are comprised. Through Johnson, this study suggests a rubric or model for African-American global citizenship.

Identification of Proteins that Interact with DNA Adenine Methyltransferase (Dam)

Author(s): Eunice Comiso, Jenna Gharzeddine, Cassandra Simkins

Mentor(s): Stacey N Peterson

Institution: Mount Saint Mary's College, Los Angeles CA

Escherichia coli DNA adenine methyltransferase (Dam) is an enzyme that transfers a methyl group to adenine within GATC sequences in DNA. DNA methylation by Dam is important for mismatch repair and expression of pathogenic genes in *E. coli*. Dam is a processive enzyme and methylates several GATC sites before dissociating from DNA. Although Dam methylates DNA processively *in vitro* the level of processivity required for efficient methylation of the approximately 20,000 GATC sites in the *E. coli* genome has never been demonstrated *in vitro*. A reason for this may be that Dam interacts with other proteins *in vivo* that increase its processivity. Furthermore, because Dam has many roles in the cell it is likely that it interacts with other proteins to help regulate its functions. We set out to identify proteins that Dam interacts with. Our methods include both immunoprecipitation and pull-down assays. These assays involve capturing Dam from the cell along with any proteins that it associates with, followed by analysis of the interacting proteins by SDS-PAGE. To determine the identity of proteins observed on the gel we will purify the bands and prepare them for analysis by mass spectroscopy. After conducting the assays several times and using different staining methods we have con-

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sistently observed one protein band on our gels. Because of its recurrence in multiple replicates, we believe it may be a candidate Dam-interacting protein. We are currently preparing for analysis by mass spectroscopy. Although we anticipated more protein bands, it is likely that Dam does not interact with other proteins without being bound to DNA. We will next include DNA in our experiments and also attempt different methods like glutaraldehyde cross-linking to identify more potential interacting proteins. Once we identify more proteins we will set out to determine their contributions to Dam's functions *in vivo*.

Fall in Line: How Surfers' Perceptions of Localism, Territoriality, and Waves as Limited Resources Influence Surf-Related Aggression

Author(s): Cassie A Comley

Mentor(s): Dustin Thoman

Institution: CSU, Long Beach, Long Beach CA

This completed study examined whether Southern Californian surfers' perceptions of localism, territoriality, and waves as limited resources predict aggression while surfing, over and above what can be accounted for by individual differences in general aggressive tendencies. Sixty surfers, randomly sampled from Huntington Beach and Newport Beach, were asked to complete a brief survey. The survey consisted of Likert scale items designed to measure each surfers' perceptions of localism, respect for the locals, responsibility to preserve the break as a local spot as well as the limited resources of the environment. To measure individual differences in general aggressive personality, participants were also asked to complete the Buss-Perry Aggression Scale (Buss & Perry, 1992). Lastly, surfers were asked to report the extent to which they engaged in actual surf-related aggressive behavior as well as the extent to which they experienced anger-related emotions toward their fellow surfers (i.e., angry, frustrated, irritated, agitated and hostile). Correlation and partial correlations were utilized to test study hypotheses. The researcher hypothesis that surfers' perceptions of localism, respect for locals and responsibility to preserving the break as a local spot contribute to surf-related anger and aggression, even when statistically controlling for aggressive personality variables, was confirmed. The researcher concludes that surfers' perceptions of the surf environment, as a limited resource and local territory, contribute to surf-related aggression, beyond what is explained by individual differences in more general aggressive tendencies.

Gray Whale, *Eschrichtius robustus*, Injuries and Photo ID: From Baja to B.C.

Author(s): Laura D Conner

Mentor(s): Lei Lani Stelle

Institution: University of Redlands, Redlands CA

Gray whales, *Eschrichtius robustus* have a migratory path along the west coast of N. America that brings them into contact with many sources of natural and anthropogenic injury. The purpose of this study is to determine through archived photographs the incidence and type of injuries in *E. robustus*. Photo Identification is a non-invasive method for studying individuals in a wild population. It is regularly used with marine mammals such as gray whales. In this study photographs taken of gray whales in British Columbia, Canada, and Baja California Sur, Mexico from 1998 to 2010 were examined for matches of individuals as well as the whale's body condition. The injury rate was 22% for identified individuals, with large scars, and fluke injuries representing the most commonly observed injuries. Such injuries are likely to be caused by both natural and anthropogenic sources. This is likely an underestimate of the actual number of injuries because the results of this study are limited to regions of the body captured in the photo-catalogs. Further, this study does not account for fatal injuries. I plan to expand the scope of this study in the future to determine whether photo-catalogs provide an accurate representation of the injuries of the *E. robustus* population as a whole. In order to reduce anthropogenic scaring of whales, it is essential to obey distance rules, and explore fishing practices that are less harmful to marine mammals.

The Reverend, The Bluestocking, and Freemasons Behaving Badly

Author(s): Mary Copeland

Mentor(s): Margaret Jacob

Institution: UC, Los Angeles, Los Angeles CA

In Boston, 1810, the Reverend Dr. Thaddeus Harris solicited the aid of Mrs. Hannah Crocker in answering the anti-Masonic sentiments of the day, especially those of women. The resulting exchange of letters was published in the local newspaper, the *Columbian Sentinel*. The letters provide a window on anti-Masonic sentiments; attitudes towards women; the question of the purpose of societies, secret or otherwise and their place in the community; and the integration of Christian morals, values and principles into the daily life of New England at that time. Harris's choice of Crocker initially seems straightforward, based on her position as a Boston bluestocking, but her letters are ambiguous in their endorsement of Freemasonry, and when read closely, bring into question Harris's motivations for publishing the exchange of letters. One of those motivations may have been to use the public forum for a private rebuke to Masons behaving badly in the public arena. In

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contrast, Crocker's motivation seems straightforward: her views on the education of women and the exclusion of women from Masonry are clearly stated. She discussed her own foray into an institution "similar" to Freemasonry. She presented herself as a highly intelligent and educated woman, with an extensive knowledge of theology, religion and history, and did so without appearing as anything other than properly womanly by the definitions of the day. We thus have another interesting possible motive for Harris's publication of the letters: to allow Crocker this public forum for her views. Crocker emerges as a special kind of feminist: one who is not afraid to express her opinions, and is able to do so in a way appropriate to the ideas of womanhood at the time, while harsher or more confrontational statements would likely have been disregarded by the very people they were meant to reach.

Social Capital and Development: Utilization of Community Elite for Ultra-Poor Development in Rural Bangladesh

Author(s): George T Corbett

Mentor(s): Jason Enia

Institution: Occidental College, Los Angeles CA

Development organizations often ignore or isolate the elite of communities in which they operate considering them inhibitory to the development process. Yet, increasingly, certain organizations have come to realize these leaders can assist in achieving program objectives. One such NGO is Building Resources Across Communities (BRAC), and its Confronting the Frontiers of Poverty Reduction – Targeting the Ultra Poor Programme (TUP), created to assist Bangladesh's ultra-poor escape extreme poverty. As part of the TUP programme, BRAC has established Gram Daridro Bimochan Committees (GDBCs) comprised of "elite" village members to protect the program's gifted assets to TUP participants from theft or damage. This research intends to understand what additional non-material transfers GDBCs provide to TUP participants, and the perceived value of such non-material transfers relative to other assets or services offered under the TUP Programme. The research is based on group interviews of 670 subjects conducted in June 2010 in 22 villages of Bangladesh's Rangpur and Naogaon districts. Conclusions from this sample indicate that the majority (52%) of ultra-poor subjects value GDBC non-material transfers more than material transfers offered by the program. Of these non-material transfers, educational and sanitation support, as well as advice/encouragement are the most valued. Furthermore, the research identified the non-material transfer of advice to exist in three primary forms: emergency, preventative, and asset management advice of which GDBCs are the usual provider to the ultra-poor. These findings are significant in that GDBCs clearly contribute to the attainment of program objectives, thereby acting as a force multiplier, of which there is no close substitute. However, since the majority of these transfers

are non-material, and thus difficult to observe and quantify, GDBCs are chronically undervalued in comparison to other aspects of the TUP programme.

Game On: The Relationship between Athletes, Self-Esteem, and Hope

Author(s): Ashley Cordero

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

Sports impact American culture in more ways than one, it goes beyond race, gender, and class. It has been suggested that children and adolescents who participate in sports have higher levels of self-esteem, mainly in their physical appearance. In addition, participating in sports may increase feelings of physical competence and happiness with physical appearance, which in turn increases general self-esteem. The present study expands on this research by examining the relationship between participating in competitive sports, and self-esteem. It was hypothesized that those who participated in competitive sports throughout high school and/or college would show higher self-esteem after completing a workout. A survey was conducted of adult athletes living in a large southern California county ($n = 548$; Mean age = 36.88 years, range 18 – 91 years). Hierarchical regression results indicated that self esteem was able to uniquely account for variance in post workout satisfaction ($pr^2 = 0.03$, $R^2 = 0.14$, $p < .001$) even after demographic variables were entered into the equation. Discussion focuses on participating in competitive sports, self-esteem, and the implication for a person's overall well-being.

Stressors and Their Implications for First Year Students at Cal Poly Pomona

Author(s): Edward P Cortez,

Mentor(s): Erika DeJonghe, Susan Siaw

Institution: California State Polytechnic University, Pomona, Pomona CA

The transition to college represents an important developmental milestone for many adolescents. However, many students do not negotiate this transition successfully. Recent data on retention of college freshman revealed that on 2007-2008, only 66% of new college students returned for a second year (Bushong, 2009). We assert that one reason students fail to complete their college degrees is that students are feeling the strain of rising tuition costs and difficulty navigating the university due to reduced course offerings and services. This presentation will share data on the levels of stress experienced by incoming college freshman and the major factors to which students attribute their stress. Data are drawn from a larger, ongoing study of students who were enrolled in "first year experience" courses during Fall quarter of 2009 ($n = 198$ for this

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study). Participants completed a survey which include the College Student Stress Scale (Feldt, 2008), as well asked to respond to an open-ended question, "If you could do anything humanly possible with complete assurance that you would not be detected or held responsible, what would you do?" Results from the questionnaire showed that students report the highest mean levels of stress related to finances, academics, and relationships with family and peers. These findings were further visible in the free-response question, which contained a significant amount of school-related replies, including altering grades, finding ways to pay for college expenses, and circumventing the system (including obtaining priority registration for classes and changing majors more easily). Implications for student retention and academic outcomes will be discussed.

Global Geological Mapping of Enceladus

Author(s): Emma N Crow-Willard

Mentor(s): Robert T Pappalardo

Institution: Occidental College, Los Angeles CA

Global geological mapping of Enceladus highlights 3 distinct tectonized regions, which we term trailing hemisphere terrain (THT), leading hemisphere terrain (LHT), and south polar terrain (SPT). All three terrains are framed by curvilinear terrain units, and all have comparable areal extent with the south polar terrain being the smallest. In its central region, the THT contains a unit consisting of smooth materials and long shallow troughs, which is nearly identical to materials of the SPT just northward of the "tiger stripes" and with similar orientation of SPT troughs. This suggests that these shallow troughs may have formed in a similar manner to the SPT fractures. In contrast to the SPT, the THT contains a ridged unit of large dorsa, cross-cutting a striated plains unit, all within the THT's frame of curvilinear terrain. The LHT contains a disorganized network of troughs similar to parts of the SPT. The LHT also has units with polygons of sub-parallel troughs suggesting shearing. Heavily cratered terrain reaches around the saturnian and anti-saturnian sides of the satellite, abutting the south polar terrain. We recognize a total of 13 different geological units within the three tectonized regions and the cratered terrain of Enceladus. Differences in the local terrains might be explained by combinations of local diapiric uplift, collapse, and satellite reorientation to form the tectonized terrains, tied to episodic localized heat flow related to tidal stresses.

Oxidative Stress in Relation to the Lifespan of *Drosophila melanogaster*

Author(s): Carmen E Cubilla, Katherine W Jordan, Lianne M Gonsalves

Mentor(s): Trudy Mackay

Institution: North Carolina State University, Raleigh NC

Oxidative stress represents an imbalance between the production of reactive oxygen and a system's ability to detoxify the reactive intermediate. Disturbances in the balance can cause toxic effects through the production of free radicals that damage cellular components, such as proteins and DNA. Menadione is a vitamin K precursor that has demonstrated cytotoxic activity via elevation of peroxide and superoxide radical levels. In an initial experiment with five *Drosophila melanogaster* lines we found menadione bisulfate significantly decreased lifespan at high doses, but actually increased lifespan at a low chronic dose of 0.03 mMolar. We performed a follow up experiment using 41 inbred lines derived from a wild-Raleigh population and found that there is significant genetic variation in lifespan among lines ($P < 0.0001$) averaged over both sexes and both doses of menadione. The Line \times Sex interaction term was highly significant ($P < 0.0001$) indicating that the difference in lifespan between males and females also varies among the different genotypes. We replicated the effect of higher doses decreasing life span, as there were significant differences between treatments ($P = 0.0001$). Finally, the Line \times Treatment interaction was significant ($P < 0.0001$), indicating that the increase in lifespan on low doses of the drug is genotype-dependent. Our data suggests that a small amount of oxidative stress can be beneficial for adult lifespan in *Drosophila melanogaster*.

A Kinetic Study of the Low-Temperature Pack-Aluminizing of Type-304 Austenitic Stainless Steel

Author(s): Alejandro Cuevas, Kimberly Schumann, CJ Simpson, Marcelino Rubio

Mentor(s): Vilupanur Ravi

Institution: California State Polytechnic University, Pomona, Pomona CA

Metals in harsh environments can experience degradation due to reactions predominantly at the surface of the metal, i.e., corrosion. Today's engineers are faced with mitigating corrosion by either selecting new alloys that could withstand the working conditions, or by modifying the surface of an existing alloy. The focus of this study was a coating process aimed at altering the surface chemistry and microstructure of an alloy to defend against corrosive attack. This process, i.e., halide activated pack cementation, is economical and versatile. The coating resulting from this process is expected to extend the useful operating range of commercially available stainless steels to higher tem-

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peratures. Our focus was on the addition of aluminum to commercially available stainless steels, e.g., 304, 316L, etc. Using a halide-activated pack cementation process, a cementation pack was used for aluminizing at temperatures as low as 650°C for aluminizing times ranging between 1 – 25 hours. The resulting coatings were studied using X-ray diffraction, scanning electron microscopy with energy dispersive spectrometry, and micro hardness testing. Coating thicknesses ranging between ~10 – 40 μm were reported. The predominant coating layer was identified as Al-rich Fe₂Al₅, and with increased process time, a distinct interdiffusion-layer which consisted of Cr-rich precipitates was also observed. These newly formed low-temperature coatings should prove to not only increase the working-life of stainless steel type 304 under high temperature oxidizing conditions but will also retain the mechanical properties of the substrate.

Perdre et Renouveau (To Lose and Find Oneself) in Madame Brouette by Moussa Sene Absa

Author(s): Deyla M Curtis
Mentor(s): Marie-Magdeleine Chirol
Institution: Whittier College, Whittier CA

West-African cinema uses a plethora of ways to elaborate on its history and people, specifically by creating characters that represent West-Africa's various stages of dependence and independence through the colonial years until today. A prime example of this can be seen in the Senegalese film *Madame Brouette* (2002) when the main character, Madame Brouette, embodies both herself and West-Africa by experiencing both independence and dependence, as described below. Using a modern setting director Moussa Sene Absa illustrates how one woman can face the challenges of Senegalese society, specifically through her budding romance. Madame Brouette progresses through three notable phases of development which in turn can be interpreted as metaphors for Franco-African countries and their development. First I will use evidence from the film to elaborate on Madame Brouette as a strong woman whose self-sufficiency can be closely compared with that of pre-colonial Africa. Next I will explain how her character begins to lose sight of her self-sufficiency because of her love affair with a Westernized Senegalese man. This point will be compared with African colonization and how the people of Africa were introduced to Western culture. In the last section of my presentation I will describe how Madame Brouette discovers that she has lost her ability to be self-reliant at the risk of losing herself and her transition back to who she used to be but now slightly more experienced. This last element also represents West-African culture in that there has recently been a shift back to appreciating certain aspects of tradition, and a common understanding that a Westernized world is not necessarily the answer. My presentation will be in French.

Measurement of Torque in Taylor-Couette Flow with a Stationary Inner Cylinder

Author(s): Tyler E Da Pron
Mentor(s): Michael J Burin
Institution: CSU, San Marcos, San Marcos CA

We have experimentally investigated the angular momentum transport in Taylor-Couette flow by measuring the torque on the inner cylinder while rotating the outer cylinder. In general, we observe an increase of fluid torque for increasing outer cylinder speed (or Reynolds number). Our data include different end-cap conditions and degrees of flow curvature, and are discussed in light of an observed subcritical transition to turbulence. Scaling results are compared to earlier torque-based studies in this system and to possible application in stellar atmospheric mixing.

Characterizing the Aggregation of *Salmonella* Thin Aggregative Fimbril Protein AgfA

Author(s): Carol F Dale, Andrea Fenner, Keau Wong
Mentor(s): Sajith Jayasinghe
Institution: CSU, San Marcos, San Marcos CA

Thin aggregative fimbriae (Taf) are a class of cell surface filaments found in *Escherichia* and *Salmonella spp.* Taf, comprised mainly of a single oligomerized protein (AgfA), are thought to play an important role in the long-term survival and persistence of these pathogenic organisms. The overall goal of our work is to characterize the mechanism of AgfA oligomerization, to form Taf, and the structure of oligomerized AgfA. In the work presented here we sought to answer the following question: Is the self-assembly of AgfA to form Taf mediated by specific sequence or structural elements? We have begun to answer this question by investigating the ability of five polypeptides derived from the full length AgfA sequence, and corresponding to one of the five repeat regions found in the protein, to oligomerize using circular dichroism (CD) and fluorescence (Thioflavin T and pyrene) spectroscopic techniques. Our CD results indicate that the peptide corresponding to the first repeat of AgfA undergoes a random coil to β-sheet conformation upon incubation in buffer. Increase in Thioflavin T fluorescence indicates that this structural change is a result of peptide aggregation. Pyrene fluorescence spectra of aggregated peptide does not contain a peak due to pyrene excimer formation indicating that the peptides are not arranged in an in-register parallel conformation. We have obtained CD spectra for peptides derived from the second, third and fourth repeats (R2-R4) of AgfA. CD spectra of freshly rehydrated R2-R4 are similar to those of the first repeat, indicating a predominantly random coil conformation. However, unlike the first repeat none of the spectra for the other three peptides (R2-R4) changed upon incubation of peptide in buffer indicating a lack of structural change. This data points to the possibility that self-assembly of AgfA to form Taf may be mediated by its N-terminal domain.

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Television's Slickest Sell: The Consumption-Ready Retro Aesthetics of *Mad Men*

Author(s): Tara K Daley

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

My project will look at a recent advertising agreement between Unilever and AMC to air commercials in *Mad Men's* signature style during the show's commercial breaks. *Mad Men* is highly regarded, in part for its visual splendor and attention to detail, and the Unilever commercials utilize nearly identical aesthetics and include similar characters and themes of creative bravado and nostalgia. I conclude that *Mad Men's* visuals sell its narrative to viewers as a lifestyle, and that the show's packaging and broadcast style is perhaps the slickest sell of all. To ground my conclusion, I will conduct an ideological study of *Mad Men*. My methodology will include close readings of the Unilever *Mad Men* commercials, which advertise products such as Dove soap and Klondike ice cream bars in addition to television and advertising theory. Additionally, I will supplement this theory with analyses of *Mad Men's* particular aesthetics to thus better inform my close readings. My primary scholarly text will be *Consuming environments; television and commercial culture*, a book investigating the flow of commodities in television by TV/commercial culture theorists Budd, Craig and Steinman. I will expand upon their theories, written in 1999, to apply them to the Unilever *Mad Men* spots, to suggest that AMC is selling *Mad Men* as a lifestyle, ready for consumption. Scholars have discussed *Mad Men* in depth, especially focusing on narrative structure and character depth, but my interest is more in the show's visuals, its production design and how this shapes audience perception and consumption in regard to these commercial spots. *Mad Men* presents itself to viewers as a glossy, consumption-ready package of retro glamour and nostalgia, the aesthetics selling viewer the show just as Don Draper and his cohorts sell their clients campaigns.

Indicators of Volunteerism: Political Orientation, Idiocentrism, and Religiosity

Author(s): Karly Dallas

Mentor(s): Lisa Bauer

Institution: Pepperdine University, Malibu CA

Past research has sought to uncover and understand the various causes of prosocial behavior, whether they are situational factors or personality characteristics. The present study examined the relationship between several personality dispositions and one's participation in a particular kind of prosocial behavior- volunteering. Survey data was used to analyze the relationship between three independent measures (i.e., political orientation, idiocentrism: individualism and collectivism, and religiosity) and the dependent measure of volunteerism. The six main

motivations for volunteering were also measured to examine how people with different personality dispositions might volunteer for different reasons. One hundred Pepperdine University psychology undergraduates completed a demographic questionnaire, the Individualism-Collectivism Scale, the Polarity Scale, the Mature Faith Index, the Volunteer Function Inventory, and a volunteer experiences questionnaire. Data was analyzed using hierarchical multiple regression and simple correlations. In accordance with past research, results revealed that religiosity and gender were significant predictors of past and current volunteerism. Although collectivism had a moderate positive correlation with past volunteerism and likelihood to volunteer in the future, idiocentrism was not a significant predictor of volunteerism. Additionally, political orientation showed no significant relationship to volunteerism. Five of the six motivations to volunteer showed moderate to moderately-strong positive relationships with religiosity and collectivism. Only one of the motives, volunteering for self-improvement, showed a positive relationship with individualism. Two motivations were positively correlated with political orientation. This information is important in understanding what drives people to volunteer, which can be used to create effective programs to recruit and maintain volunteers.

Understanding Protein Stability Through Destabilization: C-terminal Truncation of CusF, a Bacterial Cu(I) Chaperone

Author(s): Devon Michael Dally, Susan Y Ly

Mentor(s): Blake Gillespie

Institution: CSU, Channel Islands, Camarillo CA

What is the effect of ligand binding on protein stability, and can ligands rescue the folding reaction of destabilized proteins? CusF is a small bacterial copper chaperone that, upon ligand binding, does not unfold completely even at high temperature or denaturant concentrations. By making 1-3 residue C-terminal truncations of this protein, we have destabilized CusF so much that its complete denaturation may now be quantified. It appears that binding a single Cu(I) ion increases the protein's melting temperature by 40 °C, and this stabilization is largely due to an increase in CusF's heat capacity change, ΔC_p . Interestingly, such an enhancement is similar to the stabilization mechanism seen in some pairs of homologous proteins from mesophiles and thermophiles. We are now extending the truncations to 4 and 5 residues, to convert CusF to a natively unfolded protein, with ligand serving as a folding trigger. In future studies, such a construct will allow the exploration misfolding and aggregation processes that are important to many human disorders, such as Alzheimer Disease or transthyretin amyloidosis.

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Cloning, Overexpression, and Purification of Proteins Necessary in Prostate Cancer Progression

Author(s): Alyza S Damji, Veronica Magana, Janette Mincitar, Amanda Madison

Mentor(s): Luiza Nogaj

Institution: Mount Saint Mary's College, Los Angeles CA

Polycomb proteins (PcG) are transcriptional silencers and thought to be important in prostate cancer progression. Bmi1 and EZH2, members of the Polycomb complexes, are overexpressed in many types of cancer including prostate. The more Bmi1 or EZH2 the cells have the more aggressive the tumors. However, the mechanism of Bmi1 and EZH2 action is not well understood. Recent literature and results from our laboratory suggest that PcG proteins turn off tumor suppressor genes such as p16. In order to understand the role of Bmi1 and EZH2 at the p16 promoter, it is necessary to characterize their interactions in vitro. In this work we show successful cloning, overexpression and purification of Bmi1 and EZH2 in *E. coli*. We also present a unique immobilized template assay to successfully examine the binding of PcG proteins at the p16 promoter. These studies will help determine the nature of Bmi1 and EZH2 binding to the DNA. They will also address the question if Bmi1 or EZH2 alone can turn off gene expression.

The Pueblo Ground: How Pueblo Indians Shaped Colonial Relations with the Spanish in 17th Century New Mexico

Author(s): Michelle Daneri

Mentor(s): Ann Kakaliouras

Institution: Whittier College, Whittier CA

My paper explored the interactions between Pueblo Indians and Spanish colonists in 17th century New Mexico, and the subsequent expulsion of the Spanish from New Mexico during the Pueblo Revolt of 1680. By applying Kathleen DuVal's argument in *The Native Ground*, about Native Americans and European colonist cultural interactions in the Arkansas Valley, to colonial interactions in New Mexico, in order to understand the Pueblo Indians' role in shaping colonial relations. More specifically, I will work to explain how the Pueblos' own Native Ground dictated how the Spanish needed to fit into the Pueblos' societal systems and cultural expectations in order to maintain a colonial presence, and how once the Spanish failed to continue to meet Pueblo expectations, the Pueblo Indians no longer tolerated Spanish presence in New Mexico. Along with *The Native Ground*, I am using other secondary sources, such as Andrew L Knaut's *The Pueblo Revolt of 1680* and Carroll L Riley's *Rio del Norte*, with primary sources that include material culture and oral history along with published secondary sources included in Charles Wilson Hackett's *Revolt of the Pueblo Indians of New Mexico and Otermin's Attempted Reconquest, 1680-1682*, in order to explore my research question. Through my exploration of the Pueblo Revolt, and my exposure to important sources on the subject, I have found evidence that Spanish colonists were able to maintain a presence in New Mexico as long as they adhered to the Pueblo Indians' cultural expectations.

Light Environment Influence on Sapling Performance in the Locally Dominant Neotropical Tree *Pentaclethra macroloba*

Author(s): Adrienne R Daniels

Mentor(s): Elizabeth H Braker

Institution: Occidental College, Los Angeles CA

Pentaclethra macroloba (Fabaceae) is a dominant tree (25-40% of stems) in the tropical rain forest of La Selva Biological Station, Costa Rica. A recent movement to encourage the growth and propagation of native tree species within Costa Rica has prompted studies to examine the variables that affect the cultivation of *P. macroloba*. Past research on *P. macroloba* and other neotropical trees has determined that polyculture plantations will produce higher survival rates than monoculture plots. To determine other influences of *P. macroloba* seedling success rates, 60 seedlings were followed for nine weeks at the La Selva Biological Station. Given the constant stress of an ever-changing light environment in rainforests, we predicted that seedlings with greater canopy light exposure would produce and retain more leaves, exhibit faster leaf expansion, have greater height and diameter, and an overall greater chance of survival. Leaf expansion, production and desiccation, light environments, overall growth, and initial diameters of the seedlings were compared to determine whether one or several could accurately predict survival or elevated growth of a seedling. Measurements were taken every 7-10 days with electronic calipers or measuring tapes, with new leaves marked with paint along the rachis. Canopy openness was determined with a gap light analyzer and fish-eye lens. From the factors tested, three displayed significant correlation (where $P < 0.01$) with canopy openness. The number of new leaves produced held a slightly negative correlation, where $r_s = -0.3563$; however, both leaf retention and the plant's diameter exhibited a strong positive relationship to canopy openness, where $r_s = 0.3684$ and 0.3914 respectively. Factors without statistical significance included plant height and the total number of leaves. These results indicate that while light environment holds a significant influence over a seedling's growth, other factors must be taken into consideration, such as insect herbivory or the conditions of a seedling's cotyledon.

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Waning Influence: The Response of Female Midwives to Male Midwifery

Author(s): James Paul de Haan

Mentor(s): Michaela Reaves

Institution: California Lutheran University, Thousand Oaks CA

Women very rarely found themselves in positions of power in 18th/19th century America, so the role of the midwife, in which they were given an extraordinary amount of respect and clout, has been an important topic of research. However, as medical expectations and practices evolved, women turned away from the midwife, and this change was met with resentment. Unfortunately that resentment has too often simply been attributed to latent conservative values held by these women; it was not simply the changing world that created anger in midwives refusing to accept the future. Rather, the noticeable loss in power and prestige that had previously been afforded them was the true source of their ire. Through a close examination of the diary of Martha Ballard, along with the writings of Elizabeth Nihell and Sarah Stone, the power of the female midwife is seen slowly slipping away as the world marched into the nineteenth century, and a general feeling of animosity bubbled forth from the pens of the non-classically trained midwife. Despite their objections, and evidence that their methods were often times safer, they could do little as male physicians began to dominate their field and popular demand required a university education to perform the tasks women had done for centuries.

Capoeira as a Black Atlantic Cultural Form

Author(s): Celina de Sa

Mentor(s): Rebecca Overmyer-Velasquez

Institution: Whittier College, Whittier CA

Capoeira is a dance-like martial art founded by African slaves in the tumultuous beginnings of Brazilian statehood. Undoubtedly, capoeira is rooted in rituals and traditions inherent in the African slave population, however its distinctly Brazilian identity may have served to complicate the origin. In over a century the humble beginnings of the slave practice have grown to be Brazil's national sport as well as an international attraction. The recent emergence of capoeira schools in West Africa brings to light the dynamics of culture in a diasporic context. Drawing on participant observation and interviews I conducted with West African practitioners, I argue that capoeira acts as a medium for reconnecting to ancestral traditions, as well as expressing pan-African consciousness. While recognizing the African ritual aspects, Senegalese capoeiristas in particular hold a purist view of the sport by maintaining allegiance to Brazil. They do not stray from the Brazilian styles or Portuguese language, giving the impression that they recognize Brazil as the source of origin. With the complexities of the

Black Atlantic as a cultural space, there exists a feedback loop of practices that are rooted in Africa, diffuse across the Americas and return again to the source of the diaspora. By studying Senegalese capoeiristas reappropriating a culture that extracts from their own rituals, I discovered there was little recognition of capoeira as African. In fact, the Senegalese held a distinct reverence to what they characterized as capoeira's authentic Brazilian origin.

Religiosity and Adversity

Author(s): Christopher del Rosario

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

Research has shown that individuals with a religious orientation either live their lives based on a self-serving, instrumental approach of religion (extrinsic orientation), or a meaning-endowed framework through which their life is understood (intrinsic orientation) (Allport and Ross, 1967). For these individuals, their spiritual well-being can be an indicator of how hopeful they are – whether they can get past the daily vicissitudes (immediate situation) and relate positively to God (Ellison, 1983). Hope is operationally defined as “a positive motivational state that is based on an interactively derived sense of successful (a) agency (goal-directed energy), and (b) pathways (planning to meet goals)” (Snyder, Irving, & Anderson, 1991). The present study expands on this research by examining the role of religiosity, the participant’s feelings of success, and whether they were able to meet their goals. Utilizing a sample of community dwelling adults drawn mostly from Southern California, the present report is based on analyses of a sizable subsample-sample ($n = 1638$). It was hypothesized that those individuals high in religiosity on a day-to-day basis are in fact more successful in meeting the goals that they set for themselves as compared to those who are not religious. Using a median split of religiosity into high versus low groups, the hypothesis was examined using ANOVA. Results supported the hypothesis in that those individuals with high religiosity were reported being significantly more successful and were also more likely to meet the goals they set for themselves. Perhaps even more important is the finding that those with high religiosity were more likely to feel they could overcome daily problems. The discussion focuses on people’s overall spiritual well being in relation to overcoming daily obstacles.

Serenity

Author(s): Brighton M Demerest-Smith

Mentor(s): Joseph Piasentin

Institution: Pepperdine University, Malibu CA

As part of my continued experience, research, and education in the realm of painting, I find myself intrigued by the world around me. I was introduced to the world of outdoor

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of outdoor “Plein Air” painting at the age of 14 and since then I have found my studio, more often than naught, in the outside world, whether on a sidewalk painting a cityscape, deep in the hills at a secluded location, on a California beach, or in my most recent circumstances on the Pepperdine University Campus. I have been fascinated by how the light plays on a physical location. More than just documenting the place and light I am documenting an emotional response to it. It is this emotional response that gives me a connection to my work. My painting is greatly about the play of light, represented by paint. My work offers a simple, intimate, glimpse into the way in which I view the world. I paint what interests me. However, what captures my attention is more than just subject alone. One of my instructors once said; “Painting is more about the relationships of light, design, and color than it is about the painting of things, and subject matter.” This has always inspired me when choosing what to paint. What interests me; capturing the moment; attention to artistic relationships: these elements fuse themselves into my final works of Art. As an Artist I find great calling in the necessity to show the world how it is I see, in color and design, but also how the negative space, or void where the meaning of life or the painting reveals itself to us.

The Effects of Acute Exercise on Executive Function in Healthy Middle-Aged Adults

Author(s): Michelle Deneen, Jessell M Owens, Zachary Miller, Erika Hosoi, Jane Travis, Lauren Frazier, Ollie Oliver, Andrew Frierson, Shane Naki, Kathryn Linehan

Mentor(s): Priscilla MacRae

Institution: Pepperdine University, Malibu CA

Previous research suggests that chronic exercise positively affects cognitive function, but little is known about acute exercise effects on executive function. Executive function refers to high level cognitive abilities that involve responding to relevant stimuli while ignoring irrelevant stimuli. This study examined the effects of a single acute exercise bout, i.e. aerobic, balance, or stretching, on executive function in middle-aged adults (40-59 years). Twenty middle-aged adults (9 males, 11 females; 51.0 ± 6.4 years) completed the study, which involved one session per week for five weeks. The first session familiarized the participant with the executive function tasks, the Stroop (Stroop, 1935) and Letter Number task (Wechsler, 1997), and each exercise condition. During the following weekly sessions, participants completed one of the 4 counterbalanced conditions: **aerobic** (walk/jog on treadmill at 60-70% heart rate reserve), **balance** (structured square stepping routine), **stretching** (major muscle groups), or the **control** (leisure reading). Each session was conducted according to the following schedule: assessment of executive function, 30 minutes of an exercise or control condition, immediately followed by re-assessment of executive function. Two-way ANOVA for repeated measures (conditions and practice) were performed on Stroop and the Letter-Number mea-

sure of executive function. There was no significant effect of condition, nor was there a significant condition x practice interaction on executive function. However, there was a 6.50% improvement in performance on the Stroop task due to practice ($F(1, 19) = 6.7$, $p = 0.02$, $\eta^2 = 0.26$). Similarly, there was a 5.85% improvement in performance on the Letter Number task due to practice ($F(1, 19) = 4.7$, $p = 0.04$, $\eta^2 = 0.19$). In conclusion: a single bout of exercise in healthy middle-aged adults did not significantly affect executive function, but a single practice session significantly improved executive function.

Determination of NO_x in Indoor Library Air Using Passive Sampling

Author(s): Dane W deQuilettes

Mentor(s): Jane A Ganske

Institution: Pepperdine University, Malibu CA

In sunny urban areas experiencing photochemical smog, measurable concentrations of outdoor pollutants including ozone and the oxides of nitrogen can be found inside buildings. These pollutants may pose risks to special collections inside museums and libraries. In this study, passive sampling was utilized to determine the concentrations of nitric oxide and nitrogen dioxide (NO_x) in the indoor air of Pepperdine University's Payson library, as well as in outside air. In the circulations area of the library, nitric oxide and nitrogen dioxide concentrations ranged from detection limit -1.38 ppb and 4.01-6.39 ppb, respectively. Outdoor NO_x concentrations were measured to be nearly equal to indoor concentrations, possibly suggestive of an inefficient library heating, ventilation, and air conditioning (HVAC) system for removal of analytes. Indoor generated gases off-gassed from aging books, wood storage cases, paints, carpets and other materials were surveyed using solid phase microextraction (SPME) coupled with gas chromatography-mass spectrometry (GC-MS). Aldehydes and organic acids implicated in the aging of paper materials were identified in the rare books collection air.

Size and Shape Change in Rancho La Brea Horse Limbs During the Last Glacial-Interglacial Cycle

Author(s): Sylvana N DeSantis

Mentor(s): Donald Prothero

Institution: Occidental College, Los Angeles CA

This study examines the fossil horses (*Equus occidentalis*) from the Rancho La Brea tar pits at the Page Museum in Los Angeles, to see if the climatic changes over the last glacial-interglacial cycle had any effect on the shape or size of their limb bones. Large samples from all the pits that had good radiocarbon dates were measured in order to see if there was a change in size or shape of the bones over the last 40,000 years. Even though pollen, plants, snails, and

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isotopic studies show that there was a dramatic climatic and vegetational change from the previous interglacial (40 ka-20 ka) to the peak glacial (20 ka-15 ka) to the glacial-interglacial transition (15 ka-10 ka) to the Holocene, none of the other mammals or birds that have been measured so far show any significant difference in size or shape of their bones from one time period to another. Horses show complete size and shape stasis (as established by ANOVA and other statistical tests) in their carpal and tarsal metapodials, astragali and patellae. In a larger perspective, this study will add to the paleontologic study of the effects of climate changes on different species of mammals and help us better understand the morphology of a species over time.

Twist Regulates IL-8 and Correlates with Highly Aggressive Breast Cancers

Author(s): Simranjit K Dhillon, Shan Li
Mentor(s): Carlotta Glackin
Institution: UC, Berkeley, Berkeley CA

Metastasis progresses cancer mortality. Although the mechanisms regulating metastasis remain elusive, the expression of Twist, a basic helix-loop-helix transcription factor, positively correlates with advanced breast cancers. Studies in our laboratory reveal that Twist up-regulates interleukin 8 (IL-8), a proinflammatory chemokine correlated with highly aggressive cancers, by activating its promoter with NF-kB. By using co-immunoprecipitation, we discovered NF-kB (p65) forms a protein complex with Twist, which is compromised when the Runx binding domain of Twist is truncated. The association between p65 and Twist is crucial for IL-8 induction in breast cells. Thus, engineered Twist proteins can be delivered to tumor cells to restrict IL-8 secretion by competitively inhibiting endogenous Twist from p65 interaction. This therapeutic strategy may reduce breast cancer mortality by minimizing metastasis. Moreover, we show that Twist indirectly activates IL-8 promoter by inducing histone modification from luciferase and western blotting data. We further analyzed the expression levels of cytokines that were previously reported to be under transcriptional regulation by NF-kB and found IL1A, CCL5, TNFSSF, VEGFC, CXCR4, and CD44 upregulated by Twist over-expression in breast cancer cell lines. These data indicate that Twist indirectly regulates the expression of NF-kB responsive cytokines through interacting with p65 to induce chromatin remodeling.

Identification of Phenotypes for Mutants Lacking Hybrid Histidine Kinases in *Neurospora crassa*

Author(s): Fitz-Gerald I Diala, Carol Jones, Jackie Servin, Gyungsoon Park
Mentor(s): Katherine A Borkovich
Institution: UC, Riverside, Riverside CA

Environmental sensing and signal transduction are indispensable to the survival of an organism. One signaling pathway found in prokaryotes, protist, plants and fungi, but not animals, is the two component system, consisting of proteins with histidine kinase and response regulator domains. In fungi, two component signaling pathways contain three different types of proteins: hybrid histidine kinases (HHK), histidine phosphotransfer protein, and response regulators. When the HHK is phosphorylated, the phosphate moiety is transferred intramolecularly to the receiver domain of the HHK. The same phosphate moiety on the receiver domain of the HHK is transferred to the histidine phosphotransfer (HPT) protein and subsequent phosphorylation of a response regulator follows. The response regulator then mediates downstream effects, depending on stimulus. The multicellular fungus *Neurospora crassa* is a model for fungal pathogens of animals and plants. *N. crassa* has eleven hybrid histidine kinases. Previous work in our laboratory and others has resulted in generation of deletion mutants, each lacking a single HHK gene. Phenotypic characterization of these mutants resulted in the identification of phenotypes for only one, $\Delta os-1$. Based on these results, we have adopted a chemical screening strategy to identify phenotypes for HHK mutants. Exposure of mutants to sub-lethal concentrations of benomyl (perturbs microtubules), cytochalasin A (destabilizes actin), FK-506 (influences protein dephosphorylation), fludioxonil (fungicide), sodium chloride (osmotic stress), and sorbitol (osmotic stress) has revealed phenotypes for additional HHK mutants, thus validating the chemical screening approach.

Perceived Access Barriers to Gang Prevention Programs in Low-Income Latino Communities

Author(s): Maritza Diaz
Mentor(s): Katy M Pinto
Institution: CSU, Dominguez Hills, Carson CA

Youth at-risk for joining gangs reside in low-income and socially disorganized communities where violence and crime occur often. Specifically youth who socialize with gang members in their community. Nonetheless, not much attention is devoted to families looking for gang preventative help and the barriers they encounter. In order to have more effective gang prevention programs, it is significant to identify the barriers faced when attempting to gain access. Therefore, the barriers that families encounter in receiving help for youth in low-income communities who

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are at risk for gang membership are sought. Sampling procedures initiate with a convenience sample followed by the snowball effect. This field research includes 10 qualitative, semi-structured interviews with Latina/o parents of youth 13-16 years of age who reside in a low-income community where gang presence is explicit. Literature indicates that many Latino/a at risk youth parents have little knowledge of social services. Anticipated results are that a significant barrier faced by families is lack of knowledge of existing gang prevention programs. This research project calls on the need for existing programs to reach out to gang-ridden neighborhoods more effectively. Limitations consist of limited sampling of low income Latino/a communities in Southern California.

The Balance Between Extemporaneous and Logic

Author(s): William Dick

Mentor(s): Jack Reilly

Institution: CSU, Channel Islands, Camarillo CA

To me, life is all; and I mean everything, including this piece of art, about choice and chance. As for my experience with the artwork, selfishly it's about my process and relationship with each piece, looking for or just moving and finding a balance while retaining respect for the viewers of the piece. Including anyone that experiences the painting or paintings and anyone that takes that experience with them directly affecting someone else's life or their own. Spontaneity, experimentation, mixed media-ism, minimalism. Thankfully creating art is an experience that embraces some of my obsessions. My paintings are about process, and I spend weeks and months typically covering and repainting over what had previously been on the canvas. Garnering surfaces that I respect. I focus on experimentation, expression, emotion, and experience as the integral ideas in my work. Often I use dreams to find new directions or techniques to try the night before. For this particular piece I came upon a process I developed after a four-month painting spree that produced 10 paintings, all striking me all as directionless (which is pleasant but I got bored of that experience during that time), producing no logic whatsoever. My process then developed into a personally challenging logical process, all the while trying to preserve the spontaneous abstraction and expressionistic aspects of my experience with the materials and the canvas.

Visualization and Analysis of *C. elegans* VD Motor Neurons in *zyg-8* Mutants

Author(s): Riva F DiGiacomo

Mentor(s): Renee Baran

Institution: Occidental College, Los Angeles CA

Correct microtubule function is necessary for proper neural development. Doublecortin-like kinase (dclk) is a microtubule associated protein that stabilizes growing microtubules. Mutations in dclk have been shown to disrupt cell migration, axon outgrowth and axon transport during mammalian neurodevelopment. To study the role of *C. elegans* dclk, *zyg-8*, we constructed *zyg-8* strains with a GFP transgenic marker that visualizes a specific subset of 19 GABAergic D motorneurons. Thirteen of these neurons synapse to the ventral body wall muscles of *C. elegans*, while 6 synapse to the dorsal side. Unfortunately, the axons of both dorsal and ventral neurons overlap and the 13 VD's cannot be visualized alone. A tissue specific promoter is not available for these neurons. However, injection of dsRNA encoding the gene *unc-30* induces a gene knock-down effect that shuts off GFP expression in the dorsal D neurons born during embryogenesis. This results in visualization of the 13 VD neurons, which are born later in development. *unc-30* dsRNA was synthesized using a RiboMax Express RNAi System (Promega). The dsRNA was injected into adult *C. elegans* and the progeny were examined for GFP expression. This examination of the VDs indicates that there are axon outgrowth and synapse formation defects associated with the *zyg-8* mutation.

Pumping and Valving for Integrated Nucleic Acid Testing in a Pouch-Based Cartridge

Author(s): Winnie Ding, Stephanie Tan, Kristina Roskos, Anna Hickerson

Mentor(s): Angelika Niemz

Institution: Keck Graduate Institute, Claremont CA

A disposable diagnostic for infectious diseases such as tuberculosis and herpes simplex virus is in development to address the growing need for accessible point of care testing. The diagnostic device encompasses a handheld electronic unit and a disposable pouch-based cartridge. Passive valves and electrolytic pumping will be integrated into the disposable cartridge for fluidic control, necessitating the determination of quantitative requirements and characteristics. Limitations on cracking pressure and pumping pressure were established based on pouch properties. Various wax valve fabrication methods have been explored and cracking pressures have been determined. Electrolytic pumping rate and the pressure generated in the reaction pouch as a result of the pump have been characterized as a function of current. It was determined that the minimum acceptable wax valve cracking pressure is 0.56 psi, based on the amount of pressure needed to contain 100 μ L of fluid within the pouch. The study also

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suggested a maximum acceptable pumping pressure of 9.16 psi based on the maximum amount of pressure the pouch can withstand. Reproducible manufacturing techniques for wax valves have been developed, but must be optimized further for greater precision in the desired pressure range. A comprehensive characterization of pumping rate and pressure is necessary for future studies: pump rate has been characterized as a function of current, however, the target pump rates for fluid control throughout the cartridge have not yet been determined. After the components of the system have been optimized individually, they will be integrated into the cartridge to function as a coherent unit.

Saturn Ring Data Analysis and Thermal Modeling

Author(s): Coleman Dobson

Mentor(s): Linda Spilker

Institution: CSU, Los Angeles, Los Angeles CA

Cassini's Composite Infrared Spectrometer, (CIRS), a dual Michelson interferometer, has acquired six years worth of thermal data on Saturn's lit and unlit rings, operating within a multi-dimensional observation space, which includes solar phase angle, spacecraft elevation, local hour angle, and a range of solar elevation angles which span from 24° through ring equinox. To determine to first order the parametric dependence of Saturn's B and C ring particle temperatures, ring particle temperature variation with changing spacecraft elevation is analyzed. Concomitant to the analysis of the effect of spacecraft elevation is a discussion of the supplementary roles of phase angle, ring optical depth, geometric filling factor, and self-gravity wakes, the deconvolution of which, it is found, is not possible. To this effect, a multilayer thermal model is used, which solves the equations of classical radiative transfer, and considers both the vertical heterogeneity of ring particle spin frequency and the heat transport due to particle dynamics. Observational data from the CIRS database is fit and compared against the predictions of the thermal model. Further research includes the development of a dynamical ray-tracing model, which considers the effects of finite volume density and particle regolith, each of which most plausibly influences thermal opposition. This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, and was sponsored by USRP and the National Aeronautics and Space Administration.

Progress Toward All-Optical Production of a Bose-Einstein Condensate: Cooling and Confining Dilute Rubidium-87 Vapor

Author(s): Eric M Dodds, Joel Shuman, Zack Lasner

Mentor(s): Dwight Whitaker

Institution: Pomona College, Claremont CA

With the goal of creating and studying a Bose-Einstein Condensate (BEC) near its critical temperature, we cool and confine rubidium-87 atoms using a magneto-optical trap (MOT) and a quasi-electrostatic dipole trap in a vacuum of $\sim 10^{-9}$ torr. We have successfully developed a stable MOT of $\sim 10^9$ atoms at hundreds of microKelvin and a routine for compressing and imaging the trapped atoms as we attempt to load them into the dipole trap. Fitting idealized functions to the images allows us to estimate the number, density, and temperature of the atoms in our compressed MOT (CMOT). Our CMOTs have densities around 8×10^9 atoms/cm³ at about 50 μ K. Recent work has focused on optimizing the parameters of the CMOT such as optical pumping time and laser detuning, and on characterizing the ~ 50 W CO₂ laser that creates the dipole trap, including its intensity profile after a 1.5 inch focal length lens focuses the laser to a ~ 30 μ m beam waist which we attempt to overlap with the CMOT.

Study for October 23 - 24

Author(s): Susan Doe

Mentor(s): Joseph Piasentin

Institution: Pepperdine University, Malibu CA

My paintings are a study of the visual elements I encounter during my daily commute. A photograph is taken at one-minute increments from a camera that is mounted to the driver side window of my car. Each minute captured by the camera is then transferred to one by six feet panels through the medium of paint. Every vertical panel is a visual slice of time corresponding to the slices of time in my commute. What began with realistic interpretations of the images captured in specific moments in time has become a visual record of the effects that time has on my interpretation of the images. In my paintings contradictory elements presented through time challenge relationships and as visual slivers are pressed against each other, unexpected relationships of noticed and especially unnoticed information of my commute propose significance.

From Rouault to Rhode

Author(s): Elizabeth Dollmeyer

Mentor(s): Paula Radisich

Institution: Whittier College, Whittier CA

"From March 11 to June 6, 2010, South African artist Robin Rhode presented his work at the Los Angeles County Museum of Art (LACMA) in an exhibition called "Con-

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temporary Projects 12: Robin Rhode". With influences from movements such as cubism, futurism, expressionism, and the various branches of Dada, Rhode's exhibit synthesized many artistic elements from the early twentieth century with a modern spin to create a unique brand of art. This paper looks at his May 2010 exhibit at LACMA and its connections with these movements from the turn of the century to the mid-1920s. By exploring these periods, I was able to see how art almost a century old has impacted today's contemporary artistic style. The parallels examined between the movements of the early twentieth century and today's contemporary art include social conflict, the conception of beauty, *tableau objet*, representation of motion, and the idea of street art, among other artistic concerns. The significance of the media used and the contrast between the media used by the early twentieth century artists is also explored. Information was collected from André Breton's novel *Nadja*, Rhode's exhibit at LACMA, and various academic lectures. I challenge the perception that we are witnessing a new brand of art stylistically and instead argue that contemporary artists are now adapting ways of dealing with contemporary social issues and conflicts, as well as the aesthetic ideas of these earlier artists, and recycling them in different mediums and in a contemporary context."

Effects of Tidal Restrictions upon Tidal Prism and Water Quality within a Remnant Southern California Estuary: Mugu Lagoon, Naval Base Ventura County

Author(s): Andrew Domingos

Mentor(s): Sean Anderson

Institution: CSU, Channel Islands, Camarillo CA

Mugu Lagoon (Ventura County, CA) is one of the largest remaining coastal wetland complexes within southern California and suffers from varying degrees of tidal restriction. We examined tidal flow restrictions throughout Mugu Lagoon and correlated attenuated tidal prism with water quality parameters as a barometer of ecosystem integrity. We found that sub-units of the Mugu Lagoon system with the most reduced tidal exchange have the greatest range of water quality parameters and the highest levels of persistent Chlorophyll-a and macroalgal (*Ulva-Enteromorpha* species complex) blooms. In addition to simply exploring the state of Mugu Lagoon, we also examined a drainage ditch on the periphery of Mugu Lagoon that is a candidate hydrological connector to the adjacent, soon-to-be restored Ormond Beach Wetland complex. While Ormond Beach may benefit from such connectivity from a gross water budget perspective, our data suggest such a link may further increase residency times and algal blooms in both Mugu Lagoon and Ormond Beach wetlands. Improving flows between all sub-units of Mugu Lagoon will improve water quality both within the Mugu system and the adjoining Ormond system.

GIS Based 3-D Visualization and Analysis of Landslides

Author(s): Ryan L Douglas

Mentor(s): Binod Tiwari

Institution: CSU, Fullerton, Fullerton CA

Landslides, in the United States alone, are estimated to cause an annual loss of about \$1.5 billion, and at least 25 fatalities. Therefore, the analyses of previous and potential landslide regions are of great interest. Currently there are a number of different programs and methods being utilized for slope stability analysis. These methods range from the more commonly used simplified two-dimensional method, to the more time consuming three-dimensional method (each of these can produce a slightly different safety factor value). In this research, a new approach to both 2D and 3D slope stability analysis will utilize ArcGIS Spatial Analyst and the ArcGIS 3D Analyst extensions in calculating the factor of safety of a preexisting landslide. Mapping out the contours, sliding surface, and water table gave a 3D rendering of the physical surfaces. From the rendering a complete analysis was done using both 2D and 3D methods. The calculated factors of safety from each method were compared, and an appropriate conclusion was drawn.

Congressional Appropriations Earmarks and Representation in American Politics

Author(s): Brandon J Dowling, M Garcia, K Newcomb, C Padginton

Mentor(s): Sean Q Kelly

Institution: CSU, Channel Islands, Camarillo CA

Controversy surrounds the issue of congressional earmarks. In recent years the number of earmarks—language placed in appropriations conference reports aimed at targeting spending to members' congressional districts and states—has been on the rise. Negative public perception of earmarks is fueled by sensational media coverage, opportunistic politicians seeking to take advantage of public anger toward government, and watchdog groups that seek to delegitimize the practice of earmarking. Reporters who write splashy exposés on the vices of "pork" would be hard pressed to explain how an earmark makes its way into a congressional bill. Where do the earmarks come from? Why does a member of Congress request that an earmark be included in Appropriations Committee language? Using archived data spanning more than two decades we examine two broad conjectures: 1) the number of earmark requests reflects institutional considerations, and 2) the demand for earmarks originates at the district level, that is, earmark requests reflect district needs and boils down into a simple matter of responsive representation on the part of members of Congress. Using data on earmark requests for four House appropriations subcommittees (Energy and Water, Interior, Labor-H, Military Construction),

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we examine four hypotheses that stem from the political science literature: H₁: Senior members of Congress request more earmarks than junior members of Congress; H₂: Democrats request more earmarks than Republicans; H₃: Members who represent wealthier districts request fewer earmarks than members from poorer districts; H₄: Members who represent physically larger districts request more earmarks than members who represent smaller districts. Our research shows that Hypothesis one and two are largely unsupported by the data. Our analysis provides support for the hypothesis that earmark requests are driven by district demand. Our analysis sheds light on the earmarking process and supports the view that earmarks are an honest response to constituent's needs.

Akin

Author(s): Sunni Downing

Mentor(s): Avery Faulkner

Institution: Pepperdine University, Malibu CA

There is a sublime connection between each soul on this earth. Art is one way that connection manifests. We look at a painting and feel what the artist feels. I want people to see how beautiful each and every human being really is; whether a homeless man taking a nap in the alley or a wise, old woman shuffling across her dusty village, each one has a story to tell, a secret to reveal. There is more to viewing a painting than just glancing and noticing a pretty color; the viewer must read the paint and try to understand what the artist is conveying. I want my art to muster what hides deep within our hearts; I want the viewer to notice the stirring inside their soul and realize that that is exactly what they have in common with the subjects in the paintings no matter their apparent differences. We all share what awakens deep feelings; we are spiritually akin.

Seasonal Changes in the Vessel Anatomy of Adult and Resprouts of California Black Walnut Trees Following Wildfire

Author(s): David Duarte, Sara Pak, Shawn Pham

Mentor(s): Frank W Ewers, Edward G Bobich

Institution: California State Polytechnic University, Pomona, Pomona CA

Following a wildfire at Bonelli Park in San Dimas, CA, unburned adult trees and new growth resprouts of *Juglans californica* S. Watson were examined to determine the anatomical basis for seasonal variation in hydraulic conductivity and mechanical flexibility and strength. Differences between the adult and resprout growth forms were also considered. Stems from nine individuals per growth form were sampled monthly from February through June of 2008. Mechanical strength of stems was measured with an Instron mechanical testing device. Following hydraulic conductance and embolism measurements, stem samples

were perfused with crystal violet to mark conductive vessels, then sectioned and placed on slides for analysis of variance in vessel diameter, hydraulic vessel diameter, vessel frequency, percentage of conductive/non-conductive vessels, and percent vessel lumen area. Measurements were taken using a Leica microscope/image analysis program. The results showed a significantly greater vessel frequency in adults than in resprouts regardless of the season. In addition, the percent vessel lumen areas were greater in adults, whereas the mean and hydraulic mean vessel diameters tended to be greater in resprouts. Seasonal vessel variances were apparent in both growth forms with positive increases in percentage of conductive/non-conductive vessels, percent vessel lumen area, and mean, maximum and mean hydraulic vessel diameter in going from February through June. Vessel frequency decreased from the months of February though June for both adults and resprouts. The xylem specific hydraulic conductivity increased greatly during this time period. All the seasonal changes can be attributed to the production of a new xylem growth ring with wider vessels and lower vessel frequency. Higher mechanical strength in resprouts was correlated to lower vessel frequency and lower percent vessel lumen area than what occurred in adults. Higher xylem specific hydraulic conductivity in resprouts was correlated to much greater mean hydraulic vessel diameters.

Nematodes as a Bioassay for *E. Coli* at Different Growth Phases

Author(s): Alexander S Duchon, Ian Marcus

Mentor(s): Sharon Walker

Institution: UC, Riverside, Riverside CA

Throughout the growth phase of pathogenic bacteria, cells express different levels of virulence. Using *Caenorhabditis elegans*, a nematode, as a bioassay it is possible to rate the relative virulence of our model *E. coli* bacteria. By exposing *C. elegans* to O157:H7 (EDL933) at different points during the growth cycle and recording the amount of time it takes for fifty percent of the population to die (TD_{50}) the virulence at each growth phase can be quantified. This value can then be compared to the level of fluorescence of the virulence factor, stx1AB, a gfp-tagged (green fluorescent protein) in the *E. coli*. The bacterial growth curves and fluorescent gfp expression curves have been measured over time. These growth curves have determined the phases at which the *C. elegans* are initially exposed to the bacteria, which will affect their death rates. Progress to date will be presented. This study will allow for downstream monitoring of the virulence level of pathogenic *E. coli* in engineered systems using an inline fluorometer.

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Characterization of the RBM5/H37 Tumor Suppressor Gene Located at 3p21.3, the Most Frequently Deleted Region in Lung Cancer

Author(s): Ramzi E Dudum, Eileen Taschereau, Bryan Lau, Karen Cham

Mentor(s): Juliana Oh Barba

Institution: UC, Los Angeles, Los Angeles CA

The RBM5/H37 gene is located at chromosomal 3p21.3, deletion of which region is the most frequent and earliest genetic alteration occurring in lung cancer. Therefore, studying this region and RBM5 is particularly promising toward developing novel diagnostics/therapeutics to combat lung cancer. The accumulated evidence has corroborated firm characteristics of this gene as a tumor suppressor in both in vitro and in vivo studies. Using cDNA microarray analysis we have recently identified global gene expression changes caused by the RBM5 knockdown. Consistent gene expression increase was seen for the group of genes functioning in cell adhesion, migration, and motility, known to be essential in cancer metastasis. Among these genes, Rac1 and β -catenin, the two important players downstream of Wnt signaling pathway leading to increased cell migration, have been the focus of our subsequent functional studies. We have performed RBM5 siRNA transfection in Calu-6 lung cancer cells and confirmed corresponding cell growth increase as well as its protein expression decrease by Western blot analysis. Further, we showed RBM5 gene expression decrease would increase protein expression of β -catenin and protein activation of Rac1 in the same knockdown cells. In addition, we demonstrated that RBM5 knockdown results in increased migration by wound healing scratch assay. Further study is warranted to validate RBM5's true function in tumor metastasis in particular related to β -catenin/Rac1 biology with a long-term goal of this research in mind for developing novel lung cancer therapeutics/diagnostics.

Ground Reaction Force is Altered Following Four Weeks of Automated Locomotor Training in Spinal Cord Injured Rats

Author(s): Jessica Duhon, Ryan Schmitt, Dal Soto

Mentor(s): Jeff A Nessler

Institution: CSU, San Marcos, San Marcos CA

Locomotor training is commonly used in the rehabilitation of gait following spinal cord injury (SCI). Because manual, therapist applied training is very labor intensive, several robotic training devices have been developed in recent years to automate this process. While previous investigators have focused on training algorithms to improve neurological outcomes following locomotor training, much remains unknown regarding the effects of automated training on muscle function. Recently, a robotic device was developed that can provide automated locomotor training to rats following SCI while simultaneously

measuring animal-robot interaction force. The purpose of this study was to evaluate these forces as a measure of *en vivo* muscle function in SCI rats across 4 weeks of training. Thirteen female, Sprague-Dawley rats received mid-thoracic spinal cord transections as neonates. Eight animals underwent automated locomotor training for 4 weeks beginning at 21 days of age. Training occurred 5 days per week for 5 minutes per day with approximately 90% of the animal's body weight supported by the robotic device. The remaining 5 animals were not trained. Results indicated that vertical ground reaction force (GRF) during the stance phase of stepping was similar for both groups at 2 weeks, but was significantly greater for the trained group following 4 weeks of training ($p = 0.005$). When normalized for body weight, there was a general trend for GRF to decrease across time for both groups, though the control group demonstrated significantly greater reductions in normalized GRF ($p < 0.001$). GRF projection angle also became significantly more vertical over time for both groups ($p < 0.001$), resulting in greater step height with less drag of the hindlimb. These data suggest that muscle function might be improved following SCI through automated locomotor training. In addition, measurement of animal-robot interaction force appears to be a sensitive measure of locomotor recovery.

Hydrogen-Deuterium Exchange NMR Reveals the Details of Ligand-Dependent Stabilization in CusF, a Bacterial Copper(I) Chaperone

Author(s): Kevin D Eden

Mentor(s): Blake Gillespie

Institution: CSU, Channel Islands, Camarillo CA

Protein-ligand binding interactions are often coupled with changes in localized and global protein stability. Changes in protein stability between bound and unbound conformations thus provide insights into protein structural and functional dynamics. With CusF, a small copper binding protein, as a model for protein-ligand interactions, Hydrogen Exchange (HX) NMR spectroscopy was used to evaluate hydrogen exchange rates of specific CusF protein residues in solution. Hydrogen exchange rates reflect local protein stability; comparing relative exchange rates between bound and unbound CusF yields a Δ stability profile for each observed residue. Changes in exchange rates for specific CusF residues were measured and mapped onto CusF and revealed localized and delocalized changes in stability. Amino acid residues in the metal binding site as well as residues integral to the β -barrel structure far from the binding site exhibited significantly increased changes in relative stability, implying that ligand binding interactions for CusF not only stabilize binding site residues but also delocalize stability throughout the β -barrel.

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Determinants of Dung Beetle Diversity and Abundance in a Biodiversity Hotspot in Eastern Kenya

Author(s): Amanda L Edwards
Mentor(s): David N M Mbora
Institution: Whittier College, Whittier CA

We tested the hypothesis that diversity of dung beetles in Tana River forests of Kenya would coincide with an ecological gradient in the system. The forests are part of the east African coastal forests global biodiversity hotspot and are maintained by groundwater. Their lateral extent is limited to a kilometer on either side of the river. We predicted that diversity of dung beetles would be negatively associated with distance from the river because beetles are dependent on monkey dung, while the monkeys are dependent on forest vegetation. We sampled beetles using standardized baited pitfall traps in 24 hour cycles at 50 meter intervals on transects laid perpendicular to the river in November 2009 and July 2010. We compared diversity among sampling points and forests using the Shannon-Wiener diversity index. We identified 60 beetle species in 14 genera. The diversity of beetles by sampling point coincided with the ecological gradient of focus; diversity declined with increasing distance from the river. Therefore our hypothesis was supported. Diversity among forests ranged from 1.23 to 2.70. The overall diversity index of 2.66 is comparable to that of African tropical forests (range 0.91-2.34) and Amazonian forests (range 0.91-2.63). Abundance of the largest beetle species, *Anachalcos convexus*, was also negatively associated with distance from the river. However, the abundance of this species was higher on the east bank of the river, and was also significantly different among forests. Our next steps include characterizing vegetation structure and composition, levels of human disturbance and abundance of primate dung along transects to enable us to identify defining mechanism(s) causing the observed trends in abundance and diversity of dung beetles. By sampling dung beetles in this hotspot we have illuminated the biodiversity of the area and contributed to the understanding of factors that determine biodiversity globally.

Water Quality and its Distribution Pattern throughout Piso Firme and the Paraguá River

Author(s): Scott M Elder
Mentor(s): Kristen Conway-Gomez
Institution: California State Polytechnic University, Pomona, Pomona CA

Water quality is important all over the world and especially in developing countries. In Bolivia, water quality plays a very important role due to the country's tropical location and the majority of the population living in rural villages. In the village of Piso Firme, the water sources were tested by the government and determined to be polluted, but no

other information was given to the community. In order to help identify the pollutants in the community's water, this research applied the following methods. Coliform bacteria tests were conducted on multiple houses throughout the entire village with additional tests for nitrates, phosphates, pH, turbidity, and dissolved oxygen. Samples were also taken along different sites on the Paraguá River in order to compare the water quality of the river to the main well of the village. Samples were taken in a selective order to achieve the best distribution of houses from the main well. Other personal family wells were also tested to compare their water quality with the main well. Although the results were mixed, additional testing indicated positive results for coliform bacteria for each household tested and for samples taken from the river. The distribution pattern for water quality showed to be uniform throughout the entire village indicating the source of pollutants were most likely from the main well.

The Utopian Theory Present in the Works of Elena Poniatowska, "Lilus Kikus" and "Hasta no Verte, Jesús Mío"

Author(s): Rebecca Ellson
Mentor(s): Lila Carlsen
Institution: Pepperdine University, Malibu CA

This project will be analyzing the utopian theory that is present in much of Latin American contemporary literature. The focus will be on two specified works by the acclaimed Mexican novelist Elena Poniatowska. "Lilus Kikus" is a child's story with in-depth utopian themes and characteristics within its storyline. "Hasta no verte, Jesús mío" is a fictional version of Elena Poniatowska's true story of her time spent living in an indigenous Mexican community. Utopia will be studied as a critique of the actual rather than the typical idea of envisioning an ideal society in an imaginary and isolated place. The childish innocence that brings Lilus Kilus a solitary utopia will be compared and studied alongside the community utopia of an isolated indigenous group.

Effects of Repetitive Transcranial Magnetic Stimulation (rTMS) on Language Function

Author(s): S Zayd Enam
Mentor(s): Feng Rong
Institution: Aga Khan University

While the link between the motor cortex and language has been proven, little is known about how phonological and semantic characteristics of language affect this link. When we interact, we incorporate gestures to supplement our speech and previous studies have shown an evolutionary link between our hand movements and verbal expressions. We proposed to use transcranial magnetic stimulation (TMS) and electromyography (EMG)

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on bilingual patients to see the affect of language on motor thresholds. While progress has been made in understanding the neuroanatomy of how a single language is processed in the brain, virtually no research exists that studies the comparisons and differences between the synthesis of primary and secondary languages. This study will be the first to begin examining how language is synthesized and processed in the brain in the context of the Urdu language. TMS is a well-established research and clinical tool. It involves placing an electromagnetic coil on the scalp through which high-intensity current is rapidly pulsed through the discharge of capacitors. This produces a time-varying magnetic field that typically has a strength of about 2 T, which is about 40,000 times the earth's magnetic field. In a pilot study done at the Aga Khan University Hospital we selected a subject that spoke three languages: English, Urdu and Shina. His primary language was Shina, secondary was Urdu and tertiary was English. We found a direct inverse correlation between motor evoked potentials (MEP) and his skill at the language. What this indicates is that the less adept he was at expressing himself through language, the more his brain wanted to resort to gestures to express himself and thus, the excitability of neurons in his motor cortex increased. The findings of this study will give us better insight into the evolutionary link between languages and motor gestures.

Lymph Node Lymphangiogenesis Precedes Metastasis

Author(s): Jacqueline Engel

Mentor(s): Judith Varner

Institution: UC, San Diego, La Jolla CA

Lymphangiogenesis in tumors, the growth of new lymphatic vessels from preexisting vessels, has been correlated with tumor metastasis. Our lab has shown that lymph node lymphangiogenesis promotes tumor metastasis in animals and that blocking lymph node lymphangiogenesis can inhibit metastasis. Furthermore, we showed that lymphatic vessels in the lymph nodes of cancer-bearing mice express integrin alpha₄beta₁, while normal lymphatic vessels do not. In addition, we determined that antibodies directed against integrin alpha₄beta₁ block lymph node lymphangiogenesis and metastasis in lymph nodes. In this study, we used immunohistochemistry to test the hypothesis that lymph nodes from patients with breast cancer but not normal lymph nodes would exhibit evidence of lymphangiogenesis. We saw a significant increase in lymphatic vessels in tissue samples from human patients pre- and post-metastasis compared to non-cancer carrying patients for all three antibodies. Future experiments will seek to determine whether lymphatic vessels in lymph nodes from pre-metastatic and metastatic patients will show greater integrin alpha₄beta₁ expression on their vessels. These studies will enable us to determine if integrin alpha₄beta₁ is a marker of pre-metastatic lymph nodes. These findings may allow identification of patients at risk

for metastasis and those that may benefit from use of antagonists of integrin alpha₄beta₁ to prevent metastases.

Ocean Sea Surface Temperatures Recorded by Clams Present in an Orange County Terrace Deposit

Author(s): Marcus Vincent Enriquez

Mentor(s): Pedro Ramirez

Institution: CSU, Los Angeles, Los Angeles CA

A 1.2 meter thick marine terrace deposit is exposed on the cliffs at Crystal Cove State Park, Orange County, California. This terrace marks the last major high stand of the sea, correlating with marine oxygen isotope sub-stage 5e (121-133ka). The terrace deposit consists of interstratified 0.2 to 0.3 meter thick, moderately to well sorted, coarse to medium grained sand and 0.3 meter thick intervals of fragmented clams in medium to coarse grained sand and sandstone. Contorted rocks of the Monterey Formation underlie the terrace deposit and a poorly sorted, moderately to poorly stratified, mostly matrix-supported debris flow unit overlies it. Clam fragments in the terrace sequence largely range up to 2.5 cm wide and are composed of CaCO₃. Clams present provide an excellent opportunity to reconstruct ocean temperatures using an innovative clumped isotope technique developed at the California Institute of Technology. This new technique can be used to find more accurate ocean temperatures during the development of 5e marine terrace. I expect warmer ocean temperatures to correspond with the rise in sea level and the formation of the terrace. Isotopic analysis of the clams indicates that ocean sea surface temperatures during terrace development ranged from 21-26 °C in comparison to the modern mean annual ocean temperatures of ~17 °C recorded at Newport Beach by NOAA. My results, which are the first reported for the clams using this geochemical technique, show that ocean temperatures were generally 7 °C to 9 °C warmer than previously reported in some studies. Additional isotopic analysis of clams in the terrace will lead to better refinement of sea surface temperatures in the Orange County area during the last major sea level rise.

Water Level Feedback Control System

Author(s): Antonio Espinas, Phillip Lieu

Mentor(s): Norali Pernalete

Institution: California State Polytechnic University, Pomona, Pomona CA

The purpose of this project is to build a two position (on-off) water level feedback control system that maintains water level in a supply tank. This project engages our knowledge and skills we've learned in electrical engineering particularly from Advance Control System Lecture/Laboratory. *Methods:* It involves: 1) Soldering/assembling/modifying 2 Velleman Liquid Level Controllers/Sensors.

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These 2 controllers labeled as Controller 1 and 2 have built in alternating sensing voltage with a frequency of around 1KHZ to avoid electrolysis/deposits on the sensor strips. Sensor 1 and Sensor 2 were modified by replacing them with 12-gauge copper wires cut to its corresponding lengths to establish our low, medium and high level positions, (desired operating range). 2) Installing 2 water pumps labeled as Pump 1 and Pump 2 and splicing its power supply adaptors and connecting them separately to the relays of Controllers 1 and 2, respectively. The system uses the SVF-154 variable voltage variable frequency inverter to drive the motor pump to transport water from the well onto the water supply tank. In our design, we used 2-Submersible Jebao Water pumps with a maximum of 59" head pressure and 185 GPH flow to ensure adequate transfer of water. Elevating our supply tank at 2.3066 feet above the source yields a water pressure of 1 psi. *Results:* The combination of the head pressure, flow and return pressure creates a timely water supply and return cycle. Currently, no software is used; however, it could be incorporated by modifying our design requiring a complex controller/software. *Conclusions:* Seeing this project works and the interesting challenges it poses such as improving its efficiency and fully automating it is both a reward and a joy in itself.

Athletes and Self-Concept: An Exploration of Role Distance Between Real and Performer Self-Concept

Author(s): Richard A Espinoza

Mentor(s): Steve Smith

Institution: UC, Santa Barbara, Santa Barbara CA

The present study was designed as an assessment of college athletes' shifting self-concept as a function of situational role demands. Specifically, we examined if student athletes think and feel differently about themselves, their abilities, appearance, and interpersonal facility during moments of competition. Although prior research has shown that athlete self-concept is related to performance and ability to adapt to changes, little work has examined how such self-concept may differ as a function of game play. Thirty-two collegiate student-athletes (19 men and 13 women) completed a shortened version of the Self-Description Questionnaire for Young Adults and Adolescents (SDQ-III) twice: once in the mindset of their real, day-to-day self and again in the mindset of their performance/competition/public self. A performance self was induced using imagery and writing procedure to enhance a shift in self-image. Results of the two administrations of the SDQIII were compared using a repeated measures Analysis of Variance (ANOVA). Results suggested largely equivocal results, except for the Physical Abilities subscale, which measures respondents' views of their physical talents and skills at sport. However, contrary to expectations, scores on this subscale decreased after the competition mindset shift cue. Therefore, after the athletic cue, participants

perceived their abilities as lower while in play. Further analyses will examine if sport proficiency or other factors such as age or gender mediate these results. This study builds upon the previous work that suggests that personality dimensions related to athleticism strengthen with experience and salience to sport affiliation. Research and clinical implications will be discussed.

The Christian Roots of Pepperdine University Communicated through Graphic Design

Author(s): Bryan G Evans

Mentor(s): Dana Zurzolo

Institution: Pepperdine University, Malibu CA

In an effort to effectively communicate the meaning of what it means to work at a Christian University, Pepperdine gave me the task of effectively portraying content, and examples through graphically stimulating, attractive, and cohesive pages in a book titled *We are One made of Many*. The elements of the Christian roots can be subtle at times, and the community of Pepperdine broad, and for these reasons I felt as though the style of grunge perfectly compliments the community the book is trying to reach. I first was introduced to David Carson in a class at Pepperdine, and his work influenced my yearning to be a graphic designer. Carson revolutionized graphic communication by breaking the assumed rules applied in design layout by stating, "do not mistake legibility for communication and is essentially the founder of the grunge era. He allows an audience to interpret a message how they want with subtle messages being communicated by distortion. Grunge not only speaks to the audience of the Pepperdine community, but also speaks to Christianity in general; a religion in which interpretation of the message is constantly being debated. This has been a personal struggle with me through my life as a Christian and also a student; and because of this I felt the need to create a piece of work that allows the audience to be guided by its words but also be able to interpret and apply them to their own personal lives. Through this project I have grasped various ways in which the fine arts can communicate and the importance of understanding the history of the field of study. The ways that my interpreting of these styles has created a unique piece that resonates, communicates, interacts, and allows personal interpretation with the audience of *We are One made of Many*.

President Reagan and the Construction of an American Social, Political, Economic and Cultural Paradigm

Author(s): Taylor H Evenson

Mentor(s): Joyce Kaufman

Institution: Whittier College, Whittier CA

The proposed research project is a multidisciplinary ex-

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ploration of the Ronald Reagan paradigm, which will be consider a conservative political, economic, social, and cultural movement centered around ideas of individual determination. The focus of the paper is the paradigm itself, its ability to be portrayed as a populist movement counter to its true intentions, and Reagan's role in acting as an effective figure head to this end. The paradigm, lasted approximately twenty years, from 1980-2008, and was a multi-class conservative movement infatuated with extreme individualism, specifically it identifies as a populist movement while in actuality serves corporate and fiscal elite. Furthermore, the ideology expressed in the movement is closely tied to objectivism (Ayn Rand) and feelings of unjust government oversight of some "private spheres", as well as an overall distaste for the growth of American bureaucracy. The paradigm is so pervasive that its effects, ideology, cultural beliefs, desired outcomes, etc. can be analyzed through the disciplines of Sociology, Economics, Anthropology and Political Science. The intention of these approaches is to show the paradigms omnipotent influence on the American people. The evidence for this project will be historical events as well as trends identified through the four above-mentioned disciplines, each with its own methods and models for analyzing given phenomena. The information for this project will found in primary and secondary documents. The project will attempt to reveal the deviation between the movement's portrayed intentions and actual outcomes.

Analysis of Prostate Biopsy Samples for the Markers of Prostate Cancer Progression

Author(s): Bianca S Faridian, Lizbeth Alvarez
Mentor(s): Luiza Nogaj
Institution: Mount Saint Mary's College, Los Angeles CA

Prostate cancer is one of the leading causes of death in men. Benign types of prostate cancer can be effectively treated while the malignant types are incurable. Therefore, it is important to find molecular markers that will distinguish benign prostate cancers from the malignant ones. The Polycomb proteins (PcG) function as transcriptional repressors and are thought to prevent the transcription of tumor suppressor genes such as p16. The p16 protein is known to prevent the proliferation of cell growth and directs the cell into apoptosis. However, the mechanism of Polycomb-mediated silencing and its connection to prostate cancer progression is still not well understood. We study the role of Bmi1 and EZH2, members of the Polycomb complexes, on the progression of prostate cancer. Our results on prostate cancer xenografts show an overexpression of Bmi1 and EZH2 while the p16 protein cannot be detected. To confirm those results we obtained 50 prostate biopsies at different stages of prostate cancer development. In this work, we show the preparation, normalization, and analysis of those samples. Based on our work, Bmi1 and EZH2 might be good indicators of prostate cancer progression.

Infant Video Watching and Perceptual Learning of Contrast Sensitivity

Author(s): Cristina M Farkas
Mentor(s): Rain Bosworth, Karen Dobkins, Vanitha Samp
Institution: UC, San Diego, La Jolla CA

There is more television and DVD media directed at infants than ever before with the goal of "enriching" the infant's environment. Yet we are unaware of the consequences on infants' perceptual development. In the current experiment, we attempted to determine whether perceptual learning could be demonstrated in 11-15 week old infants, using a detection task. The experiment took place over 3 days: day 1 pre-training testing, day 2 20 minute video training, and day 3 post-training testing. Detection thresholds from infants were collected by the forced-choice preferential looking technique for two stimulus conditions: Chromatic (red/green) and Luminance (dark/light) horizontal grating patterns. Infants were randomly assigned to 1 of 3 training video groups: Luminance training ($n = 10$), Chromatic training ($n = 10$), and No Training ($n = 10$). A 3 (subject groups) x 2 (CS types) ANOVA revealed no significant differences for contrast sensitivity or for looking preference time ($p > 0.05$). However, infants do appear to be affected by exposure to the training video, as results show that preference (looking time) differs between control group vs. trained groups. Both trained groups preferred to look more at the Luminance than the Chromatic stimuli while the opposite was true for the control group. The current failure to find evidence that low-level perceptual sensitivity can be modified in infants following a short "training" period is actually consistent with the adult literature showing very small perceptual learning effects on low-level tasks, like contrast sensitivity. Nonetheless, we did find that infants were sensitive to the short video exposure. This is because we found evidence of a preference change following video exposure, which indicates that infants did become familiar with the video.

Intellectual Space in Naguib Mahfouz' *Thartharah fawq al-Nil*

Author(s): Robert Farley
Mentor(s): Elizabeth Dahab
Institution: CSU, Long Beach, Long Beach CA

Post-independence Egypt experienced a mass economic nationalization headed by President Gamal Abdel Nasser; the resulting emergence of an authoritarian socialist government became a source of alienation for the intelligentsia. Distinguished scholar in Arabic Language and Literature, Roger Allen states that Nobel laureate Naguib Mahfouz employs his 1966 novel *Thartharah fawq al-Nil* (*Adrift on the Nile*) to "depict the role and fate of the Egyptian cultural intelligentsia during the 1960s" (107).

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Through consultation of historical and literary sources, this paper investigates the way Mahfouz accomplishes this, specifically in his construction of internal and external environments. From the physical stature of the novel being shorter in length than those from his earlier period, to the confined setting of the houseboat where the majority of the story takes place, the reader experiences a constricted feeling perhaps similar to that of the intelligentsia under Nasser's socialist regime. On an internal level, the numerous mental evocations by Mahfouz' main character involve a vast historical spectrum, indicating both a destruction of chronological space, yet an augmentation of psychological space. Through this multi-layered analysis of the author's spatial construction in both internal and external environments, a deeper understanding can be reached of both Mahfouz' artistry and the reality for the Egyptian intellectual in the 1960s.

Cooperation is Indispensable

Author(s): Elysse N Farnell

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

Many people struggle with being torn between cooperation and independence. In fact, some have argued that one of the more important developmental stages in children comes as they move from dependence to independence, most notably for teenagers. Indeed, one study in particular argued that decision-making autonomy overtime predicted enhanced emotional functioning. Yet, others have noted that it is cooperation which could alleviate suffering and create wealth. This study examines that struggle between independence and cooperation in adulthood and how preference for one over the other is related to quality of life evaluations. It was hypothesized that those who valued cooperation over independence would have higher quality of life. A survey of adults primarily residing in a large Southern California county ($n = 868$, mean age = 37.88, age range = 18 – 91 years) were used for the analyses. Quality of life was assessed using the Delighted-Terrible scale. Preference for cooperation was assessed by creating an item that asked respondents which they would prefer to have: cooperation or independence. Results supported the hypothesis. When compared to respondents who chose independence, those who preferred cooperation reported significantly higher quality of life evaluations. The implications of this study are consistent with intergroup relation research that has pointed to the benefits of creating common in-group identities. As our society becomes more diverse there is a growing pressure to find solutions to intergroup conflict and to find a common group identity. Through cooperation not only can we possibly reduce conflict, we can also increase quality of life evaluations.

The Translation and Analysis of Indigenous Chilean Poetry: A Study of Pedro Humire

Author(s): Lissa Farrington

Mentor(s): Salvador Fernandez, Pedro Humire, Rodrigo Novoa, Sandra Rojas

Institution: Occidental College, Los Angeles CA

This paper examines the work of Pedro Humire Loredo, a contemporary indigenous poet from Northern Chile. While studying abroad in Chile, I had the privilege of working closely with Humire in the process of translating his poetry from Spanish into English. An ongoing process, this translation will hopefully open up his work to a broader audience and help it gain the appreciation and acknowledgment that his poetry deserves. Humire continues to be an outspoken advocate for the preservation of his native Aymara culture, and as a staunch communist persecuted during the Pinochet dictatorship of the 1970's and 80's, his writing provides an important insight into the internal politics and cultural conflicts of his country. By identifying the main themes and tenets of Humire's work, and applying biographical and relevant culture information to a historical reading of his poetry, this paper places him within the larger context of "exile literature." I provide a treatment of exile literature as a genre, using work by famous exiled writers such as Salman Rushdie, Milan Kundera, Edward Said and others, as well as examining critical literature categorizing and determining the exile genre. By then exploring Humire's use of the classic exile themes of nostalgia, displacement and geographical space, this paper argues that he should be categorized alongside other writers in the literary genre of exile.

The Effect of Distance from Stream Edge on Post Fire Recovery of Woody Species in the Angeles National Forest

Author(s): Courtney A Faught, Shelley Heller, Peaches Ulrich

Mentor(s): Cheryl Swift

Institution: Whittier College, Whittier CA

We explored the relationships between difference from stream edge and its effect on post fire recovery of woody species in Tujunga Canyon in the Angeles National Forest. Between June 9, 2010 and September 21, 2010, transects spanning the riparian zones were taken from 4 sites along the Upper Big Tujunga River. We measured the following aspects of the woody species encountered in the riparian zone: the number of branches, alive and dead, size of the smallest and largest remaining branches, and the presence or absence of a canopy or resprout. Data was analyzed by comparing the distance from the river's edge to the mean damage of the canopy and the smallest remaining branch. Our results show that in relation to the river, the number of seedlings increased as the distance from the river's edge decreased. Proximity to the river decreased mortality

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and increased the likelihood of crown survivorship. The data from the Tujunga River are similar to data collected on post fire recovery of woody riparian species in that proximity to the river influenced mortality, and degree of canopy damage.

Comparing STEM Students' Implicit Science Identity, Attitudes, and Stereotypes

Author(s): Abdiel J Flores, Sara Chapman, Marissa Salazar, Tanya Chavez

Mentor(s): Bettina J Casad

Institution: California State Polytechnic University, Pomona, Pomona CA

The objective of this study was to examine gender differences in implicit associations among science, technology, engineering, and math (STEM) majors. We hypothesized that (1) male participants would more strongly endorse gender stereotypes associating women with liberal arts and men with science than female participants. We also hypothesized that (2) stronger gender identity would predict lower math and (3) science identity among female participants, but that gender identity would be unrelated for male participants. Finally, we predicted (4) more positive attitudes toward science would be positively correlated with science and math identity. Male and female STEM majors completed five Implicit Association Tests (IAT) administered online. The IATs included science-liberal arts stereotypes, science-liberal arts attitudes, gender identity, math identity, and science identity. The IAT is a computer task in which participants press a left or right key on a keyboard to categorize stimulus words as belonging to a target (e.g., female/male) or attribute category (e.g., liberal arts/science). Participants' speed and accuracy are calculated to determine which pairs of targets and attributes are more strongly associated. Preliminary results ($n = 34$) provide some support for hypotheses 1 and 4. There was a non-significant trend showing males more strongly endorsed gender stereotypes regarding STEM than women, $t(31) = 1.77, p = 0.086$. Supporting hypothesis 4, positive attitudes toward science were correlated with science identity ($r(32) = 0.605, p = 0.001$) and math identity ($r(32) = 0.613, p = 0.001$). Interestingly hypotheses 2 and 3 were not supported and the opposite was found. Males with stronger gender identity had higher math ($r(15) = 0.784, p = 0.001$) and science identity ($r(15) = 0.663, p = 0.004$), whereas results for women were non-significant. The findings have implications for women's experiences in STEM and the role of female identity as a potential risk factor in STEM identification.

Respiratory Sinus Arrhythmia Moderates the Effects of Stereotype Threat among First Generation College Students

Author(s): Abdiel J Flores, Veronica Macina, Hannah Krebs, Tiffany McGinn

Mentor(s): Bettina J Casad

Institution: California State Polytechnic University, Pomona, Pomona CA

Stereotype threat is a situational phenomenon that stigmatized group members experience when they are concerned that their behavior will be judged according to negative social stereotypes. This concern interferes with a variety of mechanisms that lead to impaired performance on stereotype-relevant tasks. Although previous research has documented the effects of stereotype threat on a wide range of social groups, no published study has yet focused on the effects of stereotype threat among first generation college students. Thus, the objective of this study was to examine whether first generation college students are susceptible to experiencing stereotype threat in academic settings. Twenty undergraduate students completed a moderately challenging exam taken from the verbal portion of the GRE while their physiological responses were recorded. Participants in the experimental condition were told that group differences in performance were expected based on college generational status, while in the control condition participants were told that no such differences were expected. We hypothesized that participants in the experimental condition would experience stereotype threat and impaired test performance, which would be moderated by physiological arousal. Results revealed a two-way interaction between respiratory sinus arrhythmia (RSA) and condition on academic test performance, $t(17) = 2.69, p = 0.01$. Participants in the control condition did not differ on test performance depending on levels of RSA. However, in the experimental condition, participants showing a threat response (lower RSA) had significant lower test scores than participants showing a challenge response (high RSA). In addition, there was a two-way interaction between RSA and condition on academic self-perceptions, $t(17) = 2.63, p = 0.02$, such that participants with low RSA had more negative academic self-perceptions than participants with high RSA. These results illustrate the negative effects that stereotype threat has on first generation college students' test performance and academic self-perceptions.

The Critical Theory and Social Justice Journal of Undergraduate Research at Occidental College

Author(s): Tania A Flores

Mentor(s): Elmer Griffin

Institution: Occidental College, Los Angeles CA

The Critical Theory and Social Justice (CTSJ) Journal of Undergraduate Research at Occidental College publishes

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original, rigorous, and compelling academic and artistic work that critically examines the intersections of race, gender, sexuality, and nationality as they relate to problems of social justice. The CTSJ Journal, published on a semi-annual basis, seeks research articles, essays, artwork, and reviews from undergraduate students of all disciplines and of any institution, with the intention of fostering an interdisciplinary exchange of ideas and of creating a forum for students to share and publish their scholarly work. Additionally, through its engagement with a range of bodies of theory and its application of theory to existing sociopolitical circumstances, the CTSJ Journal is a source of fundamentally contemporary and relevant theoretical and political work. The contents of the first issue of the CTSJ Journal, published in May 2010, exemplify the discourse between the theoretical and the political fundamental to the mission of the journal. The essays selected for this issue include a paper positing an interaction between Aimé Césaire and Shakespeare on “powerful utterances”, an interpretation of community in Marquis de Sade’s *Philosophy in the Bedroom* in the terms of Jean-Luc Nancy, an application of postcolonial theory to black masculinity in hip-hop, and the examination of menstrual anarchy, or “menarchy”, as a critical feminist project. The upcoming issue of the journal, which will be published in December, will be a special issue focusing on the work of the French philosopher Georges Bataille; the essays contained in this issue will engage Bataille with synaesthetic language, Jacques Derrida’s concept of hospitality, flamenco performance, and Lady Gaga. Subsequent issues of the CTSJ Journal will focus on human trafficking, the problematics of “helping” Haiti, the politics of collegiate sexuality, and the nexus of affect and (dis)ability.

Cumulative Effects of Sea Level Rise on Soil Ecosystem Productivity and Infrastructure along the California Coast

Author(s): Alexandra Forman

Mentor(s): James Sadd

Institution: Occidental College, Los Angeles CA

This poster presents a comparison of potential coastal flooding risk for four spots along the California coast due to sea level rise which, currently, convincingly demonstrates that not all susceptible areas are at equal ecological and economical risk. With this in mind, I initially hypothesized that each location will subjectively alter pre-established soil ecosystems while posing similar levels of environmental, financial, and social risk to each of the given locations. These sample areas include: Moss Landing, Point Mugu, San Elijo’s Lagoon, and Batiquitos Lagoon and are all located between the Bay Area and San Diego. After completing an intensive laboratory microbial study examining the effects of a coastal flood on each site’s dominant soil type, I concluded that my hypothesis is not valid. With climate change predicting a rise in global sea level, the imminent increase in salinity upon California coastal

regions has the potential to greatly disrupt soil process, productivity, as well as infrastructure; this in turn affects established ecosystems and the economy. In creating my risk assessment, I determined microbial impact for each soil type with the sub-hypothesis that as salinity increases, the pH level would become more alkaline and the number of microbes in the soil would stay relatively constant. After the six-week flooding study, microbial populations in both the Salinas River and Point Mugu samples drastically increased whereas in both the San Elijo Lagoon and Batiquitos Lagoon samples they greatly decreased. With these initial findings, I am currently piecing together a cumulative risk assessment report for each location by comparing land-use, soil-type, and ecological impact using GIS and statistical analysis to see how each of these four areas vary. This report will have the potential to inform environmental agencies which coastal sites should be given focus when it comes to global warming coastal sustainability.

Selection and Characterization of Non-Amyloidogenic Mutants of the Type II Diabetes Linked Protein, IAPP

Author(s): Ayano Fox, Anastasia Calciano, Thibaut Snollaerts

Mentor(s): David Moffet

Institution: Loyola Marymount University, Los Angeles CA

The 37-residue polypeptide IAPP is known to aggregate into insoluble amyloid or small oligomers. Both of these oligomeric states appear to play a role in the death of pancreatic β -islet cells in type II diabetes. While IAPP has been known to be the primary component of type II diabetes amyloid, the molecular interactions responsible for this aggregation have not been identified. To identify the aggregation-prone region(s), we constructed a library of randomly generated point mutants of IAPP. This mutant IAPP library was expressed in *E. coli* as genetic fusions to the reporter protein enhanced green fluorescent protein (EGFP). Because IAPP aggregates rapidly, both independently and when fused to EGFP, the fusion protein does not yield a functional, fluorescent EGFP. However, mutations of IAPP that result in non-amyloidogenic sequences remain soluble and allow EGFP to fold and fluoresce. Using this screen, we identified 22 single mutations, 4 double mutations and 2 triple mutations of IAPP that appear to be less amyloidogenic than wild type human IAPP. A comparison of these sequences suggests an additional aggregation-prone region outside of the 20-29 region of IAPP.

Abstracts

An Investigation of the Summer Food Service Program in Los Angeles and its Influence on the Dietary Habits of Children

Author(s): Michael S Fox

Mentor(s): Marcella Raney

Institution: Occidental College, Los Angeles CA

The Summer Food Service Program (SFSP) is a free summer lunch program designed to provide children aged 1-18 with at least 1 nutritious meal per day during the summer when school lunch is unavailable. The purpose of this study was to evaluate the relative effect of the program on the daily diets of children in low-income Los Angeles City neighborhoods. Data was collected at five SFSP recreation centers as well as the surrounding areas. A survey of the food establishments within a two block perimeter of each recreation center was completed to determine daily food availability. Surveys were distributed to parents with children participating in SFSP (experimental) and to parents with children not participating in SFSP (control). According to 43.1% of all subjects, fruits and vegetables are cost prohibitive at least some of the time. Additionally, fresh fruits and vegetables are available at fewer than 30% of food establishments within a 2 block perimeter of each SFSP site, and 53.5% of food facilities do not offer any fruits, vegetables, or low-fat milk. Although 93.0% of control subjects indicated they would participate in a free lunch program, 80.7% were unaware SFSP existed. The daily servings of fruits and vegetables was not significantly different between experimental and control children ($P > 0.05$). Indeed, 42.3% of all children consume only 1-2 servings/day. Frequency of fast food and soda consumption was not significantly different between groups ($P > 0.05$), but was significantly greater compared to the school year ($P < 0.05$). 35.3% of experimental subjects disagreed that the food served by SFSP is healthier than food served at home. In conclusion, lack of awareness minimizes the potential impact of SFSP in high demand LA neighborhoods and the current program fails to improve the dietary habits of the children it serves.

Sidney and Maureen: An Examination of the Mother/Daughter Relationship in the *Scream* Trilogy

Author(s): Sarah A Frantz

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

The horror genre has always been a rich place for scholars to discuss gender because horror films portray societal anxiety over female sexuality outside of marriage. A society has always been reflected in the art, especially its films. Horror films are important because they give us an insight into a culture's views about gender and sexuality. As a screenwriting major writing a horror screenplay, I am particularly interested in how horror film narratives weave

gender into their films already preoccupied with violence or death. Wes Craven's *Scream* trilogy (1996, 1997, 2000) is one film that scholars examine because of the overt way it portrays female teenage sexuality and extra-marital affairs. Superficially, *Scream* is about a ghost-faced killer stalking teenagers, particularly, Sidney Prescott. However, the story behind the killings explores a mother daughter relationship complicated by the mother's affairs and rape as a teen. By examining the narrative structure of the films, I conclude that *Scream* deals with a posthumous mother-daughter relationship where the daughter gains resolution and closure over her mother's extra-marital affairs and murder. Whereas many scholars look at one of the films in the trilogy, my paper uses all three films as one continuous text and only that way is the narrative resolution of the daughter's troubles understood. Information about Maureen and Sidney is revealed in each film, and only once you have all the information is a clear picture of their relationship formed. By studying the trilogy narrative, we are able to get a full picture of Sidney's feelings and misunderstandings about her mother. I argue that Sidney cannot form meaningful relationships in life because of the distrust she has relating to her mother. I contend that Sidney is finally able to come to terms with her mother's past and death through the killers in the trilogy.

Application of Headspace Solid Phase Microextraction-Gas Chromatography/Mass Spectrometry (SPME-GC/MS) to the Aging of Historic and Modern Books

Author(s): Nathan J Fuller, Andrew J Clark

Mentor(s): Jane A Ganske

Institution: Pepperdine University, Malibu CA

Paper's impermanence is a significant threat to book collections, especially to those including rare books. The aging of books published between 1560 and 1939 was examined non-destructively using headspace solid-phase microextraction (SPME) coupled with gas-chromatography/mass spectrometry (GC-MS). Volatile organic compounds (VOC's) emanating from the pages of each book were identified including straight chain aldehydes, tracers of fatty acid oxidation in paper, and furfural, a tracer of the acid-catalyzed hydrolysis of cellulose. The relative abundance of furfural was shown to increase across the 379-year publication period, while the relative abundance of the straight chain aldehydes was shown to decrease across the same time span. The paper composition was shown to significantly impact a book's VOC emissions.

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The Negative Regulation of BMP Signaling by Lhx2

Author(s): Nicole M Furr
Mentor(s): Edwin Monuki
Institution: UC, Irvine, Irvine CA

Bone morphogenic proteins (BMPs) are signaling molecules that affect cell apoptosis, proliferation, differentiation and tissue specification during development. Previous data suggests that Lhx2, an embryonic lethal gene expressed in cortical cells, may be involved in regulating BMP activity in the developing brain. To explore the effects of Lhx2 on BMP, a conditional knock-out Lhx2 mouse model was created. The model allows for normal Lhx2 activity during development until we choose to induce the knock out of Lhx2, thus bypassing the embryonic lethality. We hypothesize that Lhx2 negatively regulates BMP signaling in the developing cortex. We predict that in Lhx2 null cells, Bmp activity will increase. Homozygous Lhx2 conditional knock-out females that are also homozygous for BLZ, the BMP activity reporter gene, were mated with males homozygous for the transgene Tamoxifen-CRE. The presence of the Tamoxifen-CRE gene allows for induced removal of Lhx2 from the genome upon tamoxifen injection. E12.5 embryos were sectioned and analyzed for Lhx2 and BLZ via fluorescent immunohistochemistry. Tamoxifen-induced Lhx2-null patches were observed in the cortex, and the transformation from cortex to hem in Lhx2-null patches was confirmed through the detection of the hem marker, Lmx1a. BLZ expression was not observed in the patches containing Lhx2, providing evidence against our hypothesis. However, because BLZ has a threshold level for expression, it is possible that Lhx2 is negatively regulating BLZ, but there is not enough endogenous Bmp activity to activate the reporter. Further experiments would have to be conducted to rule out this possibility.

Graphene: Silicon's Possible Substitute in the Semiconductor Industry

Author(s): Giovani Galicia
Mentor(s): Zhenqiang (Jack) Ma
Institution: UC, San Diego, La Jolla CA

This paper presents an overview of the problem of future computer microprocessors, introduces the material graphene and its properties to implement current microprocessors, shows current challenges of graphene to continue the trend of smaller, faster, and cheaper microprocessors, demonstrates why the micromechanical cleavage technique to obtain graphene is not useful to the semiconductor industry, studies how the low pressure chemical vapor deposition technique to grow graphene can be useful to make future devices, provides future applications of graphene, and suggests future research alternatives to implement current computer micropro-

cessors. Graphene research, especially graphene growth techniques, involves complex steps that have the potential for improvement so industries can adopt them into their daily product fabrication processes.

Connecting the Dots: Providing a One Stop Shop for Students and Internships

Author(s): Christopher Galindo, Carmen Leung, Gabby Arteaga
Mentor(s): Mary Danico
Institution: California State Polytechnic University, Pomona, Pomona CA

Recognizing our own needs to find internships, our group of peer mentors created a webpage (as part of a broader website) to help garner the ever more increasing need for students to connect to internships for graduate school research requirements. From contacting the internship adviser for a video Question & Answer to utilizing search engines and social media, we compiled information for those students who want an edge on finding the internship that best fits their psychology and sociology major field of study. What we found was that not only was the internship program in need of publicity but that students felt more comfortable going to a site rather than making an appointment in an already busy schedule. The hope is for the webpage to be a comprehensive and living document linked on the university website for future peer mentors to add additional opportunities for local and national programs.

Trauma, Family Illness and Religiosity

Author(s): Deborah L Galindo, Jenny A Hinzdel, Casey J Simon
Mentor(s): Lisa Bauer
Institution: Pepperdine University, Malibu CA

The majority of college students have experienced some form of trauma before or during college. The present study examined the correlation between traumatic events (e.g., family illness) and religiosity and coping in the lives of undergraduate students. A total of 125 (42 male, 83 female) Pepperdine undergraduates between the ages of 18 and 27 were given a battery of questionnaires. The series of questionnaires measured family medical history (George Mason University Center for Psychological Services, 2008), fear of recurrence of a family illness (F.O.R. Questionnaire; Northouse, 1981), the frequency of traumatic life events (TLEQ-DEQ; Kubany et al., 2000), depression (Depression: IPIP), anxiety (Anxiety: IPIP), posttraumatic growth (Cann et al., 2010), religiosity and spirituality (Santa Clara Strength of Religious Faith Questionnaire; Plante & Boccaccini, 1997; Spirituality/Religiosity: IPIP), religious coping (Brief RCOPE; Pargament et al., 1998), satisfaction with life (Diener et al., 1985); and universal

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worth (Rouse, used with permission). Of the participants, 91.2% reported having experienced a traumatic event; the most frequently reported traumatic event was sudden death of a loved one or friend (23.2%), followed by 12.8% who reported having traumatic sexual contact. Significant positive correlations were found between the amount of trauma from a distressing event and depression, anxiety and post-traumatic growth. The amount of trauma from a distressing event was negatively correlated with satisfaction with life and universal worth. Fear of reoccurrence of a family illness was positively correlated with both anxiety and posttraumatic growth. The results of this study are vital to universities in understanding the traumatic experiences of undergraduates. The results of this study may help enable clinical and counseling psychologists to better understand undergraduate students who have experienced trauma, and therefore provide students with more appropriate guidance and support.

Gestational Weight Gain Relative to Institute of Medicine Recommendations in Hispanic Women

Author(s): Kyli N Gallington

Mentor(s): Cooker Perkins

Institution: Pepperdine University, Malibu CA

The Institute of Medicine (IOM) has established recommendations for gestational weight gain (GWG) relative to prepregnancy BMI. Excess GWG increases women's risk for comorbidities of overweight, obesity, and type 2 diabetes mellitus (T2DM). Further study is needed to examine GWG trends in Hispanic women in the U.S. METHODS: Postpartum Hispanic women were assessed through medical, demographic, and acculturation data on GWG, total gain above and below the amount recommended by the IOM, as well as rate of gain in the 3rd trimester above and below the amount recommended by the IOM. Apparently healthy Hispanic women (18-35 yr) between 1-6 mos. postpartum were recruited from a tertiary care clinic in Ventura County, California. Subjects completed a written questionnaire (Spanish or English) on health behaviors during pregnancy and the postpartum period. Medical records were obtained for clinical data. RESULTS: Of the current total sample ($n = 30$, age 24.6 ± 4.4 yr), 43% of the women were considered overweight or obese ($BMI 28.8 \pm 4.5$ kg/m²) prior to pregnancy, 27% gained above IOM recommended total weight gain (range: 7.0-44.2 lbs), and 90% gained above IOM recommended rate of weight gain in the 3rd trimester (range: 0.47-3.61 lbs/wk). Rate of weight gain in the 3rd trimester was significantly related to the %GWG achieved (relative to IOM recommendations) ($r = 0.40$; $p < 0.05$), with no significant relationship to rate of gain in the 1st and 2nd trimesters. BMI was significantly related to %GWG achieved relative to IOM recommendations ($r = 0.37$; $p < 0.05$). CONCLUSIONS: Overweight and obese Hispanic women were more likely to gain above IOM recommendations for total weight during pregnancy.

Educating Hispanic women on recommended weight gain relative to prepregnancy BMI is important given the risk for postpartum weight retention and T2DM.

Comment j'ai tué mon père by A. Fontaine: The Notion of Time/La Notion de Temps

Author(s): Apollonia Galvan

Mentor(s): Marie-Magdeleine Chirol

Institution: Whittier College, Whittier CA

The theme of time is an esteemed topic in cinema because it offers the viewer a completely different way of regarding the lives of the characters. Through the decades, many directors have attempted to tackle time's importance and portray it in different ways. Anne Fontaine manages to present time in a very unique way in her film *Comment j'ai tué mon père*. In a stimulating story focused on the turbulent relationship between Jean-Luc, a successful gerontologist and his estranged father Maurice, Fontaine depicts the role time plays in Jean-Luc's life. The purpose of my presentation is to accentuate and illustrate how different facets of time affect Jean-Luc's viewpoint and relationship with his father as well as himself as a whole. First, I will exhibit how time becomes immobile, specifically how Jean-Luc's life comes to a standstill when he reunites with his father. Next, I will show how time presents itself as a cycle and how, in essence, Jean-Luc becomes like his father. And finally, I will reveal how past or lost time ultimately decides the fate of their relationship. To emphasize the above statements, I will draw upon the cinematic techniques Fontaine employs, mainly her use of close-ups, dissolves and dolly shots to stress her treatment of time. My presentation will be in French.

Synthesis of 4-Aminocyclopentenones via Aza-Piancatelli Rearrangements Using Polymer-Bound Metal Catalyst

Author(s): Teresa Garay

Mentor(s): Gesine Veits

Institution: UC, Santa Barbara, Santa Barbara CA

Synthesizing natural products and making available a vast library of complex and biologically active molecules continues to be an important process to industrial and academic research. The recent development of an aza-Piancatelli rearrangement reaction using triflate metal catalysts to synthesize 4-aminocyclopentenones, a structural motif seen in various biologically active molecules, is not yet applicable to industrial processes. In order to meet the growing industrial need for more efficient methodology to construct biologically important molecules, we are undertaking the investigation of certain confirmed and low-yielding aza-Piancatelli reactions under identical conditions, replacing the free, powder catalyst with polystyrene-bound scandium triflate. In doing so, we hope to

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provide insight to the catalytic activity of the polymer-bound catalyst and to develop a comparative analysis in contrast to its free, powder counterpart. Using polystyrene-bound scandium triflate in the aza-Piancatelli cascade rearrangement allows for recycling of the catalyst. The reuse of the polymer-bound catalyst has provided us with information about the overall stability and tolerance of the beads to certain conditions, such as air exposure and heating cycles, with promising results, creating the potential for future application to continuous flow chemistry techniques.

High Precision Asteroid Astrometry

Author(s): Karen Garcia

Mentor(s): William Owen

Institution: CSU, Los Angeles, Los Angeles CA

High precision asteroid astrometry is the process in which highly accurate positions of asteroids are determined from images taken of an asteroid within a star field. Outer planet satellites and asteroids of 9th to 15th magnitude were observed. Two Images of each asteroid, using the R filter and a 180 second exposure, were taken with the 4K camera, mounted on the 0.6 meter telescope, located at Table Mountain Observatory. The camera consists of 4096x4096 pixels which allow for a wide square, 21.9 arc minutes, field of view and 15mm pixels that allow for a high, 0.321arc seconds/pixel, image resolution. Each image corresponded to an offset of 2-5 arc minutes in declination and 10-15 arc seconds in right ascension. After each observing session, the data was reduced. Images that resulted with bad residuals or that were too faint for their centers to be located were manually registered using the program Xrover. The final results were sent to scientists at JPL's Solar System Dynamic Group, Minor Planet Center and The International Occultation Timing Association where the acquired measurements will be used to improve their minor planet orbit models in order to more accurately predict their occultation dates. A total of 123 different targets were observed, including Neptune, Triton and Nereid, 3 outer satellites of Jupiter, Pluto, 7 satellites of Saturn and 109 different asteroids. In total 867 observations were reported.

Adherence to Heterosexual Gender Norms May Lead to Intimate Partner Violence in Men who Have Sex with Men

Author(s): Luis R Garcia

Mentor(s): Erika S DeJonghe

Institution: California State Polytechnic University, Pomona, Pomona CA

Research has shown that the prevalence of intimate partner violence (IPV) in same-sex couples is comparable to that of opposite-gender couples. Contributing factors to IPV in gay relationships are internalized homo-negativi-

ty and strong adherence to gender conformity. Research on gender conformity has demonstrated that men who strongly adhere to gender masculine norms act more aggressively toward those who do not. Men who identify as "straight acting" and adhere to traditional masculine gender norms may be more likely aggress toward their same-sex partner. Independently these different topics have been investigated, but no prior research has demonstrated how these factors interact. Difficulty in recruiting and reaching willing participants was the most surprising part in the execution of the preliminary study; more will be discussed in methodology. The small amount of participants in the preliminary study ($n = 8$) has found that there is a weak association between being a victim of IPV and adherence to gender norms ($r = -0.101, p < 0.05, n = 5$), moderate to strong association in adherence to gender norms and internalized homo-negativity ($r = -0.567, p < 0.05, n = 5$). But in an interesting finding there seems to be some positive association between adherence to gender norms and victimization by intimate partner ($r = 0.091, p < 0.05, n = 5$). Being victimized and adhering to traditional gender norms must be addressed in future research in order to understand this potential relationship. In the current phase of the study, the participants will be recruited through two new methods. One method will be the use of social networking site Facebook, and the other will be reaching out through LGBT service providers to their clients.

Narratives of Hispanic Acculturation: A Rhetorical Analysis of Stories Told during Pregnancy

Author(s): Cory P Geraths

Mentor(s): Sarah Stone Watt

Institution: Pepperdine University, Malibu CA

Hispanic communities have the fastest growing rate of diabetes in the United States. This paper argues that cultural narratives reveal important lessons for health researchers interested in understanding behavioral factors associated with the rapid growth of this condition. As part of an interdisciplinary research grant from Pepperdine University we have partnered with researchers in Natural Science and Spanish to examine the role that acculturation plays in the choices Hispanic women make during pregnancy that might increase their risk, or their child's risk, for diabetes. This portion of the study examines the role of acculturation in the stories women tell about their interactions with family, friends, and medical professionals, during their pregnancy. Through a rhetorical analysis of qualitative interview data we have a unique opportunity to explore the narratives upon which these women base decisions regarding health behaviors during pregnancy. Pregnancy is a pivotal time in a woman's life and our study reveals the ways that the stories they hear and the stories they tell during that time can help us better understand the link between acculturation and health related decision-making within this community.

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A Historiography of Female Intellectual Inferiority in Islamic Legal Scholarship

Author(s): Ilona A Gerbakher

Mentor(s): Michael Morony

Institution: UC, Los Angeles, Los Angeles CA

In Islamic historical scholarship, a debate has arisen as to whether a woman's intelligence is one half that of a man. The roots of this debate lie in varying interpretations of the Surat al-Baqarah (Quran 2:282), which states that when a plaintiff brings a case involving debt, business contracts, or financial obligations to the Shari'a courts, he should "bring to witness two witnesses from among your men. If there are not two men available, then a man and two women from those whom you accept as witnesses-so that if the woman errs, then the other can remind her" (Quran 2:282). When interpreted literally, this Surah suggests that a woman's testimony in financial matters is worth half that of a man. However, various Islamic jurists have expanded this Surah's significance; in fact, it has come down in modern scholarship as the ultimate Qur'anic condemnation of a woman's intelligence. The historiographical and legal debate about this Surah's interpretation is an important determining factor and gauge of women's place in modern Islam, and its implications affect women well beyond the boundaries of Shari'a courts. This study examines the treatment of female intellectual equality in 20th-century historical scholarship, and breaks down the historical treatment of the Surah into four distinct schools of thought: the Islamic Orientalists, the Christian Orientalists, the Sub-Continental Revisionists, and the Western-Educated Scholars of Women in Islam. The study analyzes the conceptual frameworks that bind each school of thought to a particular treatment of the concept of female intelligence in Islamic law.

The Rave Culture of the Modern American Youth and its Psychological Aspects

Author(s): Aida Ghorbani

Mentor(s): Misty Kolchakian

Institution: Mount San Antonio College, Walnut CA

In this investigation, I will take a scientific approach to the trend of raves that are populated by modern youth. This investigation will bring into light the psychological and sociological aspects of these social gatherings. I hope to answer the following questions: how do participants in raves interact with one another? Are these interactions prevalent to life outside of these gatherings? If so, what do these interactions implicate about modern youth culture? And, finally and most importantly, are raves an outlet or escape for youth? Such a topic will take into account current familial statistics (ex: 54% divorce rate). This topic delves into youth culture and what aspects of it are represented in such micro sociological aspects such as raves. I will explore reasons that these partygoers have for par-

ticipating in the rave scene. For example, are raves a hint at a larger sociological problem within modern youth culture? This topic will give way for exploration of psychological trends within the young generation. Familial problems will prove to be a great issue that seeks escape through such social gatherings as raves. Other problems will include stress from such different fields as academics and careers. Another aspect that will be delved into will be that of individuality or lack thereof in such social gatherings, where standards for behavior will prove to be more or less homogenous so that majority will be alike. I will answer the question about whether my generation is moving towards a more homogenized culture or if individuality is being promoted within this youth.

Exploring the Factors that Affect the Choice of Destination for Medical Tourism from Students' Perspective

Author(s): Harsimran Gill

Mentor(s): Neha Singh

Institution: California State Polytechnic University, Pomona, Pomona CA

Medical Tourism has become one of the latest trends in the tourism industry which has been and has the potential to continue growing exponentially every year. More travelers than ever before are now travelling abroad to get high quality medical treatments for less cost, which includes treatments such as general surgery, transplant surgery, cancer treatment, stem cell therapies, dental implant, facial implant, and liposuction, just to name a few. Although there has been significant research conducted to verify patient's point-of-view towards medical tourism, but not much has been contributed towards the potential customers', i.e. students', standpoint of this industry. The purpose of my study is to explore the interest in US travelers in medical tourism. Students from a western university are used in this study for data collection. The study will also serve as a culminating demonstration of the student's knowledge and concentration in this area of tourism, and factors that they might consider when addressing their medical needs in the future. Therefore, a total of 194 students voluntarily participated to share their opinions on medical tourism. Results from the survey indicated that 'competent doctors,' 'high quality medical treatment facility,' and 'prompt medical treatment when needed' where the top three factors before deciding whether or not to take a trip abroad. Based on this study, students' attitude toward medical tourism was also measured. The results will be useful to businesses that are either directly or indirectly involved with this industry, such as insurance companies, credit card companies, travel agencies, hotels, food and beverage companies, medical facilities and services, and spas. In order for businesses to survive in the age of globalized health care, they would have to incorporate the demands of potential clientele.

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Masking Images

Author(s): Rebecca L Gomez

Mentor(s): Jocelyn Pacleb

Institution: California State Polytechnic University, Pomona, Pomona CA

The mass media has the power to control the image of American society, and this entity chooses to group people in stereotypes in an effort to maintain power of the American image. The mass media creates the standard American image and labels any other qualities into stereotypes, causing people to be susceptible into believing these stereotypes about one another. Believing these stereotypes causes us to forget that we are all individuals and we diminish each other's identity. According to Richard Delgado, the author of *Storytelling for Opposionists: A Plea for Narrative*, society is controlled by a stock story, which is the standard story perceived by most to be true, versus the counter story, the story that proves the stock story false. The 2 faces I have created represent the stereotypical image verses the counter story image. Through my studies focused on Chicana/o identity, I have found that stereotypes that follow Chicana/o identity are based on certain images that were meant to give pride to the people, but are turned around by the mass media to destroy this pride. One of these stereotypical images is of a Mexican bandit, which diminishes iconic image of a well known Mexican hero, Pancho Villa. The face of this Mexican bandit I created is gray in color and has a blindfold, which is a symbol of stereotypes and the destruction of a person's identity. I chose to make the other image, a counter-story, with a sun and moon sharing one face. The sun and moon represents both masculine and feminine qualities that we all have, while the many colors represent our unique qualities. Together, these two faces make up the stock story or mainstream stereotypes versus the counter story or the story of the individual.

The Muxe of Juchitan, Oaxaca, Mexico and the Spanish Dual Gender System

Author(s): Talia M Gomez

Mentor(s): Irene Vasquez

Institution: CSU, Dominguez Hills, Carson CA

This investigation is concerned with obliterating gender roles in the dual gender system in the Zapotec community of Juchitan, Oaxaca, Mexico; and to serve multiple purposes: to abrogate gender conditioning archetypes associated with the Zapotec community of Juchitan; to examine the construction of sexuality among women, and Muxe men. Most importantly I strive to portray the Zapotec women and Muxe men of Juchitan within their own cultural context. Current models that study gender roles and gender relations propose the concepts of dual gender and parallelism as frameworks in which Mesoamerican societies can be measured. I however, do not believe these

models are the most appropriate for the study of Mesoamerican societies, because Mesoamerican societies reflect a more complex gender ideology which is not based sole on masculinity and femininity. In most Native American cosmologies and religious beliefs there are gods who have the talent or natural ability to transform into both genders feminine or masculine this demonstrates more complex ideas that are built on more than sole gender. This research is based on ethnographic observation and secondary literature reviews. My findings are that gendered expectations of men and women reveal complex legacies of Mesoamerican resistance and Spanish influences.

Competitive or Uncompetitive? The California Congressional, Assembly, and Senate's 2000 Redistricting Round (2000 - 2008)

Author(s): Christopher A Gonzales

Mentor(s): Jill Hargis

Institution: California State Polytechnic University, Pomona, Pomona CA

Redistricting in the United States is the redrawing of political district's geography. This process is highly contentious to both voters and politicians because it affects the partisan make-up of our legislatures. Some redistricting plans produce competition between Republicans and Democrats and other plans produce safe seats for one party. Using election and registration data from the California Secretary of State's office from 2000 to 2008, this paper contains three hypotheses and three tests to answer the question of whether California's Congressional, Assembly, and Senate's 2000 redistricting plans produced competitive districts. The first hypothesis is that the California Congressional delegations' redistricting plan will be the least competitive. This hypothesis is motivated by the competition - increasing affects of term limits imposed on members of the California Assembly and Senate. Second, this research hypothesizes that the majority of uncompetitive districts will not decline over the redistricting plans life. This hypothesis addresses the dispute in the literature over temporary versus permanent gains. The third hypothesis is that Democrats will maintain a low swing ratio advantage in California. This hypothesis responds to the question about whether a redistricting party can engineer lasting electoral gains. Hypotheses one and two were affirmed while three was rejected. This paper contributes to the literature by finding that many of California's districts did not become more competitive after redistricting, including the 2006 and 2008 elections, and suggests little competition in districts is a problem for democracy.

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Age of Lake-Level Rise and Faulting in Summer Lake Basin, Lake County, Oregon Constrained by Carbon Dating of Charcoal Collected from Kelly Creek Alluvial Fan Deposits

Author(s): Gina Gonzales, S Pezzopane, S Zimmerman
Mentor(s): Robert Negrini
Institution: CSU, Bakersfield, Bakersfield CA

Radiocarbon dating of charcoal from the Kelly Creek alluvial fan sediments was done using the Center for Accelerated Mass Spectrometry at Lawrence Livermore National Laboratory. The similarity of dates throughout the section indicated that the entire outcrop was deposited rapidly 1185 ± 109 14C years B.P. (1304-907 cal B.P. @ 2σ). This finding plus the observations that the fan deposits truncate the fault scarp and shorelines were built upon them lead us to conclude that the last scarp-forming earthquake occurred before 1185 ± 109 14C years ago. Also, the 1280m Neopluvial lake highstand of Allison (1983) and Pezzopane (1993) is younger than that age. The minimum age on the last earthquake associated with this fault scarp is roughly consistent with the 10^3 to 10^4 yr recurrence interval range typical of Basin and Range faults (e.g., Swan et al., 1980; Bacon and Pezzopane, 2007). Our maximum age on shorelines associated with the Neopluvial highstand indicates that Summer Lake experienced a prolonged period of higher lake level sometime during the past ~millennium, an observation that constrains future climate models of the North American Great Basin for the latest part of the Holocene Epoch.

Relationship Between Sierpiski, Riesel, and Fibonacci Numbers

Author(s): Angelica Gonzalez
Mentor(s): Mark Kozek
Institution: Whittier College, Whittier CA

In 2008-2009 Luca and Mejía-Huguet proved there are infinitely many Fibonacci-Riesel numbers, that is, Fibonacci numbers that are also Riesel numbers, and in a separate proof they showed there are infinitely many Fibonacci-Sierpiski numbers. Luca and Mejía-Huguet used a covering system of the integers, a method based on an argument of Erdős (1952). We want to prove there are infinitely many Fibonacci numbers that simultaneously Riesel and Sierpiski numbers. In this preliminary report we use a covering system of the integers to construct a new, infinite progression of Fibonacci-Riesel numbers and a new, infinite progression of Fibonacci-Sierpiski numbers. These are possibly only the second known infinite sets of Fibonacci-Riesel numbers and Fibonacci-Sierpiski numbers.

Title: Widening the Gap: LAUSD A-G Initiative and Latino/Hispanic Students Education

Author(s): Erika R Gonzalez
Mentor(s): Tracy F Tolbert
Institution: CSU, Long Beach, Long Beach CA

According to the 2000 U.S. Census Bureau, Latinos/Hispanics are the largest minority population in the United States; however, compared to other race/ethnic groups Latino students have the lowest educational attainment rates in all areas of education. Los Angeles Unified School District (LAUSD), in California, is one of the largest districts in the United States with the lowest graduation rate and the largest Latino/Hispanic student population. Starting in 2012 students attending LAUSD will be required to complete the A-G requirements to graduate from high school. The purpose of this study is to explore how the LAUSD's A-G Requirement is affecting the achievement gap and may in the future contribute to Latino/Hispanic students' dropout rate. Statistics in the California Department of Education website show that Hispanic/Latino students, compared to other racial categories, are less likely to complete the A-G Requirements which are needed to attend a UC/CSU institution. A previous study conducted by LAUSD , statistics, and literature are used as a medium of providing an in-depth analysis of the causes that may contribute to the low A-G completion rate of Hispanic/Latino students. The data indicates that within a three period (2005-2008), 69.2 percent of Asians students completed the A-G requirements for graduation, in contrast to 53.3 percent White students, 34.4 African Americans students, to 32.1 percent Latino/Hispanic students, during the same period. What these figures suggests is that not only do Latino/Hispanic high school students have the lowest A-G completion rate, but that it is possible also that poor social support and knowledge required of school faculty emerge as barriers to Latino/Hispanic students attempting not only to complete the A-G requirements, but also graduating with a skill set necessary to enter college. Based on the analysis, policy recommendations will be given to the LAUSD as a tool to address and improve Latino/Hispanic A-G completion and graduation rates. The project is conducted under the supervision and mentorship of Dr. Tracy F. Tolbert (Department of Criminal Justice, CSULB).

Impact of Traffic Signal Controllers on Travel Time

Author(s): Fernando Gonzalez
Mentor(s): Wen Cheng
Institution: California State Polytechnic University, Pomona, Pomona CA

Control of vehicle movements in the U.S. via traffic signals has been in place for over a century. A large number of types of traffic signal controllers have been proposed and developed in the past. Among them, four types of signal

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controllers most used today include Pretimed, Semi-Actuated-Uncoordinated, Fully-Actuated-Uncoordinated, and Fully-Actuated-Coordinated. The study focuses on the evaluation of performances of the four types of traffic signal controls from different aspects. The evaluation is conducted based on VISSIM simulation and under different traffic volume scenarios using real-world traffic data collected from the City of El Monte during morning and afternoon peak periods. Both isolated intersection and arterial levels are explored. Alternative evaluation criteria are employed which include the average intersection delay per cycle length and overall intersection delay over peak hours. Additionally, the modeling technique is utilized to establish the relationship among the level of service, traffic signal controller type and other intersection-related features including number of lanes, presence of left-turn lanes, presence of medians, and so on. Taking into account the nominal nature of the level of services, multinomial logit model is selected to conduct the evaluation. The results indicate that Fully-Actuated-Coordinated outperforms the other three types of signal controllers when the travel volumes on minor streets are much smaller than those on major streets. The multinomial logit modeling results also reveal the superior performance associated with the Fully-Actuated-Coordinated control compared with other three types of controllers.

Formaldehyde Remediation Methods for a Manufacture Home

Author(s): Noelia E Gonzalez, Lauren Strahs

Mentor(s): Seema Shah-Fairbank

Institution: California State Polytechnic University, Pomona, Pomona CA

As society continues to develop new innovations and technology rapidly advances, we begin to understand the risks associated with commonly accepted practices. Serious health concerns have been raised due to the common usage of formaldehyde-treated pressed wood in manufactured homes. Exposure to formaldehyde for extended periods of time can cause a range of health problems from eye, nose, and throat irritation to nasopharyngeal carcinoma. This study performed various simulations to test different mitigation techniques in a variety of climates to determine the technique that is most cost-effective in lowering formaldehyde concentrations and long-term cancer risk. CONTAM, an indoor air quality computer simulation program, was utilized to track formaldehyde concentrations throughout a manufactured home under various ventilation and purification scenarios. Several different scenarios resulted in concentrations below the ASHRAE work place standard of 0.027 parts per million for an eight hour duration. The scenario that produced the lowest concentration in all of the rooms in the house other than the living-room-family-room-kitchen area for all of the four climates was the combination of a supply fan and passive filter. In terms of lowering the carcinogenic risk,

the supply fan and passive filter also proved to be the most effective. However, the differences among the most effective mitigation techniques in lowering the concentration in each individual room would lend themselves to make different recommendations corresponding to the average time spent in the home per day. Future research should focus on the equipment and energy cost in order to conduct a cost-benefit analysis.

Self-Defense: A Matter of Life or Death

Author(s): Samantha N Gonzalez

Mentor(s): Michael Murrie

Institution: Pepperdine University, Malibu CA

Despite the recent growth of Internet news, millions of Americans still tune in and welcome television news reporters into their homes every morning and night, trusting that the reporter accurately selected the most significant and valuable stories of the day. Broadcast journalists share news stories that could greatly impact and benefit the public and also give a voice to those who otherwise would never be heard. The purpose of this project is to educate the audience about the importance of self-defense. This idea came about in response to a sexual attack on a female jogger, which occurred earlier this year at Malibu's Point Dume. Rather than just doing a report on the event, a more in-depth look at the issue of sexual assault and prevention seemed necessary. The completed news report includes more information about the Malibu attack, an emotional and powerful account from a rape victim, interviews with a rape-counseling specialist as well as self-defense professionals, and a demonstration with self-defense instructors. Much research and preparation went into this news report even before any filming was involved. For example, researching more information about the police report in order to verify the facts of the Point Dume attack, finding reliable and willing interviewees that would work towards the ultimate message of the project, gaining trust as a reporter from the rape victim, and creating sensitive yet still powerful interview questions for the rape victim. The audience needs to know that rape and other sexual attacks can happen to anyone at any time and it is extremely important to be as prepared as possible if ever put in such a horrible situation. If this news report were capable of helping a single person avoid sexual assault, then my commitment to this issue would have served its purpose.

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Temperature Preferences of Two Southern California Chorus Frogs, *Pseudacris hypochondriaca* and *Pseudacris cadaverina*

Author(s): Jessica A Goodheart, Molly Peters
Mentor(s): A. Kristopher Lappin
Institution: California State Polytechnic University, Pomona, Pomona CA

Pseudacris hypochondriaca (Baja California Chorus Frog) and *Pseudacris cadaverina* (California Chorus Frog) are sister species that occur sympatrically in freshwater habitats in parts of Southern California. *P. cadaverina* is typically found on large, granite boulders and *P. hypochondriaca* is most often found in plants, both adjacent to ponds and streams. Our hypothesis is that this microhabitat separation may be due to different substrate temperature preferences between these two species. We studied the temperature preferences of these two species using a thermal gradient constructed of a copper half pipe with cooling and heating elements at each end. Across a temperature range of 10-40°C we found a significant difference between species in substrate temperature preference (*P. hypochondriaca*: mean = 17.8 °C, SE = 1.46 °C; *P. cadaverina* mean = 27.4 °C, SE = 1.75 °C). *P. cadaverina* selected warmer temperatures, presumably because the substrate temperature of boulders in their habitat is generally higher than the substrate temperature of plants. This difference may corroborate the observed habitat partitioning that allows these two species to occupy two different microhabitat niches, thus facilitating coexistence in the same areas. This suggests that global climate change could significantly influence populations of each species. For example, were temperatures to continue to rise, *P. hypochondriaca* may be eliminated from freshwater habitats that they currently occupy. Ongoing work will address whether these temperature preferences are correlated with cutaneous resistance to water loss in order to determine what the combination of temperature preferences and desiccation resistance means in terms of the eco-physiology of these species.

Putting The Best Face Forward: Cosmetic Usage and Stress

Author(s): Chandra M Gordus
Mentor(s): Virgil Adams
Institution: CSU, Channel Islands, Camarillo CA

Past research has indicated that personality variables (such as self esteem, introversion, and self presentation) can predict high, medium, or low cosmetic usage. The researchers concluded that conformity and anxiety are positively correlated with cosmetic usage. The present study expands on this research by examining if the relationship between both frequency of cosmetic usage and level of distress encountered if usage was blocked are related to stress and global well-being. More specifically, it was hypothesized

that the frequency of cosmetics use would be related to increased stress levels and that as the distress from blockage of cosmetic usage increases global well-being would be negatively impacted. The present study is based on a survey of adult women from a large Southern California county (n = 850, $M_{age} = 37.71$ years, age range: 18-91 years). Two hierarchical regression models were analyzed. In the first model frequency of cosmetic use was used as the dependent variable while stress was entered into the equation after controlling for demographic variables. Results of the first model did not support the hypothesis ($F_{(8, 842)} = 1.08$, ns), there was no relationship between frequency of usage and stress levels. The second model examined if variance in distress over blockage from cosmetic use could be accounted for by global well-being, again after controlling for demographic variables. The second model was significant ($F_{(8, 841)} = 5.29$, $p < 0.001$, $R^2 = 0.05$). Analyses revealed while there was no unique contribution by global well-being several demographic factors did emerge as significant predictors of distress over blocked usage. Younger women, those with less educational attainment, those employed full time, and those with higher household incomes all emerged as predictors of distress over blocked usage of cosmetics. The discussion focuses on cosmetic usage with relation to age, income, and job status.

Effects of Recombinant TCTP Overexpression in *E. coli*

Author(s): Mary S Grabiak, Savitha Deshmukh, Amey Mukim
Mentor(s): Nitika S Parmar
Institution: CSU, Channel Islands, Camarillo CA

TCTP (Tumor protein, translationally-controlled 1) has been implicated in many cellular functions that are related to cell growth and death. Recently TCTP was shown to interact with the G-protein Rheb, a key player of the PI3 Kinase/mTOR signal transduction pathway and function as its GEF (Guanine Nucleotide Exchange Factor). TCTP is a highly conserved protein that has been suggested as a tumor associated antigen as shown in its pathway deregulation in many different types of cancers. Although TCTP is a eukaryotic protein, effects of its expression in a prokaryotic system were studied. Recombinant mammalian TCTP was cloned into a bacterial expression vector and over-expressed in bacteria. Expression was confirmed via polyacrylamide gel electrophoresis and immunoblotting. Since TCTP has been implicated in a variety of stress responses as well as function as a calcium ion binder, the impact of TCTP on bacterial growth characteristics was studied under a variety of conditions. These included growth in calcium rich and calcium depleted media, growth under heat stress conditions at temperatures ranging from 37-55 °C as well as growth under oxidative stress conditions using hydrogen peroxide as the oxidizing agent. In addition, a TCTP mutant generated via random mutagenesis was also studied in congruence. Expression

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of wild type TCTP significantly affects bacterial growth responses under the conditions studied and interestingly mutant TCTP shows different effects on bacteria compared to the wild-type. This report is the first of its kind to study this specific mutant of TCTP and compare its effects on over-expression in bacteria relative to the wild type. The study provides preliminary demonstration of a potential key amino acid residue in the TCTP protein sequence that may be critical for its function.

Comparative Geospatial Analysis of California Biotech Social Clusters

Author(s): Hannah Gravius

Mentor(s): Steven Casper

Institution: Keck Graduate Institute, Claremont CA

With successful social clustering repeatedly found to be a key element to a rich and successful biotech industry region, what factors lead to this social clustering? We examined whether physical distance between jobs compared with the strength of biotechnology industry's people's social connections are a contributor to why social networking clusters do or do not form in the industry. In the broader scope of examining this question, we hoped that by looking at these factors, we would gain further insight into why Los Angeles does not have a successful biotechnological industry in comparison with other areas such as San Diego or San Francisco. This was completed through gathering data about industry's managerial levels moves and careers, followed by transforming the collected data into mapping data using ArcGIS technology and geocoding for the companies of San Francisco, Los Angeles and San Diego. This allowed us in to create distance matrices that could be used for data analysis of career moves for those within the California biotech clusters. These were then compared with previously collected social data to determine possible correlations. Though our original hypothesis was that distance would be a factor in the creation of a successful cluster, the results showed that in fact there was no direct correlation between distances moved between jobs and the social strength of connections made. Physical location is most likely not a key factor in whether a biotech cluster formulates, yet probably plays either a minor effect or else is actually affected by the social network itself rather than the other way around.

Pressure and Time Dependence of Reactive Dilation

Author(s): Eric J Gray, Matthew R Carter

Mentor(s): Jeffrey L Jasperse

Institution: Pepperdine University, Malibu CA

The magnitude of forearm reactive hyperemia is related to both occlusion duration and arm position, suggesting that it has both a metabolic and a myogenic component.

We tested the hypothesis that decreasing intraluminal pressure in isolated rat soleus feed arteries ($n = 11$) would cause a dilation when baseline pressure was restored and that this dilation would be increased with greater pressure difference and increasing duration of pressure reduction. Arteries were isolated, cannulated, and pressurized at 90 cmH₂O for 1-h equilibration period. Baseline pressure was then set at either 65 or 115 cmH₂O to mimic arterial pressure in the arm in the above and below heart positions. Reductions in pressure to 14 cmH₂O (to mimic arm occlusion) from both baseline pressures for periods of 30s, 1 min, 2 min, or 5 min were performed. Both increasing duration and elevated baseline pressure increased the magnitude of dilation (30s-65 = 19.6 ± 5.1 , 30s-115 = 22.1 ± 5.4 , 1m-65 = 20.4 ± 4.2 , 1m-115 = 34.3 ± 5.4 , 2m-65 = 28.5 ± 5.6 , 2m-115 = 47.8 ± 7.5 , 5m-65 = 47.4 ± 7.6 , 5m-115 = 63.6 ± 7.5 % dilation.) These data indicate that vasodilation to a period of reduced pressure is enhanced by both increasing duration and increased magnitude of the pressure reduction. These results suggest that reactive hyperemia is significantly impacted by myogenic properties of the vasculature.

Construction and Characterization of a Fluctuation Correlation Spectrometer

Author(s): Sonny Green, Saghi Soroori, Wanni Lie, Nico Volz

Mentor(s): James Murphy

Institution: Santa Monica College, Santa Monica CA

Fluctuation correlation spectroscopy (FCS) is a laboratory technique utilizing confocal microscopy to collect fluorescent light from a relatively small volume typically on the order of one cubic micrometer. The FCS instrument can be used together with fluorescent labeling to measure physical properties of solute particles and solvents. It is often used in biological applications due to its low impact on living tissue. We have constructed a working FCS instrument from basic optical components at a fraction of the cost of a commercially available unit. In brief, green laser light is focused onto a drop of solution containing Rhodamine 6G (R6G) dye molecules and the emitted red fluorescent light is directed to a detector. A LabVIEW software program is employed to compute a time autocorrelation function, from which the average number of molecules in the laser focal volume and the average diffusion time of molecules across the focal volume can be determined. The capability of the device was validated through two experiments: measurement of molecule counts in solutions with varying dye concentrations, and measurement of diffusion times from solutions with differing viscosities. The results of the first experiment showed a positive correlation between concentration of R6G and the molecule counts deduced from the autocorrelation function. Moreover, the molecule counts were consistent with the expectation of approximately one molecule per cubic micrometer in a nanomolar solution. The second experiment dem-

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onstrated a strong correlation between solvent viscosity and measured diffusion time. Additionally, the diffusion times were utilized to calculate viscosity values that were found to be consistent with the literature values. Future plans include the continued characterization of the device to improve the accuracy and consistency of the molecule count and diffusion time measurements. Further efforts will include application of the FCS instrument in research projects appropriate for community college students.

Synthesis of Chiral Chromenes

Author(s): Jennifer R Griffin, Anders Eliasen

Mentor(s): Donald R. Deardorff

Institution: Occidental College, Los Angeles CA

The enantioselective synthesis of monosubstituted benzopyran derivatives, known as chromenes, is presented. Exhibiting a wide variety of biological activities, such as bronchodilation and minimizing the effects of tachycardia, this structural unit is found in many important pharmaceutical agents. In order to induce asymmetry in the achiral starting material, we use the inexpensive yet powerful enzyme oxynitrilase, which we isolate from commercial grade raw almonds. The novel palladium catalyzed chiral shift reaction transfers the stereocenter from the alpha carbon to the gamma carbon, while preserving stereochemical configuration. This step, followed by the Grubbs catalyzed ring-closing metathesis, produces the respective chromene. In total, five chromenes have been successfully synthesized, three enzyme-direct and two enzyme-indirect. The enzyme-indirect chromenes require an additional synthetic step in which the hydroxy ester undergoes a Grubbs catalyzed cross metathesis with a desired ligand. Each produced chromene was characterized with NMR and GCMS analysis.

Synthesis of N⁹-Modified Guanine Derivatives as G-quadruplex Models

Author(s): Meg Groom, Erin Keyes

Mentor(s): Jeremy McCallum

Institution: Loyola Marymount University, Los Angeles CA

With the recent interest in the anticancer potential of G-quadruplexes, the need exists for understanding the self-assembly of G-quadruplexes and G-quartets. As such, recent studies have focused on the formation of G-quartet structures from guanosine derivatives. We report progress on the synthesis of several N⁹-modified guanine derivatives that are expected to form G-quartet structures. N⁹-(3,5-bis(pent-4-enyloxy)benzyl)-guanine, N⁹-(3,5-bis(hex-5-enyloxy)benzyl)-guanine, N⁹-(3,5-bis(hept-6-enyloxy)benzyl)-guanine, and N⁹-(3,5-bis(oct-7-enyloxy)benzyl)-guanine were synthesized from the coupling reaction of 2-N-acetylguanine

and 3,5-substituted benzylbromide derivatives followed by amide deprotection. Studies are currently being conducted using ring-closing metathesis for G-quartet macrocycle formation.

Seeing Past the Media: A Study of the Experiences of Sexual Minorities in Today's Schools and What Educators Can Do to Help

Author(s): Michelle N Grue

Mentor(s): Damian Jenkins

Institution: Pepperdine University, Malibu CA

This study brings to the attention of educators, school psychologists, and administrators students who are sexual minorities, their experiences, how they are received in schools. This includes curriculum and texts, teacher and student interactions, and extracurricular activities. There is also an examination of the history and current trends in bullying, depression, and suicide in gay, lesbian, bisexual, and questioning students, as well as those perceived as such by their peers, teachers, and the community. In light of recent events regarding bullying and gay teen suicide, the American educational system's goal to provide equal opportunity for education to all of its students becomes all the more relevant. Scholarly literature in the United States and abroad was consulted throughout this research, as well as the film *It's elementary: Talking about gay issues in school*. In-depth interviews of previous and current students who identify themselves as sexual minorities, as well as former and present teachers, in Santa Barbara, Los Angeles, Ventura counties have been also been analyzed. The results of this research show that, despite the increase in popular media acceptance of homosexuality, there is a growing need for anti-discriminatory policies protecting sexual minorities and for curricular representation. Methods for achieving this change are suggested both by academic research and the interviewees. While more in-depth research is necessary to determine if these results are similarly produced throughout California and the greater United States, this does not negate the responsibility of educators in Southern California to use this information to provide an equal educational opportunity to their students.

Bioavailability of Lead in Urban Soil Environments

Author(s): Aida S Guido, Ganga M Hettiarachchi,

Chammi Attanayake

Mentor(s): Monica Palomo

Institution: California State Polytechnic University, Pomona, Pomona CA

In urban environments soil lead contamination due to human activities is a common concern. Soil lead is acknowledged by regulators and the public health com-

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munity as an important pathway of human exposure. According to the Agency for Toxic Substances and Disease Registry (ATSDR), blood-levels with a lead content of 10 µg/dL and above cause adverse affects. Common sources of lead contamination include deteriorating lead-based paint, and lead contaminated dust and soil. For children under the age of six, lead contaminated soil is particularly a concern. The Center for Disease Control's (CDC) action lead level for children seven and under is 10 µg/dL. The scope of this work was to determine the effect of compost addition on the percent of bioavailable lead in a potential urban garden soil before any gardening activity. Standard methods were used to determine total and bioavailable lead (PBET) in soil samples taken from an untreated and compost-treated test plots, located in Kansas City, MO. Samples included 4 treated plots, 4 untreated plots, and a blank. Each sample was duplicated and a total of 18 samples were taken. Here, bioavailable lead is defined as the maximum soluble lead concentration that could potentially enter the gastrointestinal tract and then absorb into the blood stream. PBET was designed to mimic the human digestive system's activity. PBET was conducted at two different pH levels, the extremes of human gastric acid conditions. ANOVA was used to analyze the plot results. In this urban site, of the total lead only 4-28 percent was measured as bioavailable. Bioavailable lead was reduced by a greater percentage at pH of 2.5 than at pH of 1.5. Individual gastric conditions would determine the quantity of lead absorbed by a person. Future studies will measure and compare bioavailability of lead after gardening activities.

Verification of Pathogenic Viruses, PMMoV, Adenovirus, and Picobirnavirus as Viral Indicators of Fecal Pollution in the San Diego River and/or Sewage Treated Water

Author(s): Bridget G Guiza, Lisa Zeigler Allen
Mentor(s): Shannon Williamson
Institution: UC, San Diego, La Jolla CA

Human fecal matter contains high percentages of human viruses, such as Pepper Mild Mottle Viruses (PMMoV), Adenoviruses (AV), and Picobirnaviruses (PBV). Concern for public health is due to the fecal-oral route of transmission of these pathogenic viruses. Here we investigated their presence in the San Diego River (SDR) and raw sewage samples from the San Elijo Water Reclamation Facility (SEWRF) using PCR, nested PCR, RT-PCR, and gel electrophoresis to detect conserved genes. These amplification products will be cloned for future sequencing and analysis. If these viruses prove to be good viral indicators of fecal pollution, water quality programs can implement new strategies for determining the efficiency of treatment methods.

Changing Minds: Enactment in Mary Fisher's "A Whisper of AIDS" Address

Author(s): John Gunter
Mentor(s): Gary Selby
Institution: Pepperdine University, Malibu CA

This essay examines Mary Fisher's 1992 Republican National Convention address, "A Whisper of Aids," which drew attention to the AIDS epidemic facing the United States and called on the Republican Party to actively combat the crisis. The address, which juxtaposed Fisher's membership in the upper echelons of the Republican Party with her personal experience as a carrier of HIV, attempted to dispel the popular notion that AIDS was simply a homosexual male's disease. The convention's reaction demonstrated that Fisher's speech had a tremendous impact on her audience and on the party itself. This essay explores the process by which she achieved this remarkable impact. This essay argues that by offering herself as an example of a non-stereotypical HIV sufferer, she overcame Republican orthodoxy, which contended that AIDS was a disease arising from sexual immorality and ought to be fought by upholding traditional values. The essay highlights three elements in her attempt to change her audience's perception of AIDS: the use of logos to appeal to the audience's rationality, the use pathos to draw the audience out of its ambivalence towards the issue, and the use of what rhetorical scholars have called enactment, the strategy whereby the speaker holds herself up as proof of the claim she is making. Using enactment, Fisher offered herself as incontrovertible proof that the Republican Party's notions about AIDS were wrong. Although she was not immediately successful in changing the GOP's policy towards AIDS, her speech represented the first significant moment in a larger process of changing the overall direction of the Party toward this pressing social problem. Her speech thus highlights the power of enactment as a rhetorical strategy for effecting attitude change, while also demonstrating the long term impact of a single rhetorical effort.

Characterization of the *Thermatoga maritima* glgC1 D277N ADPGlucose Pyrophosphorylase

Author(s): Lydia Guo
Mentor(s): Christopher Meyer
Institution: Mount San Antonio College, Walnut CA

ADPGlucose Pyrophosphorylase (ADPG PPase) catalyzes the rate-limiting step in the synthesis of glycogen and starch in bacteria and plants. Given the role of ADPG PPase in controlling the amount of a biodegradable and renewable carbon source, it is an attractive target for engineering to benefit agriculture and the environment. The enzyme from the extremophile *Thermotoga maritima* (*T. ma*) has been shown to be comprised of two subunits, designated glgC1 and glgC2. Functional assays revealed

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negligible activity for glgC1 alone; however, glgC2 showed ~20 fold stimulation as well as fructose-1,6-bisphosphate (FBP) activation when combined with glgC1. In this study, the D277N altered protein of the glgC1 subunit was analyzed as this residue was predicted to form part of a salt bridge with glgC2. In order to prepare the enzyme for kinetic analysis, the recombinant His tagged *T. ma* ADPG PPase was purified using Ni Sepharose chromatography. However, in the process of purification, the enzyme precipitated out of solution when the concentration of the enzyme was over ~0.2 mg/mL, severely limiting the yield. Solubility conditions were screened in order to determine under which conditions the protein could be successfully resuspended with maximal solubility. The best condition was determined to be 50 mM HEPES at pH 8.0 containing 100 mM NaCl and 10% glycerol which supported +1 mg/mL in solution as measured by the Bradford assay using Bovine Serum Albumin (BSA) as a standard. Kinetic assays using the D277N glgC1 in complex with glgC2 revealed both a lower activity than the wild-type complex and less activation by FBP, indicating a role for Asp-277 in formation of a optimal complex. Additional kinetic and physical characterization (oligomerization state) of the D277N glgC1/glgC2 complex is underway.

Characterizing the Dynamical Behavior of Micro-Electro-Mechanical Systems (MEMS) Sensors

Author(s): Eric Gutierrez

Mentor(s): Chris Burgner, Kimberly Turner

Institution: UC, Riverside, Riverside CA

Micro-electro-mechanical systems (MEMS) are sophisticated mechanical devices micrometers in size. They can be found in inkjet printers, iPhones, inertial navigation systems, and Nintendo Wiis. One application for MEMS is mass sensing. MEMS sensors are tiny mechanical resonators that have the ability of sensing molecules micrometers in size with a high degree of accuracy. This phenomenon is currently being utilized to detect molecules such as anthrax, bacteria, and toxins. It has been noted that the nonlinear characteristics of MEMS sensors have the potential of improving mass sensing. In order to understand a resonator's dynamics when exploiting its nonlinear behavior, its physical characteristics were investigated when exposed to different pressures in the range of 0.008 to 756.6 Torr. Also, because the natural cooling and heating cycle from the HVAC in the laboratory has altered the resonance frequency of resonators, the effect of temperatures in the range of 19 to 27 °C on the resonance frequency of a MEMS resonator was investigated. The vibration of a MEMS cantilever beam was activated by exposing it with a voltage and frequency sweep. By changing its temperature and surrounding pressure, while vibrating at a known amplitude and frequency, its dynamical behavior was characterized. A clear relationship was found between the pressure surrounding the MEMS resonator and its

quality factor, which describes how under-damped a resonator is. It was also found that a temperature deviation of approximately 4 °C changes the resonance frequency of the MEMS sensor by 7 Hz. Having a better understanding of a resonator's behavior when exposed to different environmental factors will enable one to characterize its dynamical behavior more precisely when testing its non-linear properties.

The Effect of Soy-Phytoestrogens, Genistein and Daidzein, on the Lifespan of the DAF-16 *Caenorhabditis elegans* Mutant Nematode

Author(s): Gabriela K Gutierrez, Michele K Callaway

Mentor(s): Sylvia A Vetrone

Institution: Whittier College, Whittier CA

Soybeans contain high amounts of isoflavones termed phytoestrogens (non-steroid estrogen-like compounds). *In vitro* studies have shown phytoestrogens can decrease oxidative stress and increase lifespan. Recently, our *in vivo* studies testing two phytoestrogens, daidzein and genistein, have shown similar results using the nematode *Caenorhabditis elegans* (*C. elegans*), a commonly used animal model to study aging. Within the *C. elegans* model, it has been shown that the DAF-2 Insulin-like pathway plays a major role in determining normal oxidative stress, lifespan, and immunity, by inhibiting the transcription factor DAF-16, which when activated leads to increased lifespan and oxidative stress. In this study, we tested the administration of daidzein or genistein on the DAF-16 *C. elegans* mutant to elucidate if our previous findings are mediated through the DAF-2 pathway. We hypothesize that if our previous findings were mediated through the DAF-2 pathway, performing similar studies on the DAF-16 mutant would demonstrate similar results. Young L4 stage *C. elegans* were fed OP50 *E. coli* with or without the addition of 100 ug/mL of genistein or daidzien and maintained at 22°C. All nematodes were monitored for 20 days and live (responsive to touch stimuli) nematodes were scored daily. Our preliminary results show that the administration of genistein or daidzein in the normal food regimen of the DAF-16 *C. elegans* mutant does appear to correlate with a significant increase in lifespan when compared to their control feed peers ($P \leq 0.05$). While these findings suggest that our previous findings are being mediated through the DAF-2 pathway, further studies must be executed on other *C. elegans* DAF-2 pathway mutants to ensure that the results gathered are not simply a stand-alone incident. Likewise, similar studies must be performed on the DAF-2 mutant to determine if oxidative stress and immunity are also improved.

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Quantum Dot Photoluminescence Emission

Author(s): David Guzman, Julian Bouzanquet
Mentor(s): William A Taylor, Michiaki Ishimura
Institution: CSU, Los Angeles, Los Angeles CA

We have been studying the photoluminescence from In_xGa_{1-x} quantum dots. Our ultimate goal is to observe the effects of 1 MeV proton irradiation on these quantum dots. Since the intensity of this photoluminescence is very low, we built a sensitive computer controlled spectrometer that is able to detect photoluminescence with wavelengths from 150 nm to 1550 nm. We excite the quantum dots with lasers of wavelengths of 532 nm (green), 650 nm (red), and 407 nm (violet), each producing 5 mW, to observe the photoluminescence dependence on laser excitation wavelength. We have completed photoluminescence measurements on undoped, beryllium-doped, and silicon-doped quantum dots. We see several peaks in the photoluminescence spectra. We will describe our analysis of these peaks using a Gaussian fitting function; our plans to observe the photoluminescence for additional quantum dot samples; for 1 MeV proton irradiation; and for photoluminescence studies of the irradiated quantum dots.

Characterization and Separation of Photoactive Ru-Modified Dendrimers

Author(s): Michelle T Haas, Jeffrey T Kuwahara
Mentor(s): Stephen M Contakes
Institution: Westmont College, Santa Barbara CA

We recently prepared $[Ru(bpy)_3(phenanthroline)]^{2+}$ -modified PAMAM (polyamidoamine) dendrimers and are investigating their ability to bind wastewater contaminants and photooxidize or reduce them to harmless by-products. In this poster we describe the characterization of amine derivatives of $[Ru^{II}(bpy)_2(phen)]^{2+}$ and its conjugates with G1.5 PAMAM dendrimers using a variety of techniques. Cyclic voltammetry, UV-vis, and emission spectroscopy were used to estimate the ground and excited state redox potentials for $[Ru^{II}(bpy)_2(phen)]^{2+}$ and its dendrimer conjugates. The results indicate that the modified-dendrimers have ground and excited state redox potentials and emission quantum yields comparable to other Ru-diimine complexes. Transient emission spectroscopy indicates that dendrimer conjugates have sub-microsecond lifetimes comparable to other Ru-diimine complexes and noncovalent Ru-diimine dendrimer complexes. However, their emission transients exhibit biphasic behavior which we suggest may be due to the existence of conformations in which the $[Ru^{II}(bpy)_2(phen)]^{2+}$ group is bound within the dendrimer and at its surface. Quenching studies indicate that the Ru-modified dendrimers are accessible to exogenous quenching agents. For example, the quenching rate constant for reduction of the conjugate's excited state by ascorbate, $9.5 \times 10^7 M^{-1}s^{-1}$, is comparable to those for $[Ru^{II}(bpy)_3]^{2+}$ and $[Ru^{II}(phen)_3]^{2+}$. Ion-exchange chromatography experiments indicate that

1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide-mediated coupling of 1 equivalent of $[Ru^{II}(bpy)_2(5\text{-aminophen})]^{(NO_3)_2}$ to PAMAM dendrimers produces a mixture of 1:1, 2:1, and 3:1 Ru-dendrimer conjugates, although we have so far been unable to fully separate these using size exclusion or ion-exchange chromatography.

Effect of Water Tanks on Structural Behavior under Earthquake Loads

Author(s): Jon R Haider
Mentor(s): Uksun Kim
Institution: CSU, Fullerton, Fullerton CA

A series of experiments were conducted at the Structural Laboratory at California State University in Fullerton, in order to determine the effect that a water tank would have on the seismic behavior of a small scale 3-story building. In these experiments, a structure was subjected to seismic loads of various amplitudes and frequencies, both with and without a water tank installed on its upper level. Data was then recorded in order to monitor the maximum acceleration at two points (on the first and top floor), as well as the displacement experienced by the top of the structure. The data obtained shows that the water tank, significantly increasing the mass of the structure, had an evident impact on the structure's natural frequency, reducing it from 3.3 Hz without the water mass to approximately 2.7 Hz with the tank in place. This effect was anticipated, as there's a known relationship between mass and natural frequency. However, the water's damping effect was more complex. At frequencies closer to 3.5 Hz, seismic loads were absorbed by the water mass, causing the structure to sway and accelerate by 18% less than with no tank. While when seismic loads were applied at 2.5 Hz, the water had an undesired amplifying effect on the structure. The focus of this research is to determine what factors must be taken into consideration when placing large water bodies on structures, to ensure that there is no amplification of the seismic loads on the structural members. The weight of the water mass, the natural frequencies of the structure with and without the water tank and the geometry of the tank are all things that must be examined before placing large water bodies in structures, especially when earthquake loads are a concern in the structure's design.

Body Modifications and its Relationship to Gender and Age

Author(s): Lauren Hamachi
Mentor(s): Virgil Adams
Institution: CSU, Channel Islands, Camarillo CA

The physical body acts as a source of attraction and for an increasing number of individuals, a canvas portraying self-expression and self-identity. In examining the relationship between body modification and self-esteem,

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some have concluded that body modification is used to increase self-esteem levels. Yet other studies have not supported the notion of increased self-esteem following the incorporation of body art. The current study expands on this research by examining the relationship between self-esteem, global well-being, and body modifications. Body modification was defined as the presence of body piercings and/or tattoos and it was hypothesized that individuals with body modifications would have lower levels of self-esteem than those without body modifications. Results demonstrated that contrary to our hypothesis, no significant variance in self-esteem was accounted for by the presence of body modifications. Findings showed that an increase in the use of body modification tends to be endorsed by both younger respondents and females. Contrary to the hypothesis, body modification was not related to self-esteem or global well-being. Discussion focuses on the relationship between well-being and the use of body modifications.

Evolution of Quaternary Gravels Deposited Along the East-Central San Gabriel Mountains Frontal Fault System

Author(s): Audra M Hanks, Jeffrey D Pepin

Mentor(s): Jonathan A Nourse

Institution: California State Polytechnic University, Pomona, Pomona CA

The Quaternary Sierra Madre-Evey Canyon thrusts are part of an active fault system that transects the east-central San Gabriel Mountains range front. Fault segments situated directly north of densely populated communities of Claremont and La Verne are poorly understood. Our efforts focused on the southward extending Quaternary gravels associated with uplift and erosion of hanging walls of the thrusts. By studying this sedimentary system, the regional geologic setting of a seismic hazard will become more comprehensible and will serve as a model for similar environments. We mapped and sampled portions of two basement block uplifts and collected pebble samples of associated gravels for clast analysis. The Sunset Ridge Block forms the hanging wall of the north-dipping Evey thrust. This block is composed of a layered sequence of distinctive plutonic and metamorphic rock units, including Cretaceous tonalite, Precambrian quartzofeldspathic gneiss, Jurassic diorite and granite, and Triassic "dalmationite." Situated farther south in the footwall of the Evey fault and the hanging wall of the active Sierra Madre thrust, the Potato Mountain Block is composed mainly of Precambrian quartzite and biotite gneiss. Field relationships constrain two generations of gravels. Clast analyses of 9 gravel samples (60 to 200 pebbles/sample) yielded systematic ties to the two basement blocks and a consistent time progression: older gravels were derived from the Sunset Ridge Block while younger gravels were shed from the Potato Mountain bedrock sources. These data indicate the two main fault blocks were uplifted sequentially. Future

acquisition of optically-stimulated luminescence dates from associated sandy layers may allow us to extrapolate an uplift rate for the Quaternary gravels. This information is vital to constraining the earthquake recurrence interval. Our study has increased understanding of the local geologic history and may eventually serve as an important tool for city planners and emergency personnel in reducing seismic risk.

Queer Discourse: Floral Decadence in Oscar Wilde's *The Picture of Dorian Gray*

Author(s): Courtney A Hansen

Mentor(s): Bryan B Rasmussen

Institution: California Lutheran University, Thousand Oaks CA

Oscar Wilde's *The Picture of Dorian Gray* has been understood as not only the epitome of decadent fiction, idolizing aestheticism, but as a novel of implicit homoerotic ideals. Here, I want to show that these implicit ideals were expressed through a language of flowers that had come, through poetry and essays well in advance of Wilde and the Fin de Siècle, to represent illicit *heterosexual* love. As Beverly Seaton has argued, for the Victorians flowers corresponded with a meaning, which could also be enhanced with colors and odors. By Wilde's time, however, this language was withering, so to speak. Wilde, I argue, took advantage of this dying language to express a queer subtext in *Dorian Gray*, one in keeping with a decadent aestheticism that was, to use his infamous contemporary Andreas Huysman's phrase, "against nature." My argument helps us rethink the larger context of the Victorian culture of deviance—a culture well articulated by queer theorists and critics of Wilde such as Jeffrey Weeks and Ed Cohen. Through this context, it becomes clear that Wilde was writing through a dying discourse, in order to express himself through his art without the fear of being prosecuted. By writing queer theory in another "language," Wilde gave the dandies of the era a way to express "the love that dare not speak its name."

Digital Wasteland

Author(s): Gianna M Haro

Mentor(s): Kurt Meyer

Institution: Irvine Valley College, Irvine CA

Electronic waste (e-waste) is one of the most obscure economic trades worldwide. The recycling of e-waste is contributing to environmental degradation and human health issues in countries such as Vietnam, China, Ghana, and India. Private companies that dismantle e-waste are profiting by illegally purchasing it from developed western countries. Lack of enforcement and deficiency in regulatory laws are largely to blame for the disasters occurring from e-waste. By examining in-depth past and current

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U.S. policies about the proper disposal of e-waste, it is proven that the outcome of these laws is ineffective as the bills proposed are never ratified by the respective parties. As the only developed country that failed to ratify the Basel Convention, the United States is justifying its actions by free market trade. By investigating the lack of effectiveness of these laws, it is revealed that the proposals implemented are developed only on a national level basis such as the Electronic Waste Recycling Promotion and Consumer Protection Act. Also by comparing U.S. e-waste laws with European developed countries' laws, evidence shows the European incentives are more effective to promote the manufacture of electronics goods with the use of alternative materials harmless to humans and nature. Political, ethical, legal, environmental and human health aspects of this controversial issue are in need of discussion and can be resolved by the implementation of a consumer-based tax that ensures proper disposal of e-waste, strong penalties or fines on illegal exports and imports of e-waste, enforcement of more rigorous environmental laws in developed and developing countries. Implementation of recycling companies in developing countries will provide safer jobs, to recycle our e-waste responsibly and meet with the free market trade. Finally, the donation of refurbished electronics to poor eastern schools in order to replace child work for education.

Glucose Metabolism and Disaccharide-Induced Osmoprotection in *Sinorhizobium meliloti*

Author(s): Genevieve Hayman

Mentor(s): Daniel Wacks

Institution: University of Redlands, Redlands CA

Sinorhizobium meliloti is a species of bacteria that is known to instigate nodulation and fix nitrogen on leguminous plants. However, the rhizobia are likely subject to stressful osmotic conditions, such as high sodium concentrations. These stressors are counteracted by osmoprotectants that either accumulate within the cell or instigate the accumulation of other compounds such that sufficient turgor pressure is maintained. Certain disaccharides have been found to enable *Sinorhizobium meliloti* to utilize this latter method of osmoprotection (Gouffi et al., 1999, *Applied and Environmental Microbiology*, vol. 65, p. 1491-1500). However, a mutation in a gene that codes for the production of glucose-6-phosphate dehydrogenase (G6PD) has been reported to prevent disaccharide-induced osmoprotection (Barra et al., 2003, *FEMS Microbiology Letters*, vol. 229, p. 183-188). Because G6PD is a known enzyme in the Entner-Doudoroff (E-D) pathway for glucose catabolism, investigations involving several different glucose-minus mutants were conducted to observe the effects on osmoprotection and potentially plant nodulation. The results obtained did not support the idea that mutations in the E-D pathway inhibited sucrose-induced osmoprotection, but the data did indicate sucrose inhibition

of growth to be more pronounced in strains with mutations further upstream on the E-D pathway.

Geographic Pork: Earmark Requests and Congressional Representation of District Characteristics and Interest

Author(s): Kaitlyn L Hennessy

Mentor(s): Sean Q Kelly

Institution: CSU, Channel Islands, Camarillo CA

Political representation in the United States is geographically based. States are represented federally in the Senate; congressional district boundaries are drawn to reflect populations and interests within states. The framers of the Constitution expected that legislators would seek to represent their constituents by pursuing policies that reflect constituent needs. Congressional appropriations earmarks provide an opportunity for members of Congress (MCs) to secure funding through national programs that address the distinct local interests that MCs represent. This project combines data on the earmark requests of members of the House of Representatives and demographic measures of "district interest" to determine whether earmark requests vary according to the needs of members' districts, as is suggested by the geographic nature of representation in the American system. Earmark request data was collected from the archives of Appropriations subcommittee chairs. This research focuses on two subcommittees: Interior and Labor, Health and Human Services (Labor-H). I chose the House Interior Subcommittee on Appropriations because the programs within their jurisdictions cater to different constituencies: Interior earmarks may be greater in rural districts; Labor-H programs may be more amenable to urban districts. Each district possesses characteristics that should be reflected in the nature of earmark requests for these two subcommittees. I examine the relationship between four measures of district need and the number of earmark requests for each subcommittee: District Size, District Population Density, District Income, and the Percentage of Non-White Voters in the District. The findings suggest support for the conjecture that earmark requests are associated with district need. MCs who represent larger, less-populated districts request more earmarks in the Interior appropriations bill; MCs who represent more racially diverse, lower income districts request more earmarks in the Labor-H bill. This research contributes to our understanding of how Congress fulfills its representational role in our political system.

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Characterization of Soil from Joshua Tree National Park

Author(s): Lillian K Hensleigh

Mentor(s): David Schrum

Institution: University of Redlands, Redlands CA

Several years ago, MERK-AAAS awarded the University of Redlands a grant which was to be put to use to restore and monitor an area of Joshua Tree National Park-the Cottonwood Wash region specifically. This area was chosen due to the clear evidence of animal and human damage. In the analysis/characterization of soil obtained from this site, several analytical techniques/instruments were employed. The analytical results of two broad sites-the disturbed and the reference-were statistically compared (using a two-tailed Student's t-test assuming unequal variance). One aspect of this study measured the following macronutrients essential for plant survival: potassium, magnesium (macronutrients), and iron (a micronutrient). Percent total organic matter as well as soil salinity were also determined. Potassium was determined using Atomic Emission Spectrometry (AES). Iron and magnesium were determined using Atomic Absorption Spectrometry (AAS). Analyte concentrations from the open soil and from beneath the canopies of indigenous restorative legumes were statistically compared. Legumes were the focus of this study because their symbiotic relationship with a bacteria (Rhizobia) which is commonly used in restorative measures. The Rhizobia bacteria fix atmospheric nitrogen making it available to the legumes, thus they are able to survive better in the harsh desert environment, which is being studied. The canopies beneath the legumes were thought to act as islands of fertility in which higher analyte concentrations would be found. Iron and potassium were found to be statistically equivalent amongst all the soil samples. Magnesium was found in higher concentrations beneath the canopies of the legumes (cumulatively) than in the open soil of the reference site. Total organic matter and soil salinity were also found to be statistically equivalent amongst all the samples. However, the canopy soil samples had higher salinities than the open soil samples.

Saccharomyces cerevisiae Responds to Cold Shock by Changing the Expression of Genes Involved in Nitrogen Metabolism

Author(s): Andrew F Herman, Alondra J Vega, Lauren N. Kubeck, Kenny R Rodriguez

Mentor(s): Kam D Dahlquist

Institution: Loyola Marymount University, Los Angeles CA

Previous studies on the global transcriptional response of budding yeast, *Saccharomyces cerevisiae*, to cold shock have revealed that the response can be divided into a set of early response genes (after 15 minutes to 2 hours of cold temperatures) and late response genes (after 12 to 60 hours

of cold temperatures). The late response genes include the environmental stress response (ESR) genes induced by many environmental stresses and are regulated by the Msn2p/Msn4p transcription factors, but less is known about the early response genes and which transcription factors regulate them. We have characterized more fully the early transcriptional response at 15, 30, and 60 minutes of cold shock at 13 °C and also the response to recovery after cold shock for 30 and 60 minutes at 30 °C using DNA microarrays. Results were analyzed using the program GenMAPP to determine which biological processes were activated in response to cold shock and recovery. We found that genes involved in nitrogen metabolism change expression during cold shock. The transcription factor Gln3p is an activator of genes regulated by nitrogen catabolite repression. We found that a strain of yeast in which the *GLN3* gene was deleted has impaired growth at 15 °C. We then performed a cold shock and recovery DNA microarray experiment on the *Dgln3* strain to determine the effect of Gln3p on the transcriptional network that responds to cold shock. Preliminary analysis of the data indicates that fewer Gln3p target genes change expression due to cold shock in the deletion strain than in the wild type strain. This suggests that there is a link between genes involved in nitrogen metabolism and the ability of yeast cells to grow at cold temperatures.

Analysis of *trnE* Gene Promoters for their Role in the Tetrapyrrole and Protein Synthesis Pathways

Author(s): Nancy Herrera-Morales, Simone M Thomas

Mentor(s): Luisa A Nogaj

Institution: Mount Saint Mary's College, Los Angeles CA

The tetrapyrrole pathway leads to the production of hemes and chlorophylls. 5-Aminolevulinic acid (ALA) is the first committed precursor in this pathway. In plants, algae, and most bacteria, ALA is generated from glutamate and tRNA^{Glu}. Therefore, glutamyl-tRNA^{Glu} is necessary for protein production and for the first step of the tetrapyrrole biosynthesis pathway. For protein synthesis, EF-Tu interactions with tRNA^{Glu} assure its entrance into the ribosome. However, it is not known how Glu-tRNA^{Glu} is channeled into the tetrapyrrole pathway. *C. reinhardtii* has two tRNA^{Glu} genes but only one of them has been characterized. Previous studies in other organisms suggest that different tRNA^{Glu} could be dedicated to protein and tetrapyrrole synthesis. In *C. reinhardtii* it is possible that one tRNA^{Glu} species is dedicated to protein production and the other to the tetrapyrrole pathway. To test this hypothesis, we examined the two *trnE* genes and their promoter sequences. Here, we show that the two tRNA^{Glu} genes are surrounded by entirely different flanking sequences, presenting the possibility that they might be expressed differently. We also show the cloning of tRNA^{Glu} loci and our investigation of their expression levels.

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Nella Larsen's *Passing*: More than Skin Deep

Author(s): Sarah Hicks

Mentor(s): Elyse Blankley

Institution: CSU, Long Beach, Long Beach CA

Nella Larsen's novella *Passing* places the spotlight on two female Mulatto characters who pass into white communities. Passing, in this context, is the ability of a light-skinned African-American to bypass social binary limits of a black and white society. Larsen's theme of passing concentrates on the Mulatto characters, Irene Redfield and Clare Kendry; nevertheless, two minor characters, Hugh Wentworth and John "Jack" Bellew reveal a subtheme of passing. Wentworth and Bellew are geographically misplaced relative to their racism, asking the reader to broaden the definition of passing. Larsen applies passing on a deeper level and through reader sympathy she manipulates these characters to pass regional boundaries. Upon a close reading of the novella, the reader questions if these stereotypes are true. Drawing on a new historicists' critique prompts the reader to search the history of the author, and of the regions involved to determine if the characters are indeed passing. During the process of research, the modernist stereotypes of the Southern and Northern perspectives are established as accurate. The outcome exposes Larsen's ability to craftily direct the reader's attention to the subtlety of passing as more than skin deep.

Modeling DNA Fragmentation Signals Observed using Pulse Field Gel Electrophoresis

Author(s): Rena Hiedo, Ilham Naili, Anca Segall

Mentor(s): Peter Salamon

Institution: San Diego State University, San Diego CA

Norfloxacin is a bacterial topoisomerase inhibitor that blocks DNA replication and is known to generate DNA breaks. The Segall lab has isolated a peptide of sequence wrwycr that inhibits DNA repair by blocking the resolution of the Holliday junction intermediates that arise during repair. We want to quantify the DNA fragmentation levels and patterns when we use these compounds individually or in combination, to test our hypothesis that norfloxacin treatment creates targets for the peptide, and thus the two compounds should be synergistic. We will analyze the results using Pulse Field Gel Electrophoresis (PFGE) to visualize the DNA breakage induced by these compounds, alone and in combination, compared to untreated controls. We have identified four pools of DNA: 1) the unbroken strands of DNA located in the wells of the gel; 2) relatively long fragments of DNA located near the top of the gel; 3) smaller fragments located in the "middle" of the gel; and 4) the very small DNA fragments that may have run out of the gel. In addition to testing the nature of the DNA damage created by the peptide, norfloxacin, and their combination, we also want to determine whether there are preferred sites in the chromosome where DNA breakage and/or repair occur. Our preliminary data shows

that peptide wrwycr and norfloxacin do not seem to break the chromosome at random sites. In the future we will assess these effects with other DNA-damaging agents in addition to norfloxacin, and will investigate what proteins may affect the pattern of DNA damage.

Improved Simulations of Image Analysis Algorithms for Subwavelength Fluorescence Microscopy with PALM and STORM

Author(s): Forrest M Hippensteel

Mentor(s): Alexander R Small

Institution: California State Polytechnic University, Pomona, Pomona CA

Emerging super-resolution fluorescence microscopy techniques (e.g. PALM and STORM) are of growing significance in biophysical research as they enable high resolution imaging of live cells. Key structures imaged by these techniques include the cytoskeleton, membranes, and mitochondria. Recent theoretical work confirms that the experimentally achievable image acquisition rate and resolution of these techniques is limited by the performance of both the physical imaging system and the rejection algorithm used to distinguish single-fluorophore images from multi-fluorophore images. Better rejection algorithms may therefore yield faster and more accurate experiments in addition to faster image analysis. An effective and representative method of benchmarking rejection algorithm performance is needed to determine the "optimal" rejection algorithm. To benchmark a rejection technique, a set of simulated images is generated and then analyzed by the rejection algorithm. Previously, photon counts per molecule were arbitrary simulation parameters; however, selecting photon counts from an exponential distribution is more realistic (the time an activated molecule spends in its excited state is exponentially distributed). The constraints (or lack thereof) placed on exponentially distributed photon counts greatly effect rejection algorithm performance. Various photon count constraints were tested by analyzing simulated images with a rejection method consisting of (1) nonlinear Gaussian curve fitting of images and (2) subsequent rejection or acceptance of images based on the ellipticity of the fitted function. (Ellipticity is used to infer the presence of multiple closely-spaced activated fluorophores.) We found that imposing a minimum photon count of approximately half the mean photon count per molecule was necessary to obtain realistic and meaningful rejection algorithm performance characteristics. Since rejection performance is a key factor in super-resolution microscopy techniques, improved rejection algorithm characterization is an important step towards robust and powerful STORM/PALM image processing tools for widespread use in biophysical research.

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Comparative Properties of Evergreen Species in Upland and Riparian Regions of the Southwestern Cape of South Africa

Author(s): Lovvet S Hollis, Erik Rempen

Mentor(s): Cheryl Swift

Institution: Whittier College, Whittier CA

Mediterranean type ecosystems in the Western Cape of South Africa differ from Mediterranean type ecosystems in California in that the trees that grow along streams (riparian zones) are evergreen, not deciduous. Evergreen and deciduous trees have distinctly different properties which would make them seem fit for different environments. In this study we compared the leaf specific mass (LSM) and maximum photosynthesis rate of evergreen species of riparian areas to species in upland regions of Jonkershoek in the southwestern cape of South Africa. We compared upland and riparian individuals of *Brabejum stellatifolium* and *B. stellatifolium* individuals to co-occurring more obligate riparian species *Brachyleana nerifolia* and *Metrosideros angustifolia* within the two riparian zones sampled. Because the upland site burned in February of 2009, we were forced to compare resprouts for *B. stellatifolium*. We hypothesized that the evergreens in the riparian zone would have traits more similar to deciduous trees, while in the upland zone, traits would be more similar to evergreen species. We also hypothesized that *B. stellatifolium* would have similar LSM and photosynthetic maximums to the co-occurring riparian species in riparian habitats, but that upland *B. stellatifolium* individuals would have higher LSM and lower photosynthetic maximums compared to riparian individuals. Our results showed a significantly lower LSM for riparian individuals of *B. stellatifolium*; however there was no significant difference in maximum photosynthetic rates between upland and riparian individuals or obligate riparian and upland species overall. Overall, the riparian species surveyed had photosynthetic rates similar to the upland species, but the more obligate riparian species, *M. angustifolia* and *B. nerifolia* had lower LSM than co-occurring *B. stellatifolium* in the two riparian areas sampled. Our results suggest that further analysis of traits that separate upland species typical and riparian evergreen species typical of fynbos is needed.

Relationship Between Body Mass Index and Motivation to Exercise

Author(s): Kayla Hornor, Shirah Bale, Bailey Liebes, Sharon Whittle

Mentor(s): Christy Teranishi Martinez

Institution: CSU, Channel Islands, Camarillo CA

Understanding people's motivation to exercise is important for helping to improve exercise habits and promote healthier lifestyles. The purpose of this study was to examine factors that contribute to the motivation to ex-

ercise. Ninety-six participants (ages 18 to 80) completed a survey assessing body mass index (BMI) and factors that motivate them to exercise (Exercise Motivations Inventory 2; Markland & Ingledew, 1997). A one-way ANOVA was conducted. Results indicated that those categorized as obese had greater motivation to exercise due to health pressures than those categorized as normal or overweight. A t-test was also conducted to examine gender differences. Men were more motivated to exercise for competition, while women were more motivated to exercise for weight management. Implications for how the media, family and peers may influence the motivation to exercise during childhood are discussed.

Utility of 454 Pyrosequencing for Design of PCR Primers that Amplify Homologous but Divergent Luciferases of Cypridinid Ostracods (Arthropoda: Crustacea)

Author(s): Elizabeth Hovhannessian

Mentor(s): Elizabeth Torres

Institution: CSU, Los Angeles, Los Angeles CA

Bioluminescence is the production and emission of light by a living organism. Luciferases are enzymes that emit light in the presence of oxygen and a substrate (luciferin). Luciferases are used for real-time monitoring of gene expression in cells, whole and transgenic organisms (Greer and Szalay 2001). The goal of my research is to design primers that amplify luciferase from many species of cypridinid ostracod crustaceans to understand the evolution of bioluminescence in this group. Cypridinid ostracods are small bivalved marine crustaceans. Over 100 species produce a unique form of blue bioluminescence (465nm), secreting light upon stimulation or during courtship displays. The luciferases of two species of luminous cypridinids have been characterized (Thompson et al. 1989, Nakajima et al. 2003). Nakajima et al. (2003) compared the luciferase sequences of *Vargula hilgendorfii* and *Cypridina noctiluca*. The sequences of *C. noctiluca* and *V. hilgendorfii* luciferase are very similar; nucleotide and amino acid sequences are 79.2% and 83.1% identical respectively. However, *C. noctiluca* shows higher activity allowing for more sensitive monitoring in gene expression in mammalian cells, and might be a more efficient reporter. *Vargula tsujii* is a bioluminescent cypridinid from the California Coast (Kornicker & Baker 1977). Attempts to amplify and isolate *V. tsujii* luciferase based on the luciferase sequences of *C. noctiluca* and *V. hilgendorfii* were not fruitful. With the use of a newly developed sequencing technique, 454 pyrosequencing, a putative luciferase sequence from *V. tsujii* was obtained. Using bioinformatics, eight primers were designed *in silico* based on the 454 pyrosequencing result. The primers were tested *in vitro* using a *V. tsujii* cDNA library as template. Thus far, one primer pair amplified a fragment of the expected size, and that product is being sequenced. The 454 pyrosequencing approach appears to be

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useful for isolating homologous but divergent luciferases in cypridinids.

Cryogenic Integrating Preamplifier for Sensing Very Low Current

Author(s): Yunqing Hu

Mentor(s): Roger Smith

Institution: California Institute of Technology, Pasadena CA

Photodiodes with quantum efficiency calibration traceable to the National Institute of Standards and Technology are frequently used to monitor flux levels during the calibration of astronomical imaging sensors. It is highly desirable to perform these calibrations at similar fluxes to those used for astronomy, which produce photocurrents of order 0.001 fA to 100 fA per square millimeter of diode area, however the best commercially available ammeters coupled to photo diodes of one to several square millimeters can barely measure fluxes at the upper end of this range. The design and testing of an inexpensive preamplifier capable of measuring <0.1 fA from a photodiode with area 1 to 10 mm² is described. The key to obtaining this performance is to greatly reduce leakage currents by cooling both the photodiode and preamplifier to cryogenic temperatures, the use of an integrator with small feedback capacitance, and the selection of op amps with low 1/f noise which also maintain adequate performance when cold. The simple circuit is described along with an analysis of various internal noise sources, and measures to prevent entry of noise via control signals and power supplies. Tests of candidate components at cryogenic temperatures are described. The effect of the choice of diode area and capacitance on signal-to-noise ratio is also discussed.

Synthesis of Discotic Liquid Crystal Dimers for Organic Photovoltaics

Author(s): Carly L Hulstein

Mentor(s): James Rego

Institution: California State Polytechnic University, Pomona, Pomona CA

Discotic liquid crystals are organic materials that have the film-forming properties of a liquid and the long-range order associated with a crystalline solid. Columnar phases formed by discotic liquid crystals are of interest because they allow fast charge migration through self-organized polyaromatic cores and thus show potential for use in organic photovoltaics (OPVs). The hexagonal columnar phase of hexapentyloxytriphenylene (HPT) was among the first to be studied and has a charge carrier mobility of 10⁻³ cm²/Vs. We present our current efforts toward synthesizing triphenylene-based discotic dimers linked by a conductive bridging unit. These discotic dimers are designed to increase charge carrier mobility by providing

additional migratory routes for charge carriers around film defects that serve as deep traps. They will also have broad absorption of visible light unlike HPT which absorbs only in the UV. Hydroxypentapentyloxytriphenylene can be synthesized using Ullman coupling to make a tetrapentyloxy-biphenyl. Subsequent oxidative cyclization gives methoxy-pentapentyloxytriphenylene. The methyl ether can be selectively cleaved with lithium phosphite to yield hydroxypentapentyloxytriphenylene which is the starting point for our current route. In an effort to optimize our synthesis, we are starting with HTP and using a selective ether cleavage reaction using β-bromocatecholborane. Subsequently, we are pursuing nickel-catalyzed cross coupling of thiophene-derived Grignard reagents and zincates with tetrazoyl ethers derived from hydroxypentapentyloxytriphenylene as a means to connect two triphenylene cores with a conducting oligothiophene bridging unit.

Behavioral Analysis of North American River Otters (*Lontra canadensis*) at Latrine Sites

Author(s): Addison Hummel

Mentor(s): LeiLani Stelle

Institution: University of Redlands, Redlands CA

The behavioral use of communal defecation areas, or latrine sites, by River Otters (*Lontra canadensis*) has been a popular topic of study, but the function of these sites is still unknown. Competing hypotheses include sexual communication, territorial marking, and communication of resource availability. My research was to: 1) Investigate behavior of *L. canadensis* at latrine sites on inlets around Ahousat, British Columbia by means of shore-based observations, kayak transects, and placement of motion-activated remote cameras and 2) analyze said behavior using behavioral software to evaluate competing hypotheses. From July 12-Aug 18, 2010, over 20 transects and 30 1 hr scans were conducted, yielding the discovery of ten active latrine sites and more than 80 videos. These videos are currently being analyzed using Noldus Observer behavioral software. Videos will be scored using a pre-assigned ethogram of possible otter behaviors. Results will be presented in activity budgets showing the behavior of river otters at latrine sites versus on a dock or in the water. Once collected, the results will be contrasted to expected results of the known hypotheses on latrine site function. For example if the territoriality hypothesis is true, expected results include defensive or aggressive social interaction and frequent spraiting over previous spraints. Or if the reproductive availability hypothesis is correct, expected results include frequent male/female social interaction and strong responsive behavior toward scat of the opposite sex. This study will help us to understand the behavior of these elusive animals and will assist in designing re-introduction programs which aim to conserve the species.

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Selection and Characterization of Small Peptides that Inhibit the Aggregation of Amyloidogenic A β 42

Author(s): Michael Hunter, Braddley Neddenriep
Mentor(s): David Moffet

Institution: Loyola Marymount University,
Los Angeles CA

Increasing evidence suggests that the aggregation of the small peptide A β 42 plays an important role in the development of Alzheimer's disease. Inhibiting the initial aggregation of A β 42 may be an effective treatment for preventing, or slowing, the onset of the disease. Using an *in vivo* screen based on the enzyme enhanced green fluorescent protein (EGFP) we have searched through a combinatorially diverse peptide library to identify peptides capable of inhibiting A β 42 aggregation. In this screen, we have genetically fused the A β 42 peptide to EGFP. Due to the propensity of A β 42 to quickly aggregate, the EGFP fails to fold and fluoresce. However, in the presence of substances that inhibit A β 42 aggregation, the EGFP is capable of folding and fluorescing. Our peptide library was built to target the purported aggregation-prone region of A β 42. We have identified four small peptides that show varying ability to inhibit amyloidogenic aggregation.

The Gendered Politics of Hollywood Film Production Culture

Author(s): Jessica-Angel Hunter-Thomas

Mentor(s): Reed Moran

Institution: CSU, Long Beach, Long Beach CA

This research explores the factors that contribute to the dearth of women within the Hollywood film industry. Throughout the history of Hollywood, women have been underrepresented in positions of power and influence. These positions of power and influence are labeled Above-The-Line positions that include producers, writers, directors, and cinematographers. This study is focused on finding and analyzing the contributing factors of the gender disparity in Above-The-Line positions. The methodology used to explore the gender disparity within Hollywood film production culture is an interdisciplinary approach using textual analysis of industry literature, scholarly studies, data analysis. This research is being conducted under the mentorship of Professor R. Moran and under the advisement of Dr. A. Hoffman.

Understanding Psychopathic Traits as Means to Predict Violence

Author(s): Maryam M Hussein

Mentor(s): Michael Cassens, Kurt Meyer

Institution: Irvine Valley College, Irvine CA

Can violence be predicted by differential characteristics of psychopathy- as well as by neurological structures? Psychopaths, or individuals with psychopathic tendencies, make up 1% to 4% of the population. Although not all are violent, individuals with psychopathic tendencies occupy a significant proportion of the criminal population (25%), especially among the more serious homicidal crimes. The significance of investigating characteristics and neurological structures of psychopathy is to create accurate assumptions of behavior sets in individuals with psychopathic tendencies, especially violent ones. Once the public is informed about expectations from these individuals, then questions regarding forms of punishment can be properly discussed. By investigating different brain structures as they relate to specific traits exhibited by psychopathic individuals and by comparing those brain structures with healthy brains, it is indicated that individuals with psychopathic tendencies suffer emotional and cognitive abnormalities which predispose them to act violently. Moreover, research data suggest evidence for differential characteristics and their neurological justifications, namely—lack of fear (impairment of the amygdala), lack of empathy (impairment of orbitofrontal cortex), and failure to abstain from punishable behavior (impairment of dorsolateral cortex). These abnormalities were shown to be more significant in violent psychopaths than non-violent psychopaths, and thus, suggest that detection of these differential characteristics can help us predict violent behavior. By acknowledging these biological factors, we can create more accurate assumptions about behaviors associated with psychopathic individuals that can predict violence. And by understanding the neurological deformities, then questions about legal implications involving punishment can be thoughtfully approached.

The Effect of Moderate Muscle Fatigue on Non-Linear Measures of Lower Extremity Kinematics During Treadmill Walking

Author(s): Hal Huynh, Mary McDougal

Mentor(s): Jeff A Nessler

Institution: CSU, San Marcos, San Marcos CA

Nonlinear time series analysis of lower extremity kinematics has been shown to be useful for the detection of subtle abnormalities in gait. For example, previous researchers have reported reduced statistical persistence in stride time in Huntington's patients and older adults at risk for fall, and increased maximal Lyapunov exponents have been observed following musculoskeletal injury. However, these measures are also known to vary under relatively

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normal circumstances in otherwise healthy individuals, and such behavior presents implications for the interpretation of nonlinear analysis of gait in patient populations. Therefore, the purpose of this study was to contribute to an overall understanding of the nonlinear dynamics of healthy gait by examining the effects of moderate muscular fatigue on lower extremity movement during treadmill walking. Twenty recreationally active subjects performed two 10 minute bouts of treadmill walking at their preferred speed while lower limb kinematics were recorded via optical motion capture. Following the first walking trial, subjects performed a series of lower extremity resistance exercises designed to induce moderate muscular fatigue. Immediately following the final exercise, subjects were asked to perform their second walking trial. Detrended fluctuation analysis of stride length and stride time revealed that statistical persistence was unaffected by moderate muscle fatigue ($p = 0.290$ & 0.597 , respectively). Estimates of finite-time maximal Lyapunov exponents for ankle angle, knee angle, and step height were also unaffected by a single bout of resistance training ($p = 0.254$, 0.298 , & 0.290 , respectively over 0-1 stride, and $p = 0.965$, 0.686 , & 0.593 , respectively over 4-10 strides). These results demonstrate that control of locomotion in healthy individuals, as measured by the nonlinear dynamics of lower extremity movement, appears to be relatively robust to moderate muscular fatigue. Additional work with greater levels of fatigue will be necessary to fully characterize the effects of muscular fatigue on gait.

Caloric Intake Predetermines Alveolization in the Developing Rat Lung

Author(s): Jasmine C Huynh, Tiffany M. Maisonet
Mentor(s): Vedang A. Londhe
Institution: UC, Los Angeles, Los Angeles CA

Prenatal caloric restriction (CR) in infants can impair development of vital organs, specifically the brain, lungs and heart. Premature infants are especially vulnerable as developmental immaturity coupled with suboptimal nutritional intake during neonatal intensive care may persist into early postnatal life. This heightens risk of developing severe pulmonary conditions such as bronchopulmonary dysplasia and respiratory distress syndrome. We explored the impact of prenatal and early postnatal CR on alveolization and hypothesize that CR negatively impacts alveolization. We altered caloric intake of pregnant Sprague-Dawley rats, allowing either ad libitum feeding or a calorie-restricted diet (50% normal caloric intake) during late gestation (embryonic day 11-21) until delivery. Pups were then fostered by mothers either receiving ad libitum feeding or a calorie-restricted diet from lactation (postnatal day 0 (P0)) until postnatal day 21 (P21). Four experimental groups resulted: control (CON), intrauterine caloric restriction (IUCR), postnatal caloric restriction (PNCR), and intrauterine + postnatal caloric restriction (IPCR). At P21, groups were weaned and fed

ad libitum. Animals were sacrificed at P1, P21 or P50. Collected lung tissue was analyzed for bronchoalveolar lavage (BAL), radial alveolar count, mRNA, and protein. The weight gain and morphology of offspring from IUCR, PNCR and IPCR groups were compared to CON groups. At P1, IUCR offspring had decreased BAL cell counts and significant morphological differences in alveolization. With refeeding, IUCR offspring showed normalization of alveolar formation and weight gain at P21. At P21, PNCR and IPCR offspring exhibited poor weight gain and enlarged and simplified alveoli—indicative of delayed alveolization. Surprisingly, all experimental groups showed alveolar normalization by P50. These results suggest that caloric restriction during the prenatal and early postnatal period does contribute to delayed alveolization, but may be reversed by caloric restoration. Further studies are required to clarify the molecular mechanisms regulating these changes.

Spectral Analysis of Color Polymorphism in Pacific Tree Frogs (*Pseudacris regilla*)

Author(s): Candy Sonhe Hwang
Mentor(s): Rodney L Honeycutt
Institution: Pepperdine University, Malibu CA

Color variation in vertebrates is a good system for studying how natural selection acts on individual variants within a population. The Pacific tree frog, *Pseudacris regilla* (formerly *Hyla regilla*), is an excellent model for a detailed assessment of mechanisms responsible for color polymorphism in an anuran. There have been four discrete color morphs documented in the Pacific tree frog, with a recently discovered fifth morph capable of changing dorsal coloration. Our study applied detailed spectral analysis of both the dorsal and lateral patterns of coloration of individuals collected in the Santa Monica Mountains. Spectral data were collected using a spectroradiometer in the laboratory, obtaining measurements from 400-900 nm. Based on our findings, the color changer morph revealed considerably more variation and occurred at higher frequency than previous studies would suggest. In addition, changes from baseline color occurred at a rate much higher than that recorded in the literature, and this rate increase was greater on the lateral surfaces of frogs. We suggest that individuals with the color changing phenotype represent more than one underlying genotype. At this point, little is known about the genetics of this system, but there may be considerably more loci involved than previously suggested. If the genetics of this system is to be understood, detailed spectral analysis as performed in our study is important for accurately identifying color changers that differ in their underlying genotype.

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Les deux emplois du temps dans *L'emploi du temps* / The Two Timetables in *L'emploi du temps*

Author(s): Alexander K Ikeda
Mentor(s): Marie-Magdeleine Chirol
Institution: Whittier College, Whittier CA

In the film *L'emploi du temps* (2001) by Laurent Cantet, Vincent, a middle-aged Frenchman with a wife and kids, loses his job at a consulting firm. Instead of filing for unemployment and searching for a new job, Vincent concocts a series of lies and engages in a number of devious schemes to hide the truth from his family and friends. My presentation will focus on the effects sudden unemployment can have on a rigid and ordered society in which its people are accustomed to following a set schedule and receiving an annual pay. First, I will explain the nature of the schedule that Vincent pretends to have, which makes it seem as if not much has changed from before. Next, I will compare, contrast, and correlate it with how Vincent actually passes the time, which, paradoxically, is not that different from what he pretends to do. Finally, I will explain how Cantet masterfully deceives and manipulates the audience into thinking Vincent is telling the truth and how the director subtly and gradually unveils the truth through his use of ellipsis, music, and the overall structure and composition of the film. The purpose of my presentation will be to show that man is a creature of habit that can “substitute” his schedule without much difficulty to the point of deceiving the closest ones around him and even the film’s audience. My presentation will be in French..

Investigation of the Influence of Roadway Features on Hit-and-Run Crashes

Author(s): Kia Ilkhanipour
Mentor(s): Wen Cheng
Institution: California State Polytechnic University, Pomona, Pomona CA

Hit-and-run is considered as a crime in most states. Compared with many other crimes, it is a special one with the characteristics of spontaneity and no involvement of career criminals. Past research studies have illustrated that there exist a relationship between hit-and-run crashes and personal traits (e.g., age, gender, illness, etc.) and impulsive behavior. However, there is lack of research dedicated to exploring whether roadway factors could contribute to the crash occurrences of hit-and-run. The objective of the study is to examine the influence of roadway features, among personal and environmental characteristics, on hit-and-run crash occurrence. In comparison with other modeling methodologies, Bayesian approach has revealed itself by numerical research studies the great advantages. First, it possesses the capability to seamlessly integrate prior information and all available data into a posterior distribution. Second, it was found to provide more valid safety estimates in smaller data samples. Given the supe-

rior properties, a Bayesian binary logit model was built to explain the contributing factors associated with hit-and-run in Arizona. The study used the data of crashes occurring on a 45-mile stretch of State Route 83 in Tucson, AZ, from the period of October 2002 through September 2007. The results of the modeling shows that, apart from the anticipated human factors, the roadway and environmental factors such as radius of the curve, vertical grade, shoulder width, weather, lighting conditions, also significantly influence the crash occurrence of hit-and-run.

Synthesis of Large Ba_{3-x}KxHx(PO₄)₂ Crystals as Solid Acid Electrolytes

Author(s): Nicole L Ing, Karthik Narsimhan
Mentor(s): Sossina Haile
Institution: California Institute of Technology, Pasadena CA

Recently, a group of compounds known as solid acids, which have chemical characteristics intermediary of acids and salts, has attracted interest for potential use as fuel cell electrolytes due to their highly-conductive nature upon reaching a heat-triggered super-protonic phase. However, most currently-synthesized solid acids have the unfortunate property of being water soluble. Ba_{3-x}KxHx(PO₄)₂ has recently been synthesized as a solid acid electrolyte for use in fuel cells to overcome problems experienced by other superprotic electrolytes. Ba_{3-x}KxHx(PO₄)₂ is water insoluble, mechanically-stable, and does not exhibit a phase transition to its superprotic phase, thereby preventing mechanical failure. Its observed proton conductivity, however, is far lower than expected from its chemical structure. To understand why Ba_{3-x}KxHx(PO₄)₂ has such low proton conductivity and to conduct direct electrochemical studies on the crystal surface, large single crystals of Ba_{3-x}KxHx(PO₄)₂ must be synthesized. Ba_{3-x}KxHx(PO₄)₂ single crystals were synthesized in gels (sodium metasilicate and acetate and tetraethyl orthosilicate waterglass gels), hydrothermally in thermal bombs, and via standard synthesis, with varying temperature ad potassium levels. Relatively large Ba_{3-x}KxHx(PO₄)₂ single crystals were only successfully grown using a hydrothermal method and exhibited low potassium content possibly due to potassium dissolving at high temperatures.

Comparison of Genetic Variation Between Populations of the Chaparral Shrub *Ceanothus megacarpus* along a Freezing Gradient

Author(s): Caitlin D Ishibashi, Anthony R Shaver, David P Perrault
Mentor(s): Rodney L Honeycutt, Stephen D Davis
Institution: Pepperdine University, Malibu CA

Chaparral vegetation of southern California is regularly subjected to freezing, as temperatures can drop well be-

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low 0 °C in cold valleys and at high elevations. Previous experiments established that *Ceanothus* species in the Santa Monica Mountains exhibit a broad range in cold tolerance, with lethal temperature for 50% leaf death (LT_{50}) varying between -9 °C to -22 °C. We hypothesized that a 4.2 km distance between a warm coastal site (minimum of 0 °C) and a cold inland site (minimum of -12 °C) influenced genetic variation among *C. megacarpus* populations. We tested this hypothesis by using a panel of microsatellite loci, which was isolated and optimized from a genome library to *Ceanothus megacarpus*. Standard molecular techniques were used to isolate nuclear DNA from fresh tissue collected from individual plants, and PCR (polymerase chain reaction) primers were designed for 10 microsatellite loci. Patterns of genetic variation at these loci revealed significant allelic and genotypic differences between two populations of *C. megacarpus* located 4.2 kilometers apart, suggesting a reduction in gene flow. Nei's Unbiased Genetic Distance was 0.229, indicating 30% similarity between the two populations of *C. megacarpus*. An Analysis of Molecular Variance showed 7% molecular variation based on allele frequencies between the two populations. These results are significant, because they represent two contiguous populations, only 4.2 kilometers apart, yet separated genetically, possibly in response to a strong coastal to inland freezing gradient. We are exploring the possibility that observed genetic differences in the inland population are matched by increased freezing tolerance (LT_{50}) that result from hybridization of *C. megacarpus* ($LT_{50} = -9$ °C) with *C. cuneatus* ($LT_{50} = -22$ °C) along a cold-tolerance-ecotone.

Mapping New *tba-1(ju89)* Suppressors in *C. elegans* by SNIP-SNP Analysis

Author(s): Rita M Ishkhanian, Marissa A Posada
Mentor(s): Renee Baran
Institution: Occidental College, Los Angeles CA

A Snip-SNP mapping technique was employed to map and position clone *tba-1* suppressor genes in *C. elegans*. SNPs (Single Nucleotide Polymorphisms) are areas of a chromosome some possessing a single nucleotide change between the wild-type N2 strain and a polymorphic CB4856 strain. Snip-SNPs are SNPs in which the base pair change results in a change in a restriction enzyme site (RFLP) that can be detected by PCR amplification and gel electrophoresis. This method was used to map three new suppressors of an alpha-tubulin mutation, *tba-1(ju89)*, known to alter microtubule function in axon and synapse formation. Determining the molecular identity of the suppressors will help reveal how microtubules are normally regulated in neurons and how disruption of these mechanisms can lead to synapse defects and degeneration. The suppressors compensate for the semi-dominant *ju89* mutation and exhibit a phenotype in between wildtype and *ju89*. Crosses between the standard N2 strain and the polymorphic strain, CB4856, were conducted to isolate worms for

the Snip-SNP analysis. Results indicate that two of the suppressors are located on chromosome 3, and a third suppressor is located on the X chromosome. Experiments with other SNPs are underway to further narrow down the region of these three suppressor genes, and also to determine the location of the remaining suppressors.

Hope and Close Relationships

Author(s): Rishelle Jabury
Mentor(s): Virgil Adams
Institution: CSU, Channel Islands, Camarillo CA

In the last 30 years psychological research on hope has consistently pointed to its benefits. In association with hope, close relationships in the form of social support have been reported to greatly affect an individual's sense of self. Additionally, the idea that close relationships play a large role in concepts of self is well researched in psychology. This present study expands on previous research by exploring the role of close personal relationships on expressed hope. More specifically this study used the Adult Dispositional Hope Scale in a hierarchical regression model to assess the role of close relationships on Hope. Questionnaires were developed and administered over a 3 month period with the current study examining a sub-sample (n = 385). Results supported the hypothesis in that controlling for age, sex, education, marital status, and income, close personal relationships significantly accounted for variance in hope scores. Individuals who indicated that they had close relationships with individuals outside of the family or if they spoke to their families over the telephone tended to have higher levels of hope. The discussion centers on the importance of increasing hope through close relationships and certain types of communication.

Phylogeography of the Bioluminescent Ostracod *Vargula tsujii* (Myodocopida: Cypridinidae) in California

Author(s): Diana M Jacinto, K H Lee
Mentor(s): Elizabeth Torres
Institution: CSU, Los Angeles, Los Angeles CA

Vargula tsujii is a bioluminescent cypridinid ostracod crustacean with a reported range from Baja California to Monterey Bay (Kornicker & Baker 1977). This species nests within a large and diverse clade of bioluminescent signaling species from the Caribbean; no other bioluminescent cypridinids are known from the Pacific Coast of the Americas. *Vargula tsujii* diverged from its Caribbean relatives prior to the emergence of the Isthmus of Panama (2-5 mya). We have collected *V. tsujii* in kelp beds at Santa Catalina Island, the Port of Los Angeles Harbor in San Pedro, and in Mission Bay at San Diego; our attempts to collect it north of Los Angeles have been unsuccessful. We have been unable to locate any published reports of its

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occurrence between Los Angeles and Monterey Bay. In Southern California, haplotype diversity in mtDNA cytochrome oxidase I is moderate, with maximum sequence divergence of 2.86% between samples from San Diego and Los Angeles. There appears to be some genetic structure in the Southern California populations. More intense sampling, especially from deeper waters, might improve our chances of collecting *V. tsujii*. The distribution of the plainfin midshipman fish *Porichthys notatus* (Batrichoididae) that consumes *V. tsujii* for its bioluminescence suggests that *V. tsujii* should still be present north of the Los Angeles region.

Market Liberalization and the Health Sector: The Changing Role of the Indian Government

Author(s): Neha Jaganathan

Mentor(s): James Desveaux

Institution: UC, Los Angeles, Los Angeles CA

India, now considered a rapidly growing economy on the road to development, has long been home to some of the worst conditions of poverty and the highest rates of mortality. Since market liberalization in 1991, it is unclear whether economic growth has had an impact on improving the health of the rural population. In this research paper I will look at how the role of the Indian government in the health sector has changed since the economic reforms of 1991. I predict that the government's role in providing health services has decreased due to the implementation of Structural Adjustment Programs and the rise of other non-state actors which are able to provide the same services more efficiently. I examine government expenditures and programs before and after 1991 and compare them to the resources of private efforts. In addition, I use the state of Kerala as a positive model for government action in health care. It is possible to conclude that while the government is only a marginal provider of health services, there is potential for government involvement in the private sector going forward.

Instruments of Men: The *Femme Fatales* Pro-pagandized Deviant for Social Patriarchal Normality

Author(s): Anthony A Jaime

Mentor(s): Stephen Clifford

Institution: Cerritos Community College, Norwalk CA

An enticing and sinister presence looms over urban Los Angeles, the epicenter of crime and corruption, creating a moral battleground within the confines of its patriarchal society. The *femme fatale* embodies the social and cultural degeneration, following the disillusionment of post-WWI and the Great Depression. Absolved from social institutions of marriage and family, the *femme fatale* serves as a pollutant, a foil to the ideal feminine identity and as

abominable threat to patriarchal order. Within the artifice of Raymond Chandler's *noir* fiction, *The Big Sleep* and *Farewell, My Lovely*, the *femme fatale* serves as a product of patriarchal propaganda, elevated to power, only to be struck down by an agent of masculine authority. As a contemporary moral knight, the hard-boiled Phillip Marlowe is a stand-in for patriarchal order. As such, Marlowe's purpose is to deconstruct the *femme fatale* façade, displacing their power over men and offering them the re-assimilation into their traditional social roles. The figural and existential stand-in for social order, the goodly Anne Rordan in *Farewell, My Lovely*, serves as a foil against these *femme fatales*, reinstating society's feminine ideals. But his moral degeneration, in light of his role as the redeemer, conceptualizes the loss of society's idealism, and more specifically, its control over women. Though *noir* fiction may have originally cast such figures as instruments of men, the *femme fatale* stands more as a transitive figure of feminism who, in her liberated state, destroys the society's patriarchal foundations, garnering both autonomy and power for women that their creator could ever have imagined. Research includes academic studies of *noir* fiction and feminist theory, including Sylvia Harvey's "Woman's Place: The Absent Family of Film Noir," illustrating the *femme fatale's* corruption within patriarchal society, and Janey Place's "Women and Film Noir," undertaking the varying female archetypes within the *noir* setting.

Allergy, Tolerance, and the Problem of Hospitality

Author(s): Agne Jomantaite

Mentor(s): Warren Montag

Institution: Occidental College, Los Angeles CA

The ancient notion of hospitality, stemming from rich philosophical and religious traditions, seems to be largely forgotten in contemporary discourse, except in the narrow economic sense of the "hospitality industry," or tourism. Prompted by the contemporary immigration debates in the United States and the anti-immigration sentiments now felt all over the world, this paper proposes to return to and examine the religious and philosophical concept of hospitality, found particularly in the religious traditions of Judaism and Christianity, and to trace its logical reorganization and development into the modern epoch. In doing so, I address the works of four thinkers—Immanuel Kant, Carl Schmitt, Emmanuel Levinas, and Jacques Derrida—who, I believe, offer some of the most compelling and powerful arguments and analyses of the concept of hospitality. The study investigates the contradictions and tensions inherent in the concept of hospitality itself—between identity and relation, ethics and law—and its relation to other highly-charged biopolitical concepts such as *allergy* and *tolerance*. In this paper, I reconstruct a way of thinking about hospitality and the other, not only as a theoretical reflection but one which could inform the contemporary practices related to immigration.

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Impact of the Teachers + Occidental = Partners in Science (TOPS) Program on High School Student Science Comprehension

Author(s): Anna Jane Jones

Mentor(s): Chris Craney

Institution: Occidental College, Los Angeles CA

This study was designed to examine the extent to which the Teachers + Occidental = Partnership in Science (TOPS) program increased student comprehension of scientific concepts. The TOPS program distributes technology-based laboratory kits to 35 schools in the Los Angeles area. These laboratory kits are designed to reflect California State science content standards in chemistry, physics, and biology. Along with each lab, students also complete a pre and post lab survey consisting of demographic identifiers and four objective multiple-choice questions drawn from release questions that appear on the California Standardized Test to measure comprehension. The pre and post Physics surveys, from the 2009-2010 school year, were analyzed to assess student comprehension over a range of topics. Repeat measures ANOVA for each lab revealed that seven out of eleven labs showed a significant and sizeable increase in pre/post student comprehension scores. The degree of change from pre to post survey was consistent across genders, ethnicities, and attitudes towards science, though the scores themselves varied among schools and demographic subgroups. These results indicate that the TOPS outreach program results in an equitable, positive impact on student comprehension of physics concepts.

Examining the Pathways to Well-Being

Author(s): Natalie Jones

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

Dispositional forgiveness has been described as a tendency to forgive others of transgressions. This trait has been shown to be stable over time and across situations. Previous research has shown that forgiveness is positively associated with gender, self-esteem, and subjective well-being; while negatively associated with depression. The present study extends this work by examining the relationship between dispositional forgiveness, hope, and global well-being. A survey was designed and administered to adults in a large Southern California county over a three month period. This study is based on a sub-sample of the larger survey ($n = 480$). A hierarchical regression model was used to examine the hypothesis that forgiveness would account for variance in global well-being beyond that attributable to demographic factors and self-esteem. Several established scales were utilized: the Adult Dispositional Hope Scale, Rosenberg Self Esteem Scale, and the Delighted-Terrible Scale. The results supported the hypothesis. Forgiveness accounted for variance in well-being beyond

that attributable to age, gender, marital status, self-esteem, and hope. The discussion focuses on the implications for both well-being and forgiveness research.

The Synthesis and Characterization of Ruthenium Terpyridine Complexes: Reactivity with DNA

Author(s): Nicolette M Jonkhoff

Mentor(s): Henry Acquaye

Institution: University of Redlands, Redlands CA

Clinical side effects associated with platinum based anticancer therapies have resulted in the search for novel non-platinum based metal compounds. Among the different metal complexes generating interest, ruthenium complexes have shown great potential as anticancer agents. Ruthenium polypyridyl complexes are among the complexes that have attracted much attention. Ruthenium complexes with the formula *cis* and *trans*-[Ru(Ptterpy)(HPB)Cl] and *cis* and *trans*-[Ru(terpy)(HPB)(OH₂)](PF₆), where Ptterpy = 4'-phenyl-2,2':6',2"-terpyridine and HPB = 2-(2'-hydroxyphenyl)-benzoxazole, have been synthesized and characterized. The reaction of [Ru(Ptterpy)(HPB)(OH₂)](PF₆)₂ and [Ru(terpy)(HPB)(OH₂)](PF₆)₂ with CT - DNA have been studied in phosphate buffer, pH = 7.0. Absorption titration and competitive DNA binding experiments have also been carried out. Preliminary absorption spectral data indicate an interaction between the complexes and CT - DNA.

Developmental Pathways of Anger and Anger Expression in Intimate Relationships

Author(s): Patricia M Jordan

Mentor(s): Jodie Kocur

Institution: California Lutheran University, Thousand Oaks CA

Previous research highlights the importance of parental behavior as a model to children for how anger is experienced and expressed. The purpose of the present research was to address two possible contexts for modeling anger and anger expression in partnered relationships. Subjects included twenty-six undergraduates (21 females and 5 males) at a small, private university who ranged in age from 18 to 26 ($M = 20.5$). Subjects completed the Trait Anger Scale (TAS; Spielberger, 1988) and the Anger Expression Scale (Guerrero, 1994) which includes 4 subscales: aggressive, passive-aggressive, assertive, and avoidant. Students completed these measures regarding their anger in their relationships, the anger they observed their parents experiencing with their partners and also the anger the parent experienced with the student when the student was a child. It was hypothesized that parental anger and expression in both contexts would predict student relationship anger and expression. Results partially

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hypothesis. Mothers' trait anger and passive-aggressive expression with her partner, in addition to her aggressive and passive-aggressive expression with the student were all significantly positively correlated with students' aggressive expression in relationships ($r_s = 0.47, 0.57, 0.54$, and $.063$, respectively). Regarding fathers, fathers' avoidant behavior with their partner was significantly positively correlated with students' aggressive expression in relationships and fathers' assertive expression with the student was significantly positively correlated with students' avoidant behavior in relationships ($r_s = 0.63$ and 0.52 , respectively). No gender differences were found in regard to trait anger; however, in regard to anger expression, males reported significantly greater use of assertive expression than did females ($F(1, 106) = 13.71$). These findings must be interpreted with caution given the small sample size. Findings contribute to the growing body of literature which highlights the importance of parental behavior as a model to children's emotional development.

The Significance of Agency in Experiencing Life Satisfaction

Author(s): Cynthia Jordan-Ramirez

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

Agency is a defining characteristic of our species. One of the primary issues in goal pursuit and attainment is to fulfill three psychological needs including competence, relatedness and autonomy. Hope theory demonstrates that two components of goal directed pursuits are agency and pathway thinking. Two hypotheses were generated for the present study. The first examines whether well-being levels differ between high versus low agency individuals. The second assessed whether agency was more important to global well-being in comparison to pathway thinking. This study surveyed community adults from Southern California which were randomly selected at various public venues in a convenience sample ($n = 1343$; age range 18-91, mean age 36.88; 41% male, 59% female). Hope was measured using two subscales of the Adult Dispositional Hope Scale, agency and pathway thinking. Global well-being was measured using the Delighted-Terrible Scale. Using a median split, the sample was divided into high versus low agency individuals. A comparison of the two groups' well-being found a significant difference, ($F(1, 1341) = 214.11$, $p < 0.001$, $\eta^2 = 0.14$). The respondents in the high agency group reported higher levels of well-being, thus supporting the first hypothesis. The next step was to examine the strength of agency and pathway thinking in the prediction of global well-being. Results of the hierarchical regression model which first control for demographic variables did significantly deviate from zero ($F(7, 1471) = 48.36$, $p < 0.001$, $R^2 = 0.19$). Examination of the standardized coefficients indicated that agency was more important than pathway thinking in accounting for variance in global well-being ($\beta = 0.41, 0.08$, $p < 0.05$) for agency and pathway thinking

respectively). The discussion focuses on the importance of agency in goal pursuit and well-being attainment.

Significance of Electrostatic Properties of M-Cells with Respect to Microparticle Uptake

Author(s): Pamela Jreij, Thejani Rajapaksa, David Lo

Mentor(s): Victor G J Rodgers

Institution: UC, Riverside, Riverside CA

Mucosal membranes cover the surface of respiratory and digestive tracts. They present a protective barrier that prevents the entry of pathogens and foreign microorganisms to the inner interstitial space. Within the epithelium surfaces, M-cells contribute to the transepithelial transport and delivery of antigens from the intestinal lumen to the underlying immune system. Although they present a favorable site for pathogenic viruses and bacteria, the mechanisms behind their interactions remain unknown. While regulating the uptake by the M cells of encapsulated vaccination remains critical for the success of oral mucosal immunization, recent studies have shown that the electrostatic properties of PLGA nanoparticles play a significant role in the uptake process. In our study, we investigated the processes lying behind the interactions between the surface of the M cells and the invading pathogens. The characterization of electrostatic properties of the M cells layers was done through the quantification of their zeta potential. A device was designed to measure the streaming potential under pressure variations. The Helmholtz-Smoluchowski relation was then used to determine the zeta potential. The experiments were done under different ionic strength across targeted and non-targeted M cells. The newly designed device was successfully tested and led to accurate results. The later were then correlated to uptake studies of PLGA nanoparticles and were used to elucidate the significance of M cell electrostatic properties on microparticle uptake for mucosal vaccine therapies.

Effects of Antioxidants from Goji Juice on DNA-Protein Crosslinking via Guanine Oxidation

Author(s): Stephanie Juson, Angelica Marquez

Mentor(s): Eric D A Stemp

Institution: Mount Saint Mary's College, Los Angeles CA

Oxidative damage to DNA can contribute to aging, cancer, neurodegenerative diseases such as Alzheimer's and Parkinson disease, and chronic inflammatory diseases such as arthritis. Oxidative damage is common at guanine (G) because it is the DNA base with the lowest oxidation potential and most vulnerable to oxidative damage. Goji juice is high in antioxidants that help boost the immune system and controls cell growth. Here, we asked whether antioxidants such as goji juice can prevent oxidative damage, and bring the guanine radical back to its original state. We looked at the effects of antioxidants from goji

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juice on DNA protein-crosslinking through the flash quench method, which is used for the 1-electron oxidation of guanine and can induce DNA-protein crosslinking. Crosslinking was detected by the agarose gel shift assay. After flash quench, pUC19 DNA showed a drop in mobility and highly crosslinked DNA remained in the wells. Adding goji juice to the sample made the plasmid run as a single band, even after the flash quench method. Thus, minimal protein crosslinking was observed when goji juice was present. Goji juice holds known antioxidative properties and therefore inhibition of DNA oxidation was expected. The extent of inhibition is comparable to that observed with other juices of polyphenolic antioxidants such as acai and pomegranate juices. Transient absorption spectroscopy experiments on analogous systems suggest that the mechanism involves reduction of the guanine radical by phenolic compounds. Through our research, phenolic compounds were found to prevent oxidative DNA damage, but investigations are still underway to discover the individual phenolic compounds. This study provides evidence for how goji juice can prevent oxidative damage to DNA.

Genome Sizes Measured by Flow Cytometry Differ among Species of *Ceanothus*

Author(s): Daniel J Kaczrowski

Mentor(s): Thomas L Vandergon

Institution: Pepperdine University, Malibu CA

Members of the family Rhamnaceae are dominant within Southern California shrub chaparral. Among these, the genus *Ceanothus* is well represented with up to 44 endemics in California chaparral. This genus is subdivided into two natural clades, the Cerastes and Euceanothus, based on morphological, physiological and genetic characteristics. Research on *Ceanothus* types reveals a high potential for hybridization within each subgenus, but low potential for hybridization between subgenera. Natural hybridization, not readily identifiable in the field, can confound ecophysiological experimentation within this group. Here we present a simple and reliable method for determining genome size in *Ceanothus* with the potential for hybrid detection. The genome sizes of most Rhamnaceae, including *Ceanothus* species, are unknown. We hypothesized that genome size measurement using flow cytometry would yield significant differences between “pure” *Ceanothus* species and would also allow for detection of hybrids. Three *Ceanothus* species from each clade were tested along with nursery samples of two species including putative hybrids. Leaf samples from plants were chopped in Woody Plant Buffer containing 0.25M sucrose, RNase treated and saturated with either propidium iodide or DAPI stain, then filtered through 36 micron mesh nylon. Genome size was determined on a Beckman Coulter Quanta SC-MPL flow cytometer using soy leaves as a genome size standard. Results showed that all tested Cerastes species possessed significantly smaller genome sizes than Euceanothus

species. In addition, there were significant differences in genome size between some species within each clade. Nursery samples yielded significant differences between the putative hybrids and both parent species.

The Influence of the Length of Relationship Between Supervisors and Employees and How Their Feedback Affects Employee Job Satisfaction

Author(s): Samuel A Kahan, Jasetta Rose Kovitch

Mentor(s): Andrea Richards

Institution: Antioch University Los Angeles, Culver City CA

This study, job satisfaction in relation to supervisor feedback, focused on length of time the supervisor and participants worked together and how this factor might interact with the nature of feedback. We hypothesized employees working with employers for a longer period (5-7 years) would have stronger bonds, increasing job satisfaction over employees who worked under bosses for a shorter period (3-7 months). We hypothesized positive feedback would generate higher levels of job satisfaction ratings than negative feedback and negative feedback coming from a long-term boss would generate higher levels of satisfaction than negative feedback coming from a short-term boss. Thirty male and female participants, varying in age and education, completed a mock “Choose Your Own Adventure” questionnaire online, with hypothetical situational descriptions about an interaction with the boss. Then the participant made a response choice, either enhancing or potentially detrimental. After their choice, feedback from the boss was presented. Participants believed their responses influenced the subsequent feedback; in reality, the bosses’ responses were predetermined in order to manipulate the conditions in this study. Following boss feedback, participants rated their job satisfaction on a 9-point scale. Results showed that positive feedback led to higher job satisfaction than negative feedback. There was no significant difference between feedback coming from a long-term boss and feedback coming from a short-term boss. There was, however, an interaction between variables, showing a more dramatic difference in the short-term boss satisfaction ratings between positive and negative feedback, and a less dramatic difference satisfaction ratings for the long-term boss. These findings support research that positive feedback is influential in employee job satisfaction. We believe that the stability of a long-term boss makes reactions less volatile because of the established supervisor/employee relationship. Employees may experience less security with newer supervisors, thus attributing to exaggerated reactions to feedback.

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Towards a Progressive Sierra Leonean Education

Author(s): Yelka W Kamara

Mentor(s): Laura Hebert

Institution: Occidental College, Los Angeles CA

Formal schooling in Sierra Leone turns people towards town life. Because schools are in urban areas, a high proportion of rural to urban migrants are school children. Families face daunting challenges to secure the necessary housing, food, and supervision to ensure the safety and wellbeing of their children. A consequence of this migration is the loss of cultural identity. What we typically describe as brain drain is the end result of the process of deculturalization. Rural education presents an alternative model that changes the physical and cultural dynamic of the schooling experience. Hence, rural schooling reduces the role of formal education in rural-urban migration. This is a study of rural schooling in Sierra Leone via the Dankawalie Secondary School (DSS) in the village of Dankawalie. The research evaluated the effectiveness of rural schooling in meeting the needs of Dankawalie and analyzed the content of the curriculum of DSS in comparison to urban schools. The research includes in-depth, open-ended interviews with pupils, school staff, parents, residents, and community leaders in Dankawalie, Kabala, and Freetown. In comparison to schools in the urban areas DSS has been effective in educating the school aged children in their community, ensuring the safety and wellbeing of children attending the school, and reducing the economic difficulty of education on parents. The school also reduced teenage pregnancy of schoolgirls and the number of children walking on foot to Kabala in pursuit of their education. This has greatly contributed to the social and economic vitality of the village. DSS pupils are learning agricultural skills and cultural practices, indicating the integration of the local economy and culture into their schooling. Nevertheless, some of the shortcomings of the Sierra Leone education system including corporal punishment, sexual misconduct of teachers, and exploitation of the labor of pupils are prevalent at DSS.

Phenology of Burned and Unburned Oaks and Walnuts After Fire

Author(s): Aaron J Kamimura

Mentor(s): Edward G Bobich

Institution: California State Polytechnic University, Pomona, Pomona CA

Plant communities of southern California are adapted to fire and fire frequencies appear to be increasing with the continued increase in urbanization. Thus, it is important to study the effects of fire on the local plant communities, such as oak-walnut woodland. In spring 2008, a wildfire occurred on Westmont Hill in Pomona, CA, burning almost 50% of the vegetation of the oak-walnut woodland on the north slope of the hill. After the fire, the phenology of

burned and unburned coast live oaks (*Quercus agrifolia*) and southern California black walnuts (*Juglans californica*) was studied for two years. It was hypothesized that resprouts from burned oaks and walnuts would have faster growing shoots than those of unburned adults, because they would have more root mass/shoot mass. Resprouts experienced greater stem growth rates than those of unburned adults in spring and summer, with no growth for either resprouts or unburned adults in late fall/early winter. The greatest stem growth rates occurred for all oaks and walnuts in spring 2010 after above-average rainfall. Oak resprouts never produced flowers during the study, whereas several walnut resprouts produced flowers in spring 2010. Almost every unburned adult tree produced flowers and fruits during the study. Resprouts of both oaks and walnuts appear to allocate most biomass to stem length in an effort to reestablish their shoots, whereas adults appear to primarily allocate biomass for reproduction.

Post-fire Adjustments in Xylem Water Transport and Biomechanical Strength in *Heteromeles arbutifolia* Adults, Resprouts, and Artificial Shade and Irrigation Treatments

Author(s): Iolana N Kaneakua, Brett A Bergman

Mentor(s): Stephen D Davis, Frank W Ewers

Institution: Pepperdine University, Malibu CA

Many species of chaparral shrubs of California undergo vigorous resprout success after wildfire. We hypothesized that the water transport properties of resprouts, as well as their biomechanical strength would differ from adults. In addition, we hypothesized that irrigated and shaded resprouts would display reduced cavitation resistance and biomechanical strength in comparison to controls and adults. We tested these hypotheses by using a centrifuge method to compare the vulnerability of xylem to water stress induced cavitation. We used 50% loss in hydraulic conductivity due to water stress (PLC50) as our estimate of vulnerability to cavitation. A Universal Materials Testing Machine (Instron) was used to measure the modulus of rupture (MOR) and modulus of elasticity (MOE) in resprout and adult stems. Our experimental subject was *Heteromeles arbutifolia* (Toyon) that burned in the Malibu wildfire of 21 October 2007. Resprout stems ($n = 6$) were more susceptible to cavitation than adults (resprout PLC50 = -4.2 MPa, ± 0.60 ; adults PLC50 = -5.9 MPa, ± 0.42 P < 0.05), but mechanical strength of resprouts ($n = 12$) was significantly greater than adults (resprout MOR = 357 N/mm², ± 32.3 ; adults MOR = 206 N/mm², ± 15.5 , P < 0.0005). Irrigated resprouts ($n = 6$) had higher susceptibility to cavitation than the shaded resprouts and controls (irrigated PLC50 = -3.66 MPa, +1.49; shade PLC50 = -4.6 MPa, +1.87; control PLC50 = -5.01 MPa, +2.71, P < 0.005), but lower mechanical strength (irrigated MOR = 170.0 N/mm², +60.1, shaded MOR = 179.4 N/mm², +73.2; control MOR = 220.5

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N/mm², +83.3, P < 0.005). We conclude that stems from post-fire resprouts of *H. arbutifolia* are very different in their water transport properties and mechanical strength than stems from adults and that these differences can be modified by artificial irrigation and shading. This pattern probably reflects xylem plasticity that maximizes post-fire stem elongation rates in a competitive post-fire environment.

Stem Cell Pathways in the Hemi-Parkinsonian Brain: Differentiation vs. Neuronal Fusion

Author(s): Michele C Kanemori, Emily Y Kimes

Mentor(s): Kerry Thompson

Institution: Occidental College, Los Angeles CA

Previous research shows that transplanted hematopoietic and mesenchymal stem cells have the capacity to fuse with the cells of the host's central nervous system. Complete cell fusion requires the membranes of the two cells to fuse and share their cytoplasm and nuclei. Generally, fusion is rare, restricted to astrocytes near the site of transplantation or Purkinje cells, and there are no reports of fusion in the brain after transplantation of embryonic stem cells (ESCs). We tested to see if fusion occurred with ESCs transplanted into a model of hemi-Parkinsonism. One year after lesioning the rats with 6-OHDA, a neurotoxin that selectively kills dopaminergic neurons, we transplanted genetically engineered, β -galactosidase-expressing mouse ESCs into the striatum. Ranging from one day to three months after transplantation, we perfused and histologically analyzed brain sections with the techniques of immunofluorescence, confocal microscopy and Transmission Electron Microscopy. We found strong evidence of fusion and partial fusion of ESCs with neurons in the cortex of the transplant site and with Purkinje cells. Our data show β -galactosidase expression in both binucleated cells and in mononucleated cells. The binucleated cells are likely the products of cell fusion, but whether they eventually form stable heterokaryon is yet to be determined. Some mononucleated cells are likely differentiated stem cells, but our data suggest that many result from partial cell fusion, a transient process that results in a transfer of cytoplasmic molecules, including β -galactosidase. Our finding of neuronal cell fusion in the cortex has never been reported before and has important implications in the interpretation of published transplantation studies. Cells may be presumed to have undergone differentiation when there may have been fusion or partial fusion. Distinction between stem cell differentiation and fusion following transplantation needs further study to fully understand the potential and limitations of stem cell therapy.

Quantifying Anthropogenic and Bogenic Semi-volatile Organic Compounds in the L.A. Basin

Author(s): James Elliot Karz, Theodore Nguyen, Kylee Chang, Nick Sadrpour

Mentor(s): Nicole C. Bouvier-Brown

Institution: Loyola Marymount University, Los Angeles CA

CalNex 2010 was one of the largest, most comprehensive studies pertaining to the interaction of air quality and climate change over California to date. In collaboration with the CalNex L.A. team based in Pasadena, from 24 May – 15 June, 2010, we collected ambient air samples, focusing primarily on semi-volatile organic compounds. We collected approximately 40 ambient air samples with sampling times ranging from 3-24 hours. Initially, we detected more than 125 compounds; our analysis began with a smaller subset of 32. Of these, 23 were positively identified and at least 7 are biogenic. These organic compounds were concentrated in the field onto the solid adsorbent HayeSep Q and extracted in the laboratory at Loyola Marymount University. The data were analyzed using a Varian CP-3800 gas chromatograph with a Saturn 2200 ion trap mass spectrometer. The results of our study compare diurnal profiles, illustrate possible correlations, and discuss sources of selected compounds.

O-Alkylation of Vanillin and Hydroxybenzaldehydes

Author(s): Brian Kasper, Jose Medina, Robert Tincher, Sameh Helmy

Mentor(s): Phil Hampton

Institution: CSU, Channel Islands, Camarillo CA

Studies have shown that curcumin has a potential for the treatment of diseases ranging from some cancers to Alzheimer's disease. However, curcumin exhibits a very hydrophobic nature and thus results in poor bioavailability. A new synthetic approach to curcumin and curcumin analogues utilizes O-(N,N-dialkylaminoethyl)-substituted vanillin and hydroxybenzaldehydes as starting materials. This research describes the synthesis of these derivatives with the goal of optimizing the yield and purity of the product. Previously, there have been no yields reported for these versatile molecules. In our hands, yields as high as 90% have been attained by the appropriate selection of reaction conditions.

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A Long Shot: Deep Focus and Color in *Rear Window*

Author(s): Anne M Kelly

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

From the 1930s to the 1950s, the words “In Technicolor” were box office gold. As the only quality color film process available, Technicolor dominated the industry for three decades, using its power to develop a “Technicolor style” that ensured that the process was being used to the company’s best advantage. However, in 1952 – the same year Technicolor peaked in production – Eastman Kodak developed one-strip color film stock, which gave directors the freedom to use color cheaply, and without the strictures of the Technicolor style. In my thesis, I analyze *Rear Window* as a film that captures the transition from Technicolor to Eastmancolor. I argue that while Eastmancolor stock was used for practical reasons to do with Technicolor’s inability to capture deep focus, the color design of the film still predominantly draws from the Technicolor style. The technical and design choices in *Rear Window* show that while technology can change overnight, aesthetic movements are slower to change. My research consists of historical analysis as well as textual analysis of the film. I use Russell Merritt’s essay “Crying in Color,” and Richard Allen’s essay “Hitchcock’s Color Design” to discuss the historical and design elements of the film. I also use Natalie Kalmus’s “Color Consciousness,” which was the cornerstone of Technicolor’s color theory. I analyze the mise en scène of key scenes in the film and explain how these designs are different from and similar to the older Technicolor style. From *Rear Window* I show the developments of Eastmancolor that ultimately doomed Technicolor. However, even though Technicolor as a company was finished, its color legacy continues. As we make a similar transition from film to digital, understanding the past can help us interpret and identify new emerging aesthetic trends.

Abu Ghraib: Degrading and Torturing the Feminized Other

Author(s): Kaitlin F Kelly

Mentor(s): Malek Moazzam-Doulat

Institution: Occidental College, Los Angeles CA

My research examined the sexual abuse of male detainees perpetrated by United States military personnel at Abu Ghraib detention center and the context surrounding these events. Though many have seen the photographs of hooded men, forced simulated sex acts and grotesque human pyramids, they are but a title page of an entire book of abuse perpetrated. Using military personnel interviews and first hand detainee accounts collected by the Red Cross, as well as legal memos, I was able to more fully understand the immediate historical and social context

surrounding these events. The sexual torture present at Abu Ghraib was deeply informed by historical precedent, in Nazi Germany and the Algerian French War. By utilizing second wave feminist critique, philosophical theory, masculinity and queer theory, and Orientalist literature I was able to understand why feminization of the victims is a central locus of power in sexual torture. Sex is seen as a core aspect of our identity thus to exploit this core is an efficient mode of eliciting information and dominating the Other. Sexual torture is horrifying as it forces one to face their own fragility and vulnerability, attacking the most susceptible core of identity, and annihilates it through extreme pain and humiliation. This experience is utterly world destroying, causing a loss of self, identity, and most painfully, voice. Following such a decimating loss, the true horrors cannot be described accurately, to their full extent. Torture devastates absolutely, yet its true magnitude may lie in its inherent lack of comprehensibility.

Approximating Derivatives Using Taylor Series and Vandermonde Matrices

Author(s): Darlena Kern

Mentor(s): David Strong

Institution: Pepperdine University, Malibu CA

A basic numerical analysis problem is that given any n distinct values of a function f , we can approximate the k^{th} derivative $f^{(k)}(a)$ for $k = 0, 1, 2, \dots, n-1$ for any a (assuming f is $n-1$ times differentiable at a). We consider this problem and find the resulting formulae in the general case. In the past, one of the matrices used in solving this problem was defined recursively, which was expensive and more importantly meant that to find a single column of that matrix (which is what is often desired), one had to find the entire matrix up to that column. We have devised and implemented an efficient algorithm which allows for explicitly finding individual entries of this matrix, which then allows us to find a single column of the matrix. Our work depends on certain properties of Vandermonde Matrices, and extends work published in a NASA technical paper in the mid 1960s.

Life on the Toad - Street Children in Pakistan

Author(s): Afshin Khan

Mentor(s): Isabel Balseiro

Institution: Pomona College, Claremont CA

Approximately 1.2 million children roam the streets of Pakistan doing menial jobs such as cleaning windscreens of cars on road intersections, selling newspapers, magazines, and flower bouquets. Children are turning to the streets amidst increasing poverty, unemployment, swelling family size and social disintegration seen in abuse in schools, as well as domestic violence, neglect and family breakdown. Undoubtedly, they have become the country’s

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largest and most ostracized social group. ‘Life on the road’ is a documentary that explores the life of these children on the streets of Karachi, at major road intersections, and in narrow lanes where they pick up garbage. The documentary explores the topic of class disparity that is very much prevalent even in a developing country like Pakistan. Most of these children run after cars barefooted to sell their products or services. Some are cursed while others are physically abused. Street children are easy prey for those who feed on their innocence. STDs, sexual abuse, sickness, stress and weakness are some of the common complaints. Having learned life lessons at a tender age, most of them realize the importance of education and some have managed to continue their pursuit of knowledge while at the same time contributing financially to their families and households. There are some who appear hopeless and imagine living and earning in the same way all their lives. Resources for this vulnerable sector of society are poor especially since about 47% of Pakistanis live below the poverty line. As Pakistan deals with political turmoil, natural disasters and other calamities, more children and people will turn towards the streets.

Synthesis of Polythiophene Nanofibers for Thin Films Using the Initiator-Assisted Oxidative Polymerization

Author(s): Pwint P Khine, Julio M D'Arcy

Mentor(s): Richard B Kaner

Institution: UC, Los Angeles, Los Angeles CA

One-dimensional (1-D) nanostructures of conjugated polymers are the focus of intensive research due to their enormous potential towards applications in organic electronics. Among the conjugated polymers, polythiophene (PT) is widely studied because of its uses in chemical sensors and solar cells. A vast literature exists on the shaping of PT into nanostructures; however, current synthetic strategies suffer from amorphous morphologies and a low yield. On the other hand, our initiator-assisted polymerization successfully synthesizes bulk quantities of nanofibers by the introduction of an initiator which accelerates the kinetic of polymerization and leads to a network of interconnected 1-D nanofibers. The purpose of this study is to synthesize bulk quantities of conductive PT nanofibers via an initiator-assisted polymerization under different chemical and physical conditions in order to produce freestanding thin-films. We have found that the type of solvent, reaction time, and temperature used *in-situ* control the conductivity of the polymer while morphology is tailored by the chemical structure of the initiator. To produce a thin, uniform, and transparent PT film, we have developed a method for depositing nanofibers on a variety of substrates, such as glass, ITO, and mica. Typically, a monolayer of nanofibers is deposited at the interface of water and oil by means of an interfacial surface tension gradient. A thin-film is characterized by scanning electron microscope (SEM) to study morphology,

ultraviolet-visible light spectroscopy (UV-vis) to investigate chemical structure, and cyclic voltammetry (CV) to analyze electrochemical properties. Our results show a high yield of PT nanofibers, thin-film deposition at the water-oil interface, and a novel technology for fabricating freestanding films of PT nanofibers.

Reconstitution of High Density Lipoprotein Containing a Polipoprotein E Receptor-Binding Domain May Serve as a Potential Nanovehicle for an Antioxidant

Author(s): Darin Khumsupan

Mentor(s): Vasanthy Narayanaswami

Institution: CSU, Long Beach, Long Beach CA

High-density lipoproteins (HDL) are lipid-protein complexes that play a role in plasma cholesterol transportation in the body. A sub-fraction of HDL contains apolipoprotein E (apoE), which plays a significant role in plasma cholesterol homeostasis. The N-terminal (NT) domain of apoE has the ability to bind lipoprotein receptors, which allows it to mediate binding and uptake of lipoprotein complexes at the cell surface. The objective of this study is to employ reconstituted HDL containing the NT domain of human apoE3 as a vehicle to transport and deliver piperine to target sites. Piperine is an alkaloid possessing anti-inflammatory, antioxidant, and antitumor abilities. Recombinant human apoE3-NT domain was over-expressed, isolated, and purified using a bacterial expression system. HDL was prepared by reconstituting dimyristoylphosphatidylcholine with human apoE3-NT in the presence and the absence of piperine. HDL was separated from protein-free lipid vesicles and lipid-free protein by gel filtration chromatography. Fluorescence spectral analysis of the reconstituted HDL (rHDL) was carried out by taking advantage of the innate fluorescence properties of piperine. Our observations indicate that piperine has partitioned into the hydrophobic milieu of the phospholipid bilayer of HDL. This was confirmed by the blue-shift in the wavelength of maximal fluorescence emission. We propose that HDL containing apoE-NT may serve as a potential ‘nanovehicle’ for transporting piperine to target sites.

California Rainfall: No Trend, but Large Inter-annual and Decadal Variability

Author(s): Daniel Killam, Ann Bui

Mentor(s): William Patzert

Institution: University of Southern California, Los Angeles CA

Being a coastal state, California exhibits a highly diverse range of climates from extreme desert to alpine forest to tundra. These regional climates have unique responses to Pacific Ocean dynamics such as the Pacific Decadal Oscil-

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lation (PDO) and El Niño Southern Oscillation (ENSO), as well as the varied geography of California itself. Over the 20th century, studies have shown a long-term positive trend in global temperatures due to anthropogenic greenhouse gas emissions and land use changes. Our objective was to determine if this rise in temperature has had an impact on California's precipitation. Looking at daily data from 1925 to present over 15 stations covering a wide range of climate types, we found increased precipitation in the Northern areas of the state and a lack of change or decline in the South, though these trends lacked statistical significance. We also found increases in moderate to heavy rainfall at some stations, but these findings were also not statistically significant. We observed a large natural variability in precipitation associated with Pacific-wide cycles such as the PDO and ENSO mentioned above. PDO and ENSO affect different regions of California in unique ways, and the two oscillations interact with each other to produce additional levels of variability. The past century's rain data doesn't reveal any trends that can be used to forecast future California coastal rainfall. Nonetheless, we caution that there is an inherent uncertainty associated with California precipitation due to future climate change and that this is a grave concern for future water security and management.

High Precision Tiltmeter Data Acquisition and Control System

Author(s): Caroline H Kim

Mentor(s): Riccardo DeSalvo, Vladimir Dergachev

Institution: California Institute of Technology,
Pasadena CA

The tiltmeter is a high sensitivity ground rotation sensor, built with a 1kg arm balanced on a knife-edge. There is noise present in tiltmeter measurements, and intrinsic noise such as 1/f noise at sub-Hz frequencies has been a challenge. To aid the tiltmeter development, the tiltmeter position is controlled and read out electronically by its own data acquisition and control system which comprise analog preamplifiers and drivers, data converter electronics, and computer-based controls. The data acquisition system can operate stably over the sensitivity of six orders of magnitude and at the highest frequency range, our sensitivity is 1e-9rad/sqrt(Hz).

Fate, Transport and Removal on Nano-TiO₂ in Porous Media: Role of Solution Chemistry and Natural Organic Matter

Author(s): James M Kim

Mentor(s): Sharon Walker

Institution: UC, Riverside, Riverside CA

The development of nanotechnology has substantially influenced the production of nanomaterial-based products

in most factories and industries. Nanomaterials provide alternative solutions for future technological advancement such as energy, consumer products, information technology, electronic devices, and environmental applications. As nanotechnology continues to expand, more nanomaterial-based products are released in the environment; therefore, this demands the investigation of the fate, transport and removal of these nanoparticles. The experimental parameters that are involved in this study simulate nanomaterial suspension in aquatic and engineered environments. TiO₂ has been selected as a model nanoparticle because it is widely used in most consumer products and environmental applications. Monovalent and divalent salts ranging between 1 and 10mM are used to suspend the TiO₂. Suwannee River Humic Acid (SRHA) is a well-characterized natural organic matter and is used in the experiments as well to simulate the organics typically present in natural waters. Our hypothesis is that the solution chemistry and the presence of SRHA will control the transport and removal of TiO₂. Transport studies have been conducted using a packed bed column to understand the fate and removal mechanisms of nanomaterials through porous media. Preliminary results indicate that both the solution chemistry and SRHA significantly affect the transport of TiO₂. Increasing the concentration of the salts hindered the transport of the nanoparticles through the column; however, the injection of SRHA resulted the opposite, actually increasing the elution of TiO₂. To further understand the surface properties of these nanoparticles, extensive characterization experiments such as sedimentation, aggregation and zeta potential have also been performed with and without the presence of SRHA. These results will improve our ability to predict the fate and transport of these harmful nanoparticles and provide more insight as to how they can be removed from both natural and engineered environments.

cis-Regulatory Analysis of SpHex

Author(s): Laura Kim

Mentor(s): Qiang Tu

Institution: California Institute of Technology,
Pasadena CA

The skeletogenic micromere (SM) lineage of the sea urchin has been the subject of many research projects, as it is a good model system for studying specification and differentiation of embryonic cell lineages. The developmental process is regulated by regulatory genes, which are functionally linked by cis-regulatory elements. We focus on *hex* of *Strongylocentrotus purpuratus*, which is expressed in the SM cells at 24-hours post fertilization, and we report our analysis to identify the cis-regulatory module of *hex*. In an attempt to narrow down the range of the cis-regulatory module, we first knocked in a GFP reporter into the reading frame of *hex* in BAC 6P7 so that the BAC shows the same spatial and temporal expression pattern as the endogenous *hex*. Then we amplified short

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and long fragments from the GFP knock-in BAC 6P7 and tested their ability to derive the correct *hex* expression using different procedures for short and long fragments. We fused the short fragments with the gataE basal promoter, GFP reporter and various tag sequences. Using the multiplex tag screening system, we injected multiple short constructs at a time and determined their activity level by measuring the prevalence of tag sequences. On the other hand, the long fragments were amplified around the GFP and the *hex* endogenous basal promoter and injected individually to look for domain specific expression at 24-hours post fertilization under the microscope. Our experimental analysis narrows the range of the *cis*-regulatory module of *hex* to 15kb. Furthermore, our study provides prerequisite information for further experimentation to identify transcription factor binding sites of the *cis*-regulatory module of *hex*.

Acknowledging Cultural Diversity: “Glocalization Approach” in International Advertising

Author(s): Pulum Kim

Mentor(s): Lewis Long

Institution: Irvine Valley College, Irvine CA

As multinational corporations (MNCs) advertise across the globe, standardizing of advertisements through the strategy of designing a single advertising campaign for various markets has become an issue. This approach attracts MNCs by promising reduced economic costs and readily identifiable global image. Experts of communication and linguistics often criticize standardization for rendering advertisements ineffective by overlooking cultural dynamics and the sophistications of linguistic diversity. Through analyzing the data collected from papers published in journals, such as *The Journal of Advertisements*, *International Marketing Review*, *The Translator and more*, written on advertising practices, management, communication, cultural studies, linguistics, and case studies, this study identifies the problems of standardizing and recommends “glocalization” as an alternative advertising method. While standardization approach assumes cultural homogenization, substantial evidence from case studies proves otherwise: cultural diversity exists and linguistic barriers are still powerful that effective cross-cultural communication is difficult without adapting to local signification systems. As the ultimate goal of advertising is to sell products, reducing advertising costs at the expense of communicative effectiveness and sales is not lucrative. Researchers claim that although messages of appeal may be uniform, the mechanisms of appealing across markets must not be identical, suggesting that companies should globalize messages and localize the delivery process. Unlike standardization, which imposes values specific to one country in a globally distributed message, “globalization” uses thorough cultural analysis of target markets to develop a message that contains values appropriate to all markets. However, the execution—the

advertisement design details—must be localized to reflect individual cultures. The findings from comparing successful and unsuccessful cross-cultural MNC advertising campaigns show that “glocalization”—an approach combining the globalization of creative strategy with the localization of the execution process—constitutes the most promising marketing technique for MNCs. Multi-national corporations should acknowledge the cultural diversity across the globe and choose to “glocalize.”

Social Outcasts: Divorce as a Case Study for Gender Inequality in South Korea

Author(s): Soo Jin Kim

Mentor(s): Laura Hebert

Institution: Occidental College, Los Angeles CA

South Korea, though hailed as a modern country, is still under the influence of Confucian teachings and traditions. Confucianism placed emphasis on a patriarchal society, leading to gender inequality becoming an implicitly accepted practice. It also advocated towards placing the wellbeing of the family before the individual, which made divorce a taboo topic until very recently. Taking these two issues (gender inequality and divorce) into consideration, I became interested in divorce as a case study for gender inequality. My study placed emphasis on the social stigmatization of divorced women compared to divorced men in Korean society, and how this related to the theme of gender inequality. My field research in South Korea focused around answering five key questions: (1) Which variables are most likely to lead to divorce in Korea? (2) How are women divorcees treated in Korean society? (3) What are social organizations doing to help empower these women by promoting women's legal, economic, and social status? (4) How successful are the organizations (evaluated by the changes they bring for both their clients' welfare and social welfare)? (5) How does divorce link to the broader topic of gender inequality in Korea? The research was based upon interviews and questionnaires conducted with women seeking divorce, women divorcees, women working for social organizations geared towards helping women divorcees and women seeking divorce, and a government sponsored researcher studying gender inequality in Korea. Although the general literature researched did show a move towards gender inequality, my research indicated that gender inequality remains prevalent in Korean society. There are signs of inequality in regards to divorced women's economic, legal, and social status when compared with divorced men, as revealed by wage differences, patriarchal laws, and stigmatization. Though there are efforts to create a more gender equal society, divorced women are continuously marginalized.

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Reactions of 1,4-Naphthoquinones with Nucleophiles

Author(s): Tiffany Kim

Mentor(s): Tetsuo Otsuki

Institution: Occidental College, Los Angeles CA

Several derivatives of 1,4-naphthoquinones such as vitamin K₃ (2-methyl-1,4-naphthoquinone) have been reported to show antitumor and anticancer effects. For example, the anticancer activities in protein tyrosine phosphatase (PTP) are due to the reactivity of electrophilic 1,4-naphthoquinones with nucleophilic cysteine residue in the active site. This covalent modification of nucleophilic cysteine residue by 1,4-naphthoquinones through a conjugate addition accounts for the pharmacological, anticancer properties of vitamin K. We study the reactions of 2-alkylthio-3-methyl-1,4-naphthoquinones against nucleophiles such as amines and thiols, the important nucleophiles in the biological environment. First, we synthesized 2-alkylthio-3-methyl-1,4-naphthoquinone from the reaction of 2-methyl-1,4-naphthoquinone epoxide with various alkanethiols in the presence of N-methylimidazole, a weak base. Depending upon the strength of the base to generate thiolate anions, the secondary product can also be formed. Then we further reacted 2-alkylthio-3-methyl-1,4-naphthoquinone with a variety of alkylamines. The alkanethiols studied were methanethiol, ethanethiol, 1-propanethiol, and 2-propanethiol, and the alkylamines studied were methylamine, ethylamine, isopropylamine, and tert-butylamine. The resulting product is 2-alkylamino-3-alkylthio-1,4-naphthoquinone through a demethylation reaction. In the presence of oxygen, a side product, 2-alkylthio-3-methyl-1,4-naphthoquinone epoxide, was also efficiently formed. However, in the reactions under argon atmosphere, the formation of the epoxide product was completely excluded, and only 2-alkylamino-3-alkylthio-1,4-naphthoquinone is detected. Therefore we can conclude that oxygen is a necessary component for the formation of epoxide ring.

Kiss-and-Tell: Transgenes Reveal Embryonic Stem Cell Promiscuity

Author(s): Emily Y Kimes, Michele C Kanemori

Mentor(s): Kerry Thompson

Institution: Occidental College, Los Angeles CA

The central nervous system (CNS) has limited ability to self repair. Diseases with focal neuronal loss such as Parkinson's disease are prime candidates for cell-replacement therapy. Developing transplant strategies using potentially therapeutic embryonic stem cells (ESC) may lead to new therapeutic avenues. We have genetically modified neurogenic ESC to produce dopamine in the presence of L-DOPA. These cells are also engineered to produce the reporter molecule β -galactosidase (β -gal). Cells (150,000 cells delivered at each 3 sites) were targeted to the lesioned

striatum in 6-OHDA lesioned rats. β -gal expressing cells were evaluated in brain sections at timepoints ranging from 3 days to 3 months after transplantation using light microscopy and transmission electron microscopy (TEM). In the first week transplanted cells were prominent at the injection site, however by one month we found that β -gal-positive cells had dispersed into multiple brain regions including the cortex, midbrain, brainstem, and cerebellum. In the cerebellum there was prominent staining of the highly fusionogenic Purkinje cells. To address whether the β -gal positive neurons were differentiated stem cells or whether they were products of fusion between host and transplanted cells, we focused our analysis on the Purkinje cells using a combination of histochemical staining and TEM. We found that 85% of the Purkinje cells carried the transgene but were mononucleated. We propose that our data are consistent with partial cell fusion produced by transient contact of stem cells with the host neurons leading to a sharing of cytoplasm which has been previously reported. This is the first report of extensive fusion by ESC derivatives in the CNS and may suggest that transient cell fusion can occur at a previously unappreciated rate. This issue will need to be thoroughly explored to fully understand the potential benefits, and the limitations, of stem cell therapies for the central nervous system.

Wildfires and the Metapopulation Dynamics of Saproxylic Lichens

Author(s): Sung Woo Koh, Stephanie Levins

Mentor(s): Stephen Adolph

Institution: Harvey Mudd College, Claremont CA

Lichens are symbiotic organisms composed of a fungus and an alga or cyanobacterium. They are found in a variety of habitats including rocks, soil, and wood, and can be key ecological components in the colonization of barren land. Our project goal was to create a mathematical model for the metapopulation dynamics of saproxylic (dead wood-dependent) lichens, specifically the recently discovered *Lecanora munzii*, in relation to wildfire frequency. By studying the geographical distribution pattern of a rare species such as *L. munzii*, we hope to better understand the ecology of saproxylic organisms and perhaps contribute to conservation efforts of such lichens. We conducted field surveys for *L. munzii* in 15 locations with varied burn history in the Greater Los Angeles Area. At each site, we searched for *L. munzii* on the dead wood of shrubs, particularly *Artemisia californica*, which is known to be the predominant habitat for *L. munzii*. We used hand lenses to identify lichens in the field, and light microscopy to confirm identification of some collected samples. We found *L. munzii* in only one site, the Claremont Colleges' Robert J. Bernard Field Station, where the lichen was first discovered. Our survey results indicate that *L. munzii* has a patchy spatial distribution, and therefore can be modeled as a metapopulation. We developed a 3-stage metapopulation model that relates young shrubs, old shrubs, and

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old shrubs that are colonized with *L. munzii*. The model consists of 3 nonlinear differential equations that describe changes in the proportion of each stage. The model has two equilibria, one in which *L. munzii* goes extinct and another where *L. munzii* persists. Upon further analysis, we found that the lichen metapopulation can persist when shrub maturation and lichen colonization rates are high, but the metapopulation is driven to extinction by high burn and/or extinction rates.

Synthesis and the Crystal Structures of Schiff-Base Copper Complexes: Hydrolysis of Phosphodiester Bonds

Author(s): Natalia Kozlyuk, Brandon Piasecki

Mentor(s): Henry Acquaye

Institution: University of Redlands, Redlands CA

Hydrolysis of phosphodiester bonds in DNA could result in DNA cleavage. Metal complexes imitating hydrolysis provide insight into the mechanism of the hydrolysis process and also serve as possible chemotherapeutic anti cancer agents. A number of Schiff-Base ligands have been synthesized. The ligands have been reacted with different copper salts to produce the corresponding Schiff-Base copper complexes. The complexes have been characterized via Infrared and UV-Vis spectroscopy. The crystal structures of two of the complexes have also been determined. Preliminary results of the reactions of the complexes with BNPP and the structural characteristics of the complexes will be presented.

Ancient Grace: Charis as the Basis for Ancient Greek Sociality

Author(s): Lisa A Kraege

Mentor(s): Damian Stocking

Institution: Occidental College, Los Angeles CA

“Charis” is an ancient Greek concept that roughly translates as “grace.” However, its implications extend far beyond the confines of the word itself. It played a crucial role in the canon of Greek literature, appearing at pivotal moments in the works of Homer, Hesiod, Sappho, Pindar, Sophocles, Aeschylus, Euripedes and beyond. These incidences led me to my research question: why did charis and its mythological complement the three Charities, or three Graces, have such profound importance in the ancient Greek psyche? My research investigates charis as it appears in the literature, and attempts to understand charis holistically, as a key to understanding Greek sociality. However, the definition and meaning of charis necessarily changes depending on its usages. It at once implies a generosity of giving *and* a sense of gratitude upon receiving. This fact led many Classicists to establish charis as an *exchange*, working within the framework of economic societies of “total-services” as put forth by Marcel Mauss. I argue

that such applications ignore one primary tenet of charis: erotic allure. Charis is very often associated with pleasure, charm and loveliness, feelings that usually subsume the subject out of systems of total-services rather than into it, as Maussian interpretations suggest. Using the work of Georges Bataille’s theories of expenditure, this paper establishes that charis defined sociality by its conditions of expenditure and excess, that Greek sociality was forged by the intimacy of an openhearted willingness to exchange excessively, giving, receiving, and loving infinitely.

Regulating Emotion: Is Gender a Significant Predictor of Emotional Suppression?

Author(s): Hannah E Krebs

Mentor(s): Faye L Wachs

Institution: California State Polytechnic University, Pomona, Pomona CA

Emotional suppression involves the hiding of feelings, which has been known to cause long-term adverse physical and psychological health effects in individuals who habitually engage in its practice. This study examined gender differences in the use of the emotion regulation techniques of suppression and reappraisal among achievement oriented individuals. These gender differences were analyzed due to empirical support from studies which suggest disparity between men and women in professional settings, and distinctions in observed neurological reactions to emotional stimulus. Hierachal linear regression was utilized to determine whether there were significant relationships between measures. Gender was not a significant predictor of whether or not individuals chose reappraisal as their method of emotion regulation ($\Delta R^2 = 0.001, ns$). Being male, however, was a significant indicator of whether or not individuals chose suppression as a primary emotion regulation technique ($\Delta R^2 = 0.065, p < 0.01$). Such results indicate that males may be at a higher risk for suffering the adverse health effects which accompany habitual suppression. Further study is warranted in order to more comprehensively understand the social and neurological processes which may contribute to this practice of emotional suppression among males.

The Relationship between Perfectionism and Academic Cheating

Author(s): Christina R Krone

Mentor(s): Lisa Bauer, Steven Rouse

Institution: Pepperdine University, Malibu CA

The 2007 Teen Ethics Survey reported that 71% of teens feel fully prepared to make ethical decisions in the workplace, yet 40% believe that lying, cheating, plagiarizing, and even violence are sometimes necessary to succeed in school. Of teens that think cheating is acceptable on some level, a personal desire to succeed was cited as the primary jus-

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tification 54% of the time. As cheating continues to be on the rise, possible explanations for motives behind cheating behaviors must be evaluated if the current situation of academic dishonesty has any hope of being remedied. The present study examines the ability of the three types of perfectionism (self-oriented, socially-prescribed, other-oriented) to predict engagement in academic dishonesty. Participants completed three questionnaires measuring their levels of perfectionism (Multidimensional Perfectionism Scale; Hewitt & Flett, 1991), frequency and recency of academic cheating, and demographic information. Ninety-eight percent of the population studied admitted to engaging in dishonest academic behaviors at some point during their life. Additional results will be discussed in terms of the relationship between type of perfectionism and the amount of academic cheating. A better understanding of the factors that motivate students to cheat could lead to the development of support techniques or programs at colleges to help equip students with adaptive coping strategies and ultimately impact the alarming rise in academic cheating.

The Effects of Ethanol on Phosphatidylethanolamine Membranes

Author(s): Kamini Kuchinad

Mentor(s): Phoebe Dea

Institution: Occidental College, Los Angeles CA

As a result of strong hydrogen bonding between the head groups and a relatively small head group size, 1,2-dihexadecanoyl-sn-glycero-3-phosphoethanolamine (DPPE) does not naturally interdigitate. To determine if DPPE interdigitates in the presence of high concentrations of ethanol, differential scanning calorimetry (DSC) was used to study the thermotropic phase behavior of the lipid. In DSC thermograms, interdigitation manifests itself in three ways: an increase in the main transition temperature (T_m) hysteresis, the presence of a biphasic effect, and an increase in the main transition enthalpy. With the addition of ethanol, the hysteresis of DPPE, or the difference between the T_m of the heating and cooling scans, drastically increases above the threshold concentration for interdigitation. Similarly, within the heating scans, the T_m decreases below and increases above the threshold concentration, indicating a biphasic effect. Furthermore, the main transition enthalpy greatly increases above the threshold concentration. These characteristics suggest that high concentrations of ethanol may induce interdigitation in DPPE membranes.

It's Mine! The Role of Entitlement and Birth Order

Author(s): Carrie A Kudlinski

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

Birth order became one of the first constructs to be studied in the field of psychology when it was examined by Francis Galton in 1874. Since then, a copious amount of research has been conducted on the topic of birth order and its differential effects on intelligence, personality, and achievement. Although it remains controversial as to whether or not birth order has an effect, one study in particular found that first-borns tend to relate better to their parents and society at large whereas last-borns tend to be more rebellious. The current study builds on this research by examining birth order in relation to one's sense of entitlement. Entitlement was operationally defined as consisting of parental obligation (feeling one's parents are obligated to take care of them), social responsibility (a deliberate implied commitment toward the good of society), and spoildness (behavior associated with being overindulged as a child or infant). An analysis was done for a sample of community dwelling adults from Southern California who completed the Quality of Life Survey ($n = 1,080$). It was hypothesized that last-born individuals would have greater entitlement than first-born individuals. Results showed that there was no significant difference in entitlement in terms of birth order; however those individuals raised as only children had significantly less social responsibility and greater spoildness than all ranked birth orders. The determining factor in entitlement was not one's birth order rank, but whether or not one had siblings. The discussion focuses on the presence of siblings (or lack of siblings) and entitlement.

Silk Genes in Atypoid Spiders

Author(s): Amanda B Kuelbs, James Starrett

Mentor(s): Cheryl Hayashi

Institution: UC, Riverside, Riverside CA

Silk is vital to the ecology of spiders and is implemented for an array of different purposes, such as reproduction, prey capture, dispersal, and shelter. In addition to having so many uses for silk, spiders are adept at constructing very diverse web architectures. Spider silks are mostly made of proteins called spidroins, but spidroins from most spider species have not yet been identified. Most silk related research has centered on araneomorph spiders (true spiders), which include spiders that build orb-webs, and there is much knowledge about their silk proteins. In contrast, very few studies have been conducted on the silks of mygalomorph spiders (tarantulas, trapdoor spiders, and their relatives). In this study, we compared the evolutionary relationships of spidroin genes from four species of the mygalomorph clade, Atypoidea. These species were chosen because they build a variety of web types: *Megahuxura ful-*

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va (sheet web), *Sphodros rufipes* (purse web), *Antrodiaetus riversi* (turret web), and *Aphonopelma seemanni* (burrow web). To compare the silk genes that encode the spidroins used by these species, we generated cDNA libraries from the silk glands and screened the library for silk gene transcripts. The transcripts that were found in the atypoids differed among species and were unlike the araneomorph spidroins. By analyzing the evolutionary relationships of the spidroins and determining the molecular composition of their silks, we will move closer toward understanding the genetics of functionally different silks. This research will also assist biotechnologists in creating new silk-based materials to improve human welfare.

A Comparison between Woven and Unidirectional Ply Fiber Reinforced Composites

Author(s): Ravin Kumar

Mentor(s): Mehrdad Hagh

Institution: California State Polytechnic University, Pomona, Pomona CA

Composites are an increasingly important class of engineering materials, and are beginning to replace traditional materials in many applications. Cutting edge projects, such as Tesla's electric sports car and Boeing's flagship 787 Dreamliner, extensively use composite material in their designs. However the physical properties of composites still aren't completely understood because of the complexity of their internal structure. Traditional materials such as steel are uniform, meaning the material is exactly the same throughout. Composites, however, are created from two or more materials. As a result, the details of the interactions of the materials within the finished part can significantly alter the physical properties of the part. Some of the factors that affect the performance of a composite include fiber type, fiber weave, epoxy type, and manufacturing process. This project explores the effect of weaving the fibers on the properties of the composite. Two sets of composite specimens are manufactured and tested. Both sets are made from the same fibers in the same orientations, have the same matrix, and have the same fiber volume fraction. The only difference between the two sets of specimens is that the first set is made of woven fiber cloth, while the second is made of alternating plies of unidirectional fibers. The carbon fiber tensile specimens were manufactured using a standard vacuum infusion process. Standard tensile specimens were tested to determine the effect of fiber configuration on the composite's elastic modulus (E), strength (Ksi), Weibull modulus and failure mechanisms. Differences were found in all three measures favoring the unidirectional plies. However the woven plies failed less catastrophically. These differences may be attributed to the kinked nature of the woven cloth, which acts out of plane and adds positive contact between 0 90 fibers and surrounding layers but holds the composite together at failure.

A Silent Victim: The Indonesian Sex Slave and Forced Laborer Trapped within the Clutches of Government Inadequacy

Author(s): Eric Patrick Kurniawan

Mentor(s): Kurt Meyer

Institution: Irvine Valley College, Irvine CA

Does the incompetent and corrupt Indonesian government have the political will to combat the complex problem of human trafficking? Indonesia is a principle provider of sex slaves and contributes towards human trafficking atrocities. Indonesian women and children fall victim to sexual and labor exploitation in Malaysia, Singapore, Hong Kong, Taiwan, Japan, the Middle East, and demand for sex slaves come from as far west as Europe and North America. Evidence suggests that 80,000-100,000 Indonesian women and children alone are victims of trafficking each year. This escalation of prostitution and forced labor industries in Indonesia is due to a lack of political will as evidenced by limited intervention and inadequate allocation of government resources. Although trafficking is criminalized by Indonesian law as punishable by 6 years in prison, the lack of a sufficient definition of what constitutes trafficking makes it difficult to successfully prosecute traffickers as well as not provide for protection or compensation for victims. Beyond its ineffectual laws, the government proves corrupt in profiting from its security forces who reportedly participate in the running of brothels and protection of rackets, which in turn shield brothels from prosecution. The government even goes as far as supporting labor recruitment companies such as Indonesian Labor Providers Organization, who promise Indonesian women to work as "domestic servants" but are later coerced into sex work and forced labor. Such recruitment agencies falsify birthdates, confiscate passports, trap workers with inflated loans to travel abroad and force them into abusive work environments in an effort to repay their unmanageable debts before sending money to their families. Because an ineffective and corrupt government is unlikely to change things, the intervention to combat trafficking in Indonesia will require efforts, sufficient funding and mobilization from grass-root organizations and non-governmental organizations both from within Indonesia and throughout the international community.

Synthesis of Ruthenium-Modified PAMAM Dendrimers

Author(s): Jeffrey T Kuwahara

Mentor(s): Stephen M Contakes

Institution: Westmont College, Santa Barbara CA

We are currently developing Ruthenium modified dendrimers that can bind wastewater contaminants and photooxidize or reduce them to give harmless by-products. To this end we have been investigating the preparation of Ru-dendrimer conjugates. Our initial ef-

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forts focused on the conjugation of amine derivatives of $[\text{Ru}(\text{bpy})_2(\text{phenanthroline})]^{2+}$ to carboxy-terminated G0.5, G1.5, and G2.5 PAMAM dendrimers and purification of the resulting products. Unfortunately 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide-mediated coupling of $[\text{Ru}^{\text{II}}(\text{bpy})_2(5\text{-aminophen})](\text{NO}_3)_2$ to the dendrimers exhibited a poor 3.5% yield, presumably due to deactivation of the amine by direct attachment to the phenanthroline and Ru^{2+} center. Consequently, we synthesized two novel aliphatic amine derivatives: $[\text{Ru}^{\text{II}}(\text{bpy})_2(5\text{-}(2\text{-aminoethyl})\text{-}1,10\text{-phenanthroline})](\text{NO}_3)_2$ and $[\text{Ru}^{\text{II}}(\text{bpy})_2(4\text{-}(2\text{-aminoethyl})\text{-}1,10\text{-phenanthroline})](\text{NO}_3)_2$, which were attached to Gx.5 PAMAM ($x = 1, 2$) dendrimers with yields of 60 and 99%, respectively.

The Use of Aftershocks to Rapidly Estimate Rupture Extent for Large Earthquakes

Author(s): Kevin B Kwong

Mentor(s): Jascha Polet

Institution: California State Polytechnic University, Pomona, Pomona CA

The spatial distribution of aftershocks for an earthquake sequence has a close empirical relation to its mainshock rupture extent. As such, the epicentral locations of aftershocks can be used to delineate the entire mainshock rupture zone and to determine first – order mainshock rupture parameters such as earthquake rupture length and orientation. An important goal of this research project is to determine how early in an aftershock sequence we can reliably and accurately determine these mainshock rupture parameters. To this end we test an algorithm we developed for rapid estimation of mainshock rupture parameters in a near real-time environment. This algorithm will serve to quickly assess the impact (damage and fatalities) of large global earthquakes when incorporated in the global earthquake analysis system currently used by the US Geological Survey National Earthquake Information Center. Required input parameters to this algorithm are limited to an earthquake catalog starting with the mainshock time and other fixed input parameters. The algorithm automatically removes outlier events such as background seismicity and triggered events by spatial binning. Then true aftershock events are projected onto straight lines centered on the mainshock epicenter with a fixed incremental azimuth. Subsequently a best fitting strike and rupture length for the mainshock are determined on the basis of this aftershock distribution. The results of the algorithm agree well with the rupture parameters for historic earthquakes that have been determined by other, more time consuming methods such as full seismic waveform inversions for strike slip and large dip-slip events. Preliminary results indicate results may be obtained as early as one hour or less after the mainshock occurrence. We will now focus on determining better constraints on the minimum time after the mainshock and the minimum magnitude of dip-slip earthquakes that are

required to obtain reliable mainshock rupture parameters using this approach.

In Search of Entangled Photons

Author(s): Gina M Labriola, Courtney Lemon, Matt Robison, Clinton Hawkins, Hector Saldivar

Mentor(s): Barbara Hoeling, Nina Abramzon

Institution: California State Polytechnic University, Pomona, Pomona CA

Entangled photons are twin pairs of photons that share special correlations in their physical properties, e.g. their polarization, making them attractive for applications such as quantum computing and quantum cryptography. The entangled pairs of photons will be generated by a 405 nm pump laser impinging on a nonlinear optical crystal in a process called spontaneous parametric down conversion. Our goal is to measure the wavelength spectrum of these photons. This project is a preliminary step to verify the validity of the two instruments we wish to use for the detection of entangled photons. We use the Acton SP2156, a high resolution optical emission spectrometer, in order to study the wavelength spectrum. This device is calibrated by measuring the known spectrum of an Argon discharge lamp, since we predict that the down converted photons will be detected within the same wavelength range. The second instrument is a set of four single photon counting modules (SPCMs) by Perkin-Elmer, SPCM-AQ4C. We will present experimental results for the spectrum of Argon as measured with the Acton SP2156, as well as the dark count rates of the SPCMs. We will discuss how these instruments will be used in conjunction to detect and determine the spectrum of down converted photons, with the SPCM signal acting as the trigger for the Acton spectrometer.

Antimicrobial Activity of Synthetic Cationic Peptides

Author(s): Christopher Lam, M Sharif, CJ Hall, Chan B Saviola, M. Yeama

Mentor(s): John Chan

Institution: California State Polytechnic University, Pomona, Pomona CA

Mycobacterium tuberculosis, the causative agent of tuberculosis, infects approximately nine million people every year. The amount of sufferers totals one third of the world's population. Antibiotic treatment of tuberculosis has been met with challenges due to the rise of multi drug resistance. Synthetic cationic peptides similar to naturally occurring peptides produced by platelets have been shown in previous studies to have antimicrobial activity against a variety of microorganisms. In this study we have hypothesized that these synthetic peptides have antimicrobial activity against members of the genus mycobacterium. To

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test our hypothesis we employed the mycobacterial model organism *Mycobacterium smegmatis*, which has a short generation time and low pathogenicity as a surrogate for *M. tuberculosis*. We incubated diluted cultures of *M. smegmatis* with five different concentrations of peptide, 0, 0.5, 1.0, 2.0, 4.0, or 8.0 μ g/ml. Several types of synthetic peptides were used throughout the study. The samples were incubated for 0, 3, 6, and 24 hours at pH 7.3 or pH 5.5. After incubation with the peptide, *M. smegmatis* was diluted and plated to produce countable colonies on 7H10 agar plates. The plates were counted and compared to control zero peptide samples. Four out of the five peptides have shown antimicrobial activity against *M. smegmatis* at pH 7.3 solution and three out of the three tested had activity at pH 5.5. *Mycobacterium tuberculosis* occupies acidic locations within the human body, such as acidified phagosomes of macrophages. Peptides active at acidic pH may have increased activity within the human body.

Optical Feedback for a Robotic Arm

Author(s): Bradley Lambrecht, Philip Petersen
Mentor(s): Norali Pernalete
Institution: California State Polytechnic University, Pomona, Pomona CA

The goal of the project was to control a multi-axis robotic system using feedback from a single webcam. This system was designed to be cost effective enough to be used in a classroom setting for demonstrations of control systems concepts, such as, feedback and D-H parameters. Our mechanical system consists of a robotic arm with five degrees of freedom that will be tasked with identifying and locating colored cups in arbitrary positions, then reaching out and retrieving them. This presents a significant challenge when using a single camera providing two dimensional data. The system is designed around a commercial toy robotic arm. Image data from the webcam provides positional feedback and is analyzed by software created for the project. This software determines the location of the arm, as well as other objects in its environment, and determines how to manipulate the arm to interact with a desired object. We allow a user to select an object from the camera's images displayed on the control computer. The software then characterizes the object based on hue and calculates its edges. This processing is completed at a rate of approximately 10 frames per second. Control signals are then created using LabVIEW and passed to the arm via an FPGA board integrated with the LabVIEW environment. The robotic arm was able to accurately position itself to retrieve the designated cup. To reduce the complexity of dealing with three dimensional space, the camera was placed directly perpendicular to the ground plane. Later advancements of the project will explore ways to create a more accurate three dimensional model of the environment. The system was determined to be effective enough to demonstrate control concepts in a classroom. This project has created a foundation for more advanced undergradu-

ate research on robotic systems.

Carbohydrate Concentration Analysis of Water Samples from the California Current Ecosystem at Various Depths

Author(s): Danielle C Lara
Mentor(s): Lihini Aluwihare
Institution: Mount Saint Mary's College, Los Angeles CA

The organic fingerprint of marine water reveals the identity of various ecological processes. Specifically, dissolved carbohydrates reflect the amount of phytoplankton and bacterial activity in various regions and at various depths of the ocean. Here, we investigated the carbohydrate composition of marine samples obtained from the different stations of the California Current Ecosystem survey cruises. In this study, the TPTZ [2,4,6-Tripyridyl-s-triazine] method was utilized to observe the concentration of monomer sugars in D-glucose standards and marine samples. Because the TPTZ assay was sensitive to only monosaccharides, seawater samples containing dissolved polysaccharides had to be hydrolyzed with acid to produce monomer sugars. Cyclic monosaccharides are in equilibrium with their open ring form, which contains an aldehyde on the anomeric carbon. This functional group is a reducing agent, which becomes oxidized to carboxylic acid in the presence of a ferricyanide ion. In the presence of TPTZ, this reaction yields a $\text{Fe}(\text{TPTZ})_{22+}$ violet complex that is observable at 595 nm. Dissolved carbohydrate concentration determined by this method was expected to reflect the concentration of chlorophyll at each study site, suggesting a correlation between carbohydrate concentration and phytoplankton activity. Two stations were compared. One station was an open ocean station with low phytoplankton abundance and low chlorophyll concentrations. This station had a very stable water column. The second station had recently received nutrient input from upwelling, and so, showed high phytoplankton abundances and high concentrations of chlorophyll. Contrary to our expectation, dissolved sugars, like organic carbon concentrations, were more strongly affected by physical processes such as upwelling than by immediate phytoplankton activity. Upwelling dilutes the surface water inventory of dissolved organic molecules, and these data indicate a temporal offset between phytoplankton growth/production and dissolved sugar accumulation.

Computing Evaporative Cooling of Trapped Atoms

Author(s): Zack D Lasner, Eric Dodds, Joel Shuman
Mentor(s): Dwight Whitaker
Institution: Pomona College, Claremont CA

We have computed the evaporative cooling trajectory for a gas of trapped atoms. The evaporative cooling process

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is important for creating Bose-Einstein condensates, an exotic state of matter that occurs at extremely low temperatures (~100 nanoKelvin). We improve upon previous models by including in our computation the atoms that have enough energy to escape the trap, but are in a state that does not escape. These energy states are neglected in many models under the assumption of “sufficient ergodicity.” There are many such high-energy atoms in shallow traps, but almost none in very deep traps. Our model can therefore be applied to a broader class of traps than some previous models and sheds light on the validity of the ergodic assumption. We compare the cooling process in spherically symmetric harmonic and Gaussian trapping potentials at a variety of trap depths. The isotropic Gaussian potential is a good approximation to an optical dipole trap and harmonic trapping potentials can be achieved magnetically. For both trap shapes, we find that shallow traps cool more efficiently, but they are not able to contain as many atoms to begin with. Further, shallow traps tend to be less densely populated, which discourages the formation of a Bose-Einstein condensate. Shallow harmonic traps produce much more efficient cooling than comparable Gaussian traps. These trap-dependent properties of evaporative cooling can help to understand and optimize the formation of Bose-Einstein condensates.

Layering Metalloporphyrins onto Titanium Dioxide via Axial Ligation in Dye-Sensitized Solar Cells

Author(s): Vivian Le

Mentor(s): Hal Van Ryswyk

Institution: Mount San Antonio College, Walnut CA

Increasing worldwide demand for energy and depletion of non-renewable energy sources necessitates the development of alternative energy sources. One potential alternative, dye-sensitized solar cells (DSSC), is extremely promising due to its low cost materials (Gratzel, 2005). The main components of dye-sensitized solar cells are the anode, dye, and electrolyte (Gratzel, 2005). Common anodes are zinc oxide and titanium dioxide. Dyes used could either be inorganic or organic, but zinc-based porphyrin dyes have proved to be the most efficient (Bessho *et al.*, 2010). DSSCs are operated by exciting the dye with light, which causes the dye to inject an electron into the conduction band of the anode (Gratzel, 2003). The electron continues to flow through the circuit to the cathode where it reduces the electrolyte, which in turn reduces the dye back to its original state to prevent it from decomposing (Gratzel, 2003). Monomers (one layer of dye), dimers (two layers), and trimers (three layers) could be synthesized and attached to titanium dioxide by bonding the porphyrin dyes to the ligand isonicotinic acid immobilized on the surface of TiO₂. Additional layers of dye can be attached with pyrazine. Each assembly is then capped with pyridine. Each porphyrin assembly was then made into a DCCS and tested for efficiency. Unfortunately, the mono-

mers, dimers, and trimers resulted in poor efficiency. The trimer proved to be less efficient than the dimer and the dimer less efficient than the monomer. Reasons for poor efficiency may be that the coupling in the dimer is weak; therefore, the uppermost porphyrin layer is not injecting electrons into the next layer. Also, the dye may not be able to inject electrons to the anode through the ligand.

Dan Graham's *Past Future Split Attention: And the Question of ‘Who am I?’*

Author(s): Kyrah Leal

Mentor(s): Paula Radisich

Institution: Whittier College, Whittier CA

Dan Graham's monumental video piece entitled *Past Future, Split Attention* records two men speaking at the same time, while moving around in a generic white square room. One is recounting the others past actions, while the other is predicting the future actions of the other. Graham asks his viewers to consider the questions of “Who Am I?” and “How much does society influence not only who I am but what I do on a daily basis”. This question of “Who am I?” draws its influence from Andre Breton and the surrealists. Throughout the 17 minute video one can see influences from primarily the movements of dada and surrealism. For Dadaists art was an expression of how that artist saw their world; thus Graham's video piece is an expression of how he sees his world. It is evident that he sees his world as chaotic and ruled more by what society dictates than what the person truly desires. The idea of the “Who am I?” is the main question asked by the surrealists primarily through their literature. In Graham's piece one person's idea of “self” must continuously be maintained by the other in order for the piece to work. By juxtaposing these two men in the same space he is forcing them to rely on the other's reactions to their actions, thereby forcing them to judge themselves by how the other man reacts to them and their behavior. Dan Graham's performance video, *Past Future Split Attention*, asks the viewer two very monumental questions: “Who am I?” and “How much does society influence who I am?” These questions and their answer transform Graham's work from a multi-media art piece to a monumental avant-garde work.

Feature Reduction of Microarray Data Using Principal Component Analysis for Visualizing Cancer Detection with Self Organizing Maps

Author(s): Carlyn-Ann Lee

Mentor(s): Charles Lee

Institution: CSU, Fullerton, Fullerton CA

DNA microarray data are of biological interest because they impart deeper insight toward genetic expressions and help identify risk of particular diseases. Many people have believed that the underlying signatures of different cancers

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are encrypted in the expressions of the genes and highly effective mathematical methods can be used to extract these features. Recent studies using statistical methods and artificial neural networks on the gene expressions have demonstrated to be a promising approach in detecting bladder, liver, colon, and other cancers. In this study, we apply the combination Principal Component Analysis (PCA) along with the Self-Organizing Map (SOM) to investigate its feasibility in cancer detection. The PCA is a model-reduction technique to extract the dominant features of a set of data. Using the PCA allows us to use a smaller but equivalent set of DNA microarray data, which facilitates the detection process. On the other hand, the SOM builds a map of neurons based on gene expressions of a training set. The neural network illustrates different regions that visually separate the two classes, cancer versus non-cancer. Results based on several types of cancers will be discussed.

Recreating the 3D Nanostructure of the Corneal Extracellular Matrix by Electrospinning and IGF-1 + Agarose Overlay

Author(s): Christine K Lee, Noah E Atwi

Mentor(s): Elizabeth J Orwin

Institution: Harvey Mudd College, Claremont CA

Transparency in the cornea is maintained by extracellular matrix (ECM) structure and fibroblast phenotype. When the cornea is wounded, stromal cells express the contractile protein α -SMA, resulting in corneal haze. Preliminary studies have shown that culturing on aligned collagen mats significantly downregulates α -SMA expression. In order to produce a functional tissue equivalent, it is necessary to scale up this 2D system to a 3D system. In this study we investigate two methods for creating 3D tissue equivalents: (1) using a rotating mandrel to collect electrospun nanofibers to create a 3D aligned ECM and (2) inducing cells to upregulate ECM production using insulin-like growth factor I (IGF1) and an agarose overlay combined with fibrous scaffolds. A 5 wt% collagen solution was electrospun onto dual copper plate collectors to create aligned and unaligned scaffolds for culturing or onto a rotating mandrel to create 3D scaffolds. Collagen scaffolds that were electrospun on a rotating mandrel for thicker scaffolds were imaged using scanning electron microscopy, and analyzed using FFT analysis in imageJ for fiber alignment. Alignment created by the rotating mandrel increased with RPM, but was still significantly less than alignment created by dual copper plate collectors for the 2D system. Scaffolds for culturing were seeded with RCFs and cells were fed with normal growth, TGF β , and IGF1 media for two weeks. After 4 days of culture in IGF1, media was replaced with a 3% agarose overlay. Samples were then stained for collagen and α -SMA and imaged using confocal microscopy. All media conditions significantly downregulated α -SMA expression when compared to the TGF β positive control. Cells cultured under an agarose

and IGF1 overlay, on an aligned scaffold expressed significantly less α -SMA and collagen type I than cells cultured on unaligned and tissue culture counterparts, and cells cultured on an aligned collagen scaffold in normal media.

Birefringence Measurements of Light-Sensitive Liquid Crystal Samples using Polarizing Microscopy

Author(s): Brett LeMaster, Nahom Yirga

Mentor(s): Hector C Mireles

Institution: California State Polytechnic University, Pomona, Pomona CA

We investigated the birefringence properties of a liquid crystal (LC) sample that responds to a light-sensitive surface monolayer (5CB-DMR). We measured the birefringence using three microscopy techniques; Berek compensation, Senarmont compensation as well as traditional direct color determination with a quarter-wave plate. The samples were prepared in-house and contained micron-sized spherical colloidal spheres. The birefringence of these LC samples is sensitive to both temperature and the polarization axis of incident light. Domains form in the LC in response to incident light. The walls between these domains induce forces on colloidal particles, which we attributed to elastic forces in the LC.

Family Secrets in Cinematic Screenwriting: Knowing, Revealing, & Coping in Mike Leigh's *Film Secrets & Lies*

Author(s): Sonia J Lessuck

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

Throughout my research process I have closely read the ways in which family secrets are revealed in Mike Leigh's 1996 film, *Secrets & Lies*, to find what specific narrative devices are used to create reveal. In the film the audience knows a family secret that the characters do not. What the third act of the film explores is how, once the secret is revealed, this family copes and changes. To answer my research question, and inform my close reading of the text, I extended the writings of Kristen Thompson, in her book *Storytelling in the New Hollywood: Understanding Classical Narrative Technique*, to *Secrets & Lies*. More specifically I use her close analysis of Wood Allen's *Hannah & Her Sisters* (1986) to inform my understanding of narrative devices in revealing family secrets. I have found that dinner tables are a commonly used narrative device to reveal family secrets in film. The reveal scene I've focused on in *Secrets & Lies* occurs around a dinner table during a birthday party. In her essay, Thompson specifically calls upon the dinner table during holidays, as a central gathering place where information amongst family members is shared—ultimately revealing secrets. I am drawn to what

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this research reveals about the modern cinematic family. As depicted, when people open spaces to other family members their interactions are wrought with tension. This tension is often tied to secrets. *Secrets & Lies* brings forth the problematic nature of concealment—a family's dwindling sense of connection. To support my thesis I will draw upon clips from *Hannah and Her Sisters* and Jonathan Demme's *Rachel Getting Married* (2008). Both films use the narrative device of dinner tables to create moments of tension based on revealing family secrets.

Unveiling Venom: Investigating Novel A-Superfamily Conotoxins from *Conus tulipa*

Author(s): Nicole Y Leung

Mentor(s): Joseph Schulz

Institution: Occidental College, Los Angeles CA

Fish-hunting cone snails (genus *Conus*) inject venom into their prey to cause paralysis. *Conus* venom is composed of different classes of peptides that are often highly post-translationally modified. In this study, we look at the A-superfamily conotoxins, which includes α -conotoxins and α A-conotoxins that cause flaccid paralysis by inhibiting nicotinic acetylcholine receptors, and neuroexcitatory peptides that cause tetanic paralysis by a mechanism currently under investigation. Neuroexcitatory peptides have only been discovered to date in fish-hunting *Conus* species, but surprisingly not in the clade of fish-hunters that includes *Conus tulipa*. While we have not identified neuroexcitatory homologs, we identified eight novel α -conotoxins with multiple clones in *C. tulipa*. These sequences define three novel subfamilies of α 4/7 conotoxins, with one subfamily showing unique characteristics. Previous studies have shown that α 4/7's target a variety of neuronal-type nicotinic acetylcholine receptor (nAChR) subtypes, which could provide insight into the physiological roles of these receptor subtypes in pain, inflammation, nicotine addiction, Alzheimer's disease, and Parkinson's disease. The diversity of α 4/7's observed in *C. tulipa* warrants further investigation into the possibility of highly selective inhibitors of particular nAChR subtypes.

How Earthquakes and Rainfalls Trigger Huge Landslides

Author(s): Adam Lewis

Mentor(s): Binod Tiwari

Institution: CSU, Fullerton, Fullerton CA

A series of experiments were conducted on soil samples, in order to determine the relationship between soil compaction, seismic event triggers and slope stability. A soil sample was placed into a testing container and then compacted to the desired density to make a 50 cm. thick model. Two accelerometers were then placed, each at 12 cm. and 36 cm. heights from the base of the model, in order to mea-

sure the amplification of soil movement compared to the base acceleration as the seismic event took place. The soil sample was then cut into a slope at different angles and shaken with different accelerations for multiple cycles until the slope failed. Similar experimental model tests were conducted for the soil samples compacted at four different densities. The data taken during the test were analyzed and found that the seismic acceleration amplified with the increase in vertical distance from the base of the model and also with the increase in soil density. The accelerometers were also collecting data pertinent to soil movement in all x, y, and z directions, in order to observe the ground shaking in all three mutually perpendicular directions, i.e., horizontal, vertical, and transverse directions, while the base shaking was applied to the horizontal direction only. This also helped in confirming the correct positions of accelerometers in the soil mass. The ultimate goal of this project is to obtain the correlations between seismic activity and rainfall that trigger landslides. Future research involves introducing some pre-determined intensities of rainfall to the slope without any earthquake shaking, in order to observe the effect of rainfall intensity on the triggering of landslides. Then, the slopes will be subject to different seismic accelerations while it is raining with different intensities to observe the combined effects of rainfall and earthquakes on landslides.

Effect of High-Intensity Interval Training (HIIT) on Cardiovascular Function and Muscular Force in Men and Women

Author(s): Robert W Lewis Jr

Mentor(s): Todd A Astorino

Institution: CSU, San Marcos, San Marcos CA

High-intensity interval training (HIIT) has been shown to improve cardiorespiratory fitness ($VO_2\text{max}$) and fat utilization similar to traditional endurance training with 90 % less time commitment. The purpose of this study was to examine the effect of short-term HIIT on cardiovascular function and muscle force. Twenty young (age = 25.3 ± 4.5 yr) men and women ($n = 20$) who completed at least 5 h/ wk of vigorous exercise in the previous 2 yr completed 6 sessions of HIIT over a 2-3 week period. Men and women did not differ ($p > 0.05$) in regards to age, $VO_2\text{max}$, or current physical activity. Subjects completed the Wingate test, a 30 s 'all-out' bout on a cycle ergometer, four times on days 1 and 2, five on days 3 and 4, and six on days 5 and 6. A control group of nine men and women (age = 22.8 ± 2.8 yr) completed pre- and post-testing including measures of anaerobic power, muscle force production, blood pressure (BP) and heart rate (HR), and $VO_2\text{max}$ but did not perform HIIT. Changes in resting BP and HR, $VO_2\text{max}$, oxygen (O_2) pulse, power output, and force production of the knee flexors and extensors were examined pre- and post-training using a two-way ANOVA with repeated measures, with group as the between-subjects variable and training as the within-subjects variable. Data showed

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significant ($p < 0.05$) improvements in VO_{2max} , O_2 pulse, and Wingate-derived power output with HIIT. Magnitude of improvement in VO_{2max} was related to baseline VO_{2max} ($r = -0.44$, $p = 0.05$) as well as fatigue index ($r = 0.50$, $p < 0.05$). No change ($p > 0.05$) in resting BP, HR, or force production was revealed. Data demonstrated that HIIT significantly enhanced VO_{2max} as well as power output in active men and women.

Development of Switchable Olefin Metathesis via Norbornadiene-Quadricyclane Isomerization

Author(s): Shuaili Li

Mentor(s): Robert H Grubbs

Institution: California Institute of Technology,
Pasadena CA

Norbornadiene and its derivatives make up an interesting, yet underrepresented, class of strained olefin monomers for ring-opening metathesis polymerization (ROMP). They can be switched to ROMP-unreactive quadricyclane isomers via photochemical conversion, and thermal or metal-assisted back conversion regenerates the olefinic ROMP-reactive species. This ability to control ROMP polymerization via external stimuli could have broad applications. My project has focused on the development of switchable norbornadiene metathesis for surface science applications where it will allow for creation of patterns of different functionality on a microscopic level in a directed, versatile, and reversible fashion. This “switchable ROMP” could find use as a tool for microarray synthesis in genomics and proteomics or as a strategy for generation of patterned microelectronics. In order to find an ideal norbornadiene derivative for switchable ROMP, a variety of norbornadienes were synthesized and their ability to undergo photoisomerization and ROMP reactions was studied. Liquid chromatography coupled mass spectroscopy (LC-MS), nuclear magnetic resonance spectroscopy (NMR), and gel permeation chromatography (GPC) were used to characterize the reactions. Several novel norbornadienes displayed interesting properties; a bromoalkyl derivative, in particular, was highly active in ROMP reactions and showed the fastest photochemical conversion to its quadricyclane isomer of any derivative tested. Upon exposure to cobalt-tetr phenylporphyrin (CoTPP) or air this derivative rapidly converted back to its norbornadiene isomer. Future work will seek to append this derivative to surfaces and confirm homologous reactivity; generation of fluorescent or polymeric patterns will demonstrate proof-of-principle for switchable ROMP.

Identifying the Bacterial Molecules that Modulate Immune Responses during Intestinal Inflammation

Author(s): Dongkook D Lim, Janet Chow

Mentor(s): Sarkis K Mazmanian

Institution: California Institute of Technology,
Pasadena CA

A member of the diverse and complex gastrointestinal tract microbiota, *Helicobacter hepaticus* is a pathobiont, residing as a symbiont in the host, but promoting pathology under specific environmental changes. *H. hepaticus* communicates with intestinal epithelial cells (IECs) via a specific secretion mechanism called type VI secretion system (T6SS), in which effector molecules are directly injected into the host cell. We sought to identify and study the specific molecular mechanism underlying the critical symbiotic role of T6SS-dependent bacteria and the host IECs. Previous studies have shown that T6SS mutant bacteria co-cultured with IECs elicited increased bacterial colonization and raised intestinal inflammation *in vivo* and *in vitro*, highlighting the important role of T6SS in maintaining the balance of microbe-host interaction and homeostasis. Two approaches were used to elucidate the T6SS-dependent molecular mechanism. First, participating molecular pathways were investigated by searching for biological differences (proteins, cytokines, and RNAs) between IECs incubated with wild-type versus T6SS mutant bacteria. Second, candidate genes encoding for T6SS effector molecules were selected from the *H. hepaticus* genome and tested for participation in microbe-host communication by analyzing bacterial colonization levels after transfecting the genes into IECs and co-culturing with wild-type or T6SS mutant *H. hepaticus*. If the candidate gene expressed proteins involved in the microbe-host communication, IECs would respond to the overexpressed candidate gene by interpreting and adjusting the colonization levels of *H. hepaticus*. Few of the candidate genes appear to control the colonization of the bacteria, which may suggest that multiple effector molecules may function as a combinatorial set to signal information about the bacterial environment to the IECs. Germ-free mice display a higher propensity to develop disease phenotypes for colitis and colon cancer. Successful medical cases of bacterial transplant, termed bacteriotherapy, are promising. Further studies in the T6SS-dependent microbe-host interaction will help bacteriotherapy.

Identification of Polo-like Kinase 1 Phosphorylation Sites on a Novel Substrate

Author(s): Yu-Huey Lin

Mentor(s): Junjun Liu

Institution: California State Polytechnic University,
Pomona, Pomona CA

Polo-like kinase 1 (Plk1) is an evolutionarily conserved

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serine/threonine protein kinase playing pivotal role in mitosis. Its level is often elevated in various cancer cells, and inhibition of Plk1 blocks tumor growth. Recently, Plk1 has emerged as a promising target for anti-cancer treatment, and understanding how Plk1 regulates cellular function is critical to develop effective therapeutic approaches. We have previously identified a deubiquitinase (DUB) as a novel substrate for Plk1 in *Xenopus* oocytes. DUB is an enzyme that removes a small peptide called ubiquitin from proteins and results in either stabilization of the protein or change of the protein's characteristics. Our preliminary data suggests that the DUB is activated by Plk1 phosphorylation. Once activated, the DUB removes ubiquitin from histone and causes chromatin conformation change, and hence, the change of gene expression profile. We first used mass spectrometry to identify DUB amino acids that are potentially phosphorylated by Plk1. Then, these Ser/Thr residues are mutated into Ala that is non-phosphorylatable by site-directed mutagenesis. The bacterial expressed mutants are subject to Plk1 phosphorylation assay *in vitro*. Significant decrease or demolish of phosphorylation indicates that these residues are indeed Plk1 phosphorylation sites. So far, we have determined 3 phosphorylation sites in human homologue of *Xenopus* DUB, and two residues of *Xenopus* DUB are identified by mass spectrometry as potential Plk1 phosphorylation sites. We have mutated these 2 sites into Ala and are in the process to carry out *in vitro* kinase assay to determine if indeed they are Plk1 phosphorylation sites. This study will provide us with valuable information about how Plk1 activates the DUB, and hence, regulates chromatin conformation and gene expression.

Size Response of *Canis dirus* Over Time Due to Climate Change

Author(s): Edward Linden

Mentor(s): Donald Prothero

Institution: Occidental College, Los Angeles CA

Evolutionary stasis over time, even in the face of climate change, has been well documented in many faunas, particularly among mammals. While the exact causes of this stasis have not been completely explained, the response of the dire wolf, *Canis dirus* to climate changes over time, may provide further evidence and shed light towards the causes of Gould and Eldredge's concept of punctuated equilibrium. Many variables were measured on hundreds of fossils from the Rancho La Brea collections using astragali, femora, tibia, humeri, and third metapodials. These were grouped based on pit number and radiocarbon age of the pit. The correlation of pit ages to paleoclimate allowed the temporal and climatic aspects of the hypothesis to be tested. The raw multidimensional data derived from fossil measurements were compared via t-tests and ANOVA to determine whether significant changes in size or shape have occurred. Previous studies on other megafauna have indicated evolutionary stasis over time and similar results are expected in this research, pending further data collection and analysis.

Nasolabial Wrinkle Classification under Multi-spectral Lighting

Author(s): David Lluncor

Mentor(s): Serge Belongie

Institution: UC, San Diego, La Jolla CA

Categorization of facial wrinkles is used in dermatology studies to determine the efficacy of certain treatments over a period of time. These studies, however, are limited by the fact that when dermatologists assign these categorizations, it is done so through qualitative, *in-vivo* observation. The objective of this study was to train a computer to categorize nasolabial wrinkles into one of four categories based on several images of the patient's face under different lighting conditions. Preliminary results indicate that the computer will be able to correctly categorize category 1, 2, 3, and 4 wrinkles with 88.2%, 57.3%, 26.2%, and 80% success, respectively. Future research will make use of stereo images to better discern unique facial features for areas such as dermatological treatment and biometric security.

Gilead Sciences Inc., INTS 597.06: External Environment, Industry Analysis, and Company Assessment

Author(s): Holly Lobprise, Kaitie Saballus, Trisdan

Homan, Danielle Boston, Jessica Jordan

Mentor(s): Venkatachalam Seshan

Institution: Pepperdine University, Malibu CA

Gilead Sciences is currently the second largest biotechnology company, with \$7 billion in Net Sales and \$2.6 billion in Net Income in 2009. The HIV/AIDS medications, counted in the Anti-Infectives & Respiratory Market Segment, make up most of Gilead's production. Truvada, an HIV medication, makes up the majority of Gilead's sales, at \$2.5 billion in 2009. The sales of Atripla, another HIV/AIDS medication, came in at \$667 million in 2009, followed by AmBisome, yet another HIV/AIDS medication at \$299 million in 2009. The main competitors in the Biotechnology Industry are Amgen Inc., currently listed as the top company, as well as Genzyme Corp. and Biogen Idec Inc. Gilead is only highly developed in the Anti-Infectives & Respiratory Market Segment, and has much room to grow in the only other Market Segment that it has medications in – the Cardiovascular Market Segment. It costs \$7,000 a year for a person with HIV/AIDS to pay for their medications, and because most people infected worldwide with AIDS cannot afford that; there are steps being taken to produce cheaper medications that will be available to everyone. Gilead itself is moving towards more affordable and readily-available HIV/AIDS medications, by giving their medications to companies in poorer countries to help them duplicate the medication at a lower cost so that it will be available to those who could not previously afford it. Because the growth rates of both the industry and Gilead together show no sign of slowing down and Amgen's Net

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Sales growth has decreased in the past few years, Gilead has a chance, in light of its continued projected growth, of not only successfully breaking into new Market Segments, but of catching up with leaders like Amgen in its reigning spot as Biotechnology industry leader.

Autonomic Activation and Psychosocial Adjustment in Students with High versus Low Emotional Intelligence

Author(s): Dana N Lockwood, Samuel Van Buskirk, Danielle Smith
Mentor(s): Kimmy Kee
Institution: CSU, Channel Islands, Camarillo CA

Background: Understanding the role of the sympathetic nervous system, as a dynamic factor in emotion regulation, provides insight into the varying degrees of psychosocial functioning in individuals. Recent research has reported a link between poor emotional processing ability and low physiological response in individuals exhibiting antisocial behavior patterns. The current ongoing study compares autonomic nervous system activity and psychosocial adjustment between undergraduate students with lower emotional intelligence (EI) and their counterparts with higher EI. **Methods:** Data are currently available on 39 undergraduate students with lower EI and 42 students with higher EI for the interim analyses. Autonomic nervous system activity was measured using galvanic skin conductance response (SCR) and was recorded while participants' viewed a series of counterbalanced positive, neutral, and negative images selected from the International Affect Picture System. At the same time, participants' were asked to report their levels of emotional arousal level using the Self-Assessment Manikin. Participants' emotional intelligence was assessed using the Mayer-Salovey-Caruso Emotional Intelligence Test and psychosocial adjustment was evaluated with the Social Adjustment Scale. **Results:** Preliminary analyses from the current study revealed lower levels of SCR in individuals with lower EI compared to their counterparts with higher EI. However, this group difference was not statistically significant, $t(79) = 0.34$, $p = \text{n.s.}$. Also, our results indicated that students with lower EI demonstrated significantly greater deficits in their everyday psychosocial functioning compared to those with higher EI, $t(78) = 2.66$, $p = 0.01$, which yielded a large effect size (Cohen's $d = 0.59$). **Conclusion:** These findings may potentially expand our understanding of the role of sympathetic activities and psychosocial adjustment in individuals with different levels of emotional intelligence.

Testing the Idiocracy Theory: Family Size & Parental Education

Author(s): Dana N Lockwood
Mentor(s): Virgil H Adams
Institution: CSU, Channel Islands, Camarillo CA

In his historic publishing, *On the Origin of Species*, Darwin stated that if a creature is unable to reproduce it is considered unfit (Leonard, 2009). Throughout various countries, a negative correlation between fertility and intelligence has been published (Meisenberg, 2010). However, conflicting evidence has been found to dispute evolutionary theories of intelligence (Wicherts et al, 2009). The present study expands on this research by replacing intelligence with level of parent's education for both the mother and the father and asks the question "is reproduction frequency the only factor that we should be concerned about when thinking about the future of our race?" Utilizing a sample of community dwelling adults drawn mostly from Southern California, reports were based on analyses from responses on questions that were part of a larger survey ($n=631$). It was hypothesized that those individuals with larger families would have less educated parents and individuals with smaller families would have more educated parents. Hierarchical results supported this in that a negative relationship between number of siblings and parent's education was found. These findings remained significant even after controlling for the individual's age, gender, education, marital status, and income.

Modular Avionics System for Use on Unmanned Aerial Vehicles (UAVs)

Author(s): Victor M Loera, Steffi B Valkov
Mentor(s): Subodh Bhandari
Institution: California State Polytechnic University, Pomona, Pomona CA

This presentation highlights the research being done on the development of a modular wireless avionics system for use on airplane and helicopter unmanned aerial vehicles (UAVs). This research involves undergraduate students and is partly supported by Cal Poly Pomona's Undergraduate Research Apprenticeship Program. The avionics system will consist of an onboard flight computer for flight data acquisition (DAQ), a ground control station for real-time data monitoring, and the ability to upload a mission profile. In addition to the DAQ capability, the flight computer will run the automatic flight control algorithms (AFCS). AFCS will be tested in the Software-in-the-Loop and Hardware-in-the-Loop simulations prior to flight testing. Currently, the development and testing of the automatic flight control algorithm for the aircraft longitudinal mode is underway. Encouraging results have been obtained for the pitch hold mode of the AFCS. Mathwork's Simulink software is being used to build, implement and test the different components of our flight control system.

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The software is allowing us to expedite the process of developing the algorithms to be integrated into the flight computer. Further research includes continued work on the automatic control of the longitudinal and lateral-directional modes, system integration, and flight testing of a Guidance, Navigation, and Control (GNC) algorithm.

Investigation of the Relationship between Speed Limit and Road Safety

Author(s): Jannet Loera Gutierrez

Mentor(s): Wen Cheng

Institution: California State Polytechnic University, Pomona, Pomona CA

Establishing appropriate speed limits is standard practice in departments of transportation throughout the U.S. The literature is replete with the development and discussion of statistical methods to evaluate the influence of speed limits on roadway safety. One of the most popular methods is to employ the crash modeling techniques which establish the relationships among crash frequency, speed limits, and driving behavior, and so on. Previous research studies have yielded mixed results regarding the influence of speed limits on crash occurrence. Some researchers have found positive effects of speed limits on safety, some have found negative effects, while others have identified negligible effects. This result is not surprising given that the selection of various speed limits is endogenous, that is, influenced by crash counts and/or traffic volumes. Endogeneity creates problems in econometric and statistical models, and is likely to explain the inconsistencies reported in the different studies. This presentation reports on a simultaneous estimation approach to address endogeneity between the employment of various speed limits and crashes. The effects of endogeneity are mitigated using the approach, revealing the true effect of speed limits on crash frequency for a dataset of intersections of the City of Corona, CA. The research shows that without accounting for endogeneity speed limits ‘appear’ to have negligible influence on crashes; however, when endogeneity is accounted for speed limits have significant impact on crash frequencies, with lower speed limits leading to smaller crash number.

Survey Development for Climate of Diversity: Applying Classical and Human Resource Perspectives to Assessment

Author(s): Andrea Lopez

Mentor(s): Juanie Walker

Institution: Pepperdine University, Malibu CA

“Pepperdine’s commitment to diversity stems from a Christian heritage that compels us to love justice and to treat every individual equally with respect and compassion” (*A Christian Rationale for Diversity at Pepperdine*,

Pepperdine University diversity website). A team of Pepperdine University student consultants developed a survey instrument to measure perceptions of the diversity climate among Seaver College undergraduate students at Pepperdine University. The purpose of the study was to investigate diversity at Seaver College by answering the research question, “What are student perceptions of diversity climate on campus?” An online survey instrument was developed to measure the diversity climate at Pepperdine, specifically regarding race, ethnicity, gender, and faith. The survey measured satisfaction with diversity as defined by Pepperdine’s diversity mission statement, relevant literature, and drawing from existing surveys. A pilot online study was conducted to test the instrument, followed by interviews with participants. Frequency analyses were conducted to check responses of the pilot study. Recommendations are made to Pepperdine diversity administrators for using the survey as a sustainable instrument to measure student attitudes biannually and to adapt to faculty and staff audiences.

Investigation of Silver Thin Film Reactivity via Scanning Tunneling Microscope (STM)

Author(s): Jehovani Lopez

Mentor(s): Stephen Tsui

Institution: CSU, San Marcos, San Marcos CA

The scanning tunneling microscope (STM) is a relatively recent tool capable of revealing the structure of surfaces down to the atomic level. The principle of the device is the quantum mechanical tunneling of current from the tip of the STM to the atoms under study. The STM has become a workhorse in both research efforts and academic laboratory environments, although its operation to some extent is nearly as much art as it is science. Perhaps its greatest limitation is its inability to examine structures whose tunneling barriers are too high, e.g. insulators. A recent attempt was made to examine the surface topography of glass by depositing a thin conducting film over the surface via plasma sputtering. Preliminary results show the inability of the deposited silver thin film to enable this imaging. Our hypothesis is that the silver nano-particles may react in air, thereby creating a tunneling barrier that impedes the STM current. To confirm this, we attempt to compare two thin film formations using silver and also gold, which is nonreactive. Silver nanoparticles deposited on highly orientated pyrolytic graphite (HOPG) at varying layers of thickness were imaged to analyze scatter patterns and deposition. Over time, STM images of the silver nanoclusters on HOPG showed some inconsistency in the diameters of the deposited clusters, possibly due to an artifact from the suggested reactivity of the silver. Gold particles on HOPG and glass will be studied in contrast in order to confirm whether these inconsistencies are a result of the deposited metal or of the instrumentation. The expected results should be consistent with the hypothesis, i.e. STM image should be obtainable for the gold on glass

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as well as with even smaller gold particle clusters than the silver in HOPG, indicating the possible oxidation.

Does Pet Ownership Promote Hope & Well-Being

Author(s): Christina M. Lucero

Mentor(s): Virgil H Adams III

Institution: CSU, Channel Islands, Camarillo CA

Past research has shown a positive relationship between pet ownership and positive physiological measures, such as lower blood pressure, serum, triglycerides, and cholesterol levels. Animal Assisted Activities, and Animal Assisted Therapy involves the carefully planned and monitored use of the therapists companion animal in sessions to build rapport, enhance the therapeutic process, and facilitate positive change. Overall, a broad range of investigations have found that animal-human interactions reduce anxiety, depression, and loneliness as they enhance social support and general well-being. The present study expands on this research by examining the role of the pet-human bond and the promotion of hope in individuals. More specifically, it was hypothesized that those individuals who owned pets or had pets that assisted them in day to day living would have increased hope and general well being. To test the hypothesis a sample of community adults drawn from a large Southern California county were surveyed ($n = 967$). The Adult Dispositional Hope Scale and the Delighted-Terrible well-being scale were included along with a battery of background questions. The sample had a mean age of 36.88 years ($sd = 16.08$, ranged 18 to 91 years). To test the hypothesis two hierarchical regression models were assessed. In the first model, hope was used as the dependent variable while well-being was used in the second model. Both models included demographic variables of age, gender, educational attainment, marital status, and household income as controls in the first step of the equation. The second step of the equation included measures of pet ownership and assistantship. Results did not support the hypothesis: no additional variance in either hope or well-being beyond that associated with the demographic variables could be accounted for by pet ownership or assistance. The discussion focuses possible explanations for the pattern of results and implications for future research.

ER Stress Differentially Activates Pro-Apoptotic Signaling Pathways in Response to Severity of Functional Defect

Author(s): Emily C Lumley, Jessica Scott, Lindsey Murphy, Emily Esch

Mentor(s): Jay L Brewster

Institution: Pepperdine University, Malibu CA

Abnormal protein processing in the endoplasmic reticulum (ER) stimulates adaptive signaling from the ER to the nucleus, and can also activate the intrinsic apoptotic cascade. The hamster tsBN7 cell line carries a temperature-sensitive mutation that results in defective N-linked glycosylation and ER stress signaling. Tunicamycin (Tm) is a pharmacological agent that inhibits N-linked glycosylation. Both conditions generate stress signaling, proteasome-mediated destruction of misfolded proteins, and apoptosis. However, only the TS-treated cells display an apoptotic signal that is susceptible to cyclosporine and to 2-aminoethoxyborate, an inhibitor of ER Ca^{2+} release via the inositol 1,4,5-triphosphate receptor (ITPR). We hypothesized that Tm (1uM) and TS-induced apoptosis displayed different signaling characteristics due to differences in the severity of the stress. Adaptive ER stress is signaled by inositol-requiring kinase 1 (IRE1), which detects accumulated unfolded proteins and activates the splicing of RNA encoding the Xbp1 transcription factor. An analysis of Tm concentrations and Xbp1 splicing revealed a clear dose-response relationship (peak at 250 nM Tm). TS-treated tsBN7 cells displayed a level of IRE1 activation similar to 30 nM of Tm, a much lower dose of Tm than typically used in ER stress experiments, revealing that TS induces a weak ER stress compared to 1 uM Tm. The parental BHK21 hamster fibroblast cell line (w/t) was exposed to a range of Tm concentrations, and only the 20 nM-30nM range activated an apoptotic signal that was susceptible to inhibitors of the ITPR (2-APB, Xestospongin C). This data is consistent with a model in which the ER is capable of activating multiple apoptotic pathways, depending upon the severity of the ER stress. The low level signal is susceptible to inhibition with agents that block Ca^{2+} release from the ER. The signal induced by more severe stress is unknown, but is currently being explored.

What Is To Be Done? The Woman Question in *Anna Karenina*

Author(s): Montserrat Luna

Mentor(s): John Struloff

Institution: Pepperdine University, Malibu CA

Leo Tolstoy's *Anna Karenina* begins "Happy families are all alike; every unhappy family is unhappy in its own way." Tolstoy's novel captures the complexities of Russian society, and with it, the strict societal norms that restricted women's life at the time. Through thorough layers, the questioning of the fundamental role of women is

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explored. This essay examines how women in the novel are each unhappy in their own way as they fall prey to the social constrictions that bound their search for happiness, ultimately deeming it unachievable. Whether they try to fulfill the roles expected of them or attempt to find happiness through independence, their search is ultimately futile. They are trapped in their paradoxical circumstances, always wondering: *what is to be done?*

Rápido Corren los Trenes: The Role of Trains in *One Hundred Years of Solitude* and *Anna Karenina*

Author(s): Montserrat Luna

Mentor(s): Julianne Smith

Institution: Pepperdine University, Malibu CA

Gabriel Garcia Marquez' novel *One Hundred Years of Solitude* and Leo Tolstoy's *Anna Karenina* illustrate worlds in which unhappy families are unhappy in their own ways. Though the driving force behind their unhappiness varies between the novels, a common link shared is the important role that trains play in connecting characters and cities to their ultimate tragedies. This essay explores trains as the carriers of misfortune to both Macondo and Moscow, comparing the function they perform in the transformation of its characters. Trains are used as agents of plot that establish the development and construction of the characters and their settings, while also acting as a symbol of modernity and urbanization, their effects paralleling the real-life consequences that trains brought upon the cities by which Moscow and Macondo were inspired. From the innocent yellow locomotive that brings so many changes to Macondo, to the cold train that brings Anna and Count Vronsky together for the first time, trains (despite such different settings) bring to the novels change and mark a turning point for their development.

Ligand-Dependent Stability and Folding in CusF, a Bacterial Copper (I) Chaperone

Author(s): Susan Ly, Devon Dally

Mentor(s): Blake Gillespie

Institution: CSU, Channel Islands, Camarillo CA

How are the intramolecular interactions that stabilize small proteins affected by ligand binding? We are using CusF, a small periplasmic Cu(I) and Ag(I) chaperone protein from *E. coli*, as a model system to address this question. Using temperature controlled fluorescence spectroscopy, we have carried out thermal denaturations of CusF to determine the conformational equilibrium of apo- and holo-CusF. However, the *holo* protein does not completely unfold at elevated temperatures, and the *apo* form is significantly up-stabilized relative to ligand-free CusF. Furthermore, a complete set of thermodynamic parameters cannot be determined from a single temperature

melt. To solve these problems we are generating stability curves for *apo*- and *holo*-CusF by performing a set of urea-dependent thermal melts for global thermodynamic analysis. Our results show that CusF's ligand-dependent stabilization derives primarily from large changes in its heat capacity and enthalpy of unfolding.

Is Psychosocial Adjustment a Predictor of Community-Based Services Program Success?

Author(s): Matthew K Lysak, Dorothy Scuteri, Melinda Miranda, Maria Vaca

Mentor(s): Kimmy Kee

Institution: CSU, Channel Islands, Camarillo CA

Background: Although poor psychosocial functioning has been documented in children with psychological problems, fewer efforts have been undertaken to understand the nature of this impairment in at risk children populations. The current ongoing study explores the cross-sectional and longitudinal relationships between specific aspects of psychosocial adjustment (i.e., *role performance*; *disruptive behavior towards self and others*; *emotion modulation/self-harmful behavior*; *substance use*; *thought processes*) and the success of a community-based services program. **Methods:** Data are currently available on a sample of 76 youths with emotional and behavioral problems, who were at risk for out-of-home placement at intake. Participants' psychosocial adjustment was measured at intake and again at discharge using the Child and Adolescent Functional Assessment Scale. Success in the community-based services program was demonstrated by the attainment of in-home placement at discharge. **Results:** Multiple significant cross-sectional associations were found between *role performance*, *disruptive behavior towards self and others*, *emotion modulation/self-harmful behavior*, and *substance use* with program success at discharge, with the coefficients ranging from 0.34 to 0.52 (p values = 0.001 to 0.0001). More importantly, significant longitudinal relationships were found between baseline *disruptive behavior towards self and others* with program success ($r = 0.26, p = 0.012$) and *substance use* with program success ($r = 0.19, p = 0.05$). Also, the associations between baseline impairments in *role performance* and *emotion modulation/self-harmful* and poorer program outcome at discharge were at trend levels ($r = 0.17, p = 0.067$; $r = 0.18, p = 0.055$). **Conclusion:** Preliminary findings from this study suggest that at risk youths who showed inappropriate daily behavior, substance use, deficits in role functioning, and poor emotional modulation were less likely to be successful in treatment in community mental health agencies.

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Computational Tools for the Generation of EXPAR Templates and Triggers

Author(s): Ralph Ma, Jifeng Qian

Mentor(s): Angelika Niemz

Institution: Keck Graduate Institute, Claremont CA

The current methods of diagnosis for Tuberculosis (TB) either lack sensitivity or are too expensive and lengthy for point of care usage. The Exponential Amplification Reaction (EXPAR) performs isothermal replication of DNA, and when paired with lateral flow, can be used to diagnose *Mycobacterium tuberculosis*, the causative agent of TB in humans. Appropriate assay design, which includes the identification of template and trigger oligonucleotide sequences related to the targeted organism is crucial for making EXPAR a viable diagnostic tool. We created a computational algorithm using Python with a graphical user interface to address this challenge. Using this program, we identified 132 possible sites of excision through nicking enzymes within the *Mycobacterium tuberculosis* H37Rv complete genome. Through NCBI Blast analysis, we selected a subset of these sequences that were 100% conserved amongst other strains of the *M. tuberculosis* complex for which genomic sequences are available, and that are not cross-reactive with non-tuberculous mycobacteria, other pulmonary pathogens, or human genomic DNA. Triggers and templates were then generated from the remaining 46 fingerprinting sites, abiding with EXPAR's general assay design rules. From the still large number of possible trigger / template combinations, several templates/triggers were manually selected for further investigation. The selected sequences were screened for performance in EXPAR, and several candidates were selected that gave promising results for further assay development. Better computational tools are still needed to accurately predict based on the sequence which EXPAR template/trigger combinations will give the best experimental results. However, the basic computational infrastructure for Fingerprinting / EXPAR assay design has been completed, and this software has been applied to identify several promising template/trigger combinations.

Natural Oils as Cancer Suppressors

Author(s): Simon J Majeno, Charmaine Ibarra

Mentor(s): Nitika S Parmar

Institution: CSU, Channel Islands, Camarillo CA

Natural compounds found in various foods have been found to have anti-carcinogenic properties. Cultural differences in dietary habits greatly impact the incidence of cancer development. We hypothesize that exotic oils and spices are likely to have compounds which are potentially capable of inhibiting a prominent pathway implicated in cancers—the insulin/mTOR (Mammalian Target of Rapamycin) pathway. The effect of 12 different oils was assessed using HeLa cells as a model system. Initial optimization involved solubility studies and dose-dependent

effects on cell viability as measured by the MTT cell proliferation assay. One of the most striking effects was observed using Menthol-Eucalyptus oil which drastically inhibited cell growth without causing cell death. Effects on mTOR signaling were monitored using antibodies to downstream effectors of mTOR such as S6 which is activated via phosphorylation when mTOR is active. Preliminary data suggests targeting of this pathway by the oil. To determine the active causative ingredient in the oil, the sample was subjected to GC/MS analysis. Major chemical components of the eucalyptus oil consisted of eucalyptol, menthol, D-limonene, 1-isopropyl-2-methylbenzene, and alpha and beta-pinene. Our future study will involve the treatment of cells with these pure compounds to assess the effects on S6 phosphorylation. In addition, studies are ongoing to explore the effects of menthol, a key ingredient of the eucalyptus oil used in this study on cell viability. Lead compounds isolated from this screen will be subsequently tested on human cancer cell lines and further derivatized to recover compounds with higher anti-proliferative activity. A screen of food oils and spices can provide valuable insights into harnessing potential anti-cancer compounds which could have significant commercial applications in the future.

Voltage Activated Currents in Zebrafish Hair Cells

Author(s): Minette Malinao, Jeanne Ngo, Thanh Sy,

Priscilla Bravo, Amber Tucker

Mentor(s): Bruce Yazejian

Institution: Mount Saint Mary's College, Los Angeles CA

Sensory neurons in the ears of vertebrates--called hair cells--detect and transduce sound, gravitational and vibrational stimuli from the environment into electrical signals. They pass on this information to higher order neurons in the brain by releasing neurotransmitters at synapses. We have begun a study to understand how the genome specifies the instructions that regulate the synaptic activity of hair cells. Inner ear labyrinths were removed from adult zebrafish (*Danio rerio*) and hair cells from the lagena, sacculus, utricle and semicircular canals were isolated. Hair cell morphological variability was observed between and within end organs. Using patch clamp methods we have recorded voltage activated currents in hair cells from all these end organs. As with the varied morphology, recordings showed that hair cells varied in their complement of voltage gated channels. SCC cells were found to express a rapidly inactivating current reminiscent of the A-current seen in goldfish hair cells. The current displays a voltage-dependent inactivation that is half-inactivated with a pre-pulse to -60 mV. The decay of the current at +50 mV was well fitted by a single exponential with a time constant of 13 msec. Recordings from some cells isolated from the lagena also showed evidence of this current but in these cells the voltage dependence of inactivation was less pronounced than in the SCC cells.

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On the other hand, lagena cells display an inwardly rectifying current that is absent in SCC cells. In addition, there appears to be a Ca^{2+} -activated outward current present in one morphological type of lagena cell but not in the others. The diversity in morphology and voltage-activated currents that we see presumably underlies different functions of these inner ear structures and cell types and may be subject to genetic control.

Humanistic Buddhism: Empowering Free Will and Reason on the Path to Enlightenment

Author(s): Natalie L Malter

Mentor(s): Dale Wright

Institution: Occidental College, Los Angeles CA

This project examines a form of Ch'an Buddhism called Humanistic Buddhism. The term Humanistic Buddhism has its origins in early twentieth century China with the radical reformist Buddhist monk Tai Xu, but the movement began to thrive over the last fifty years under the leadership of Venerable Master Hsing Yun, founder of the Fo Guang Shan Order in Taiwan. In conducting my research, I consulted works written by the Fo Guang Shan Order and about the order as well as traveled to the original Fo Guang Shan Monastery in Taiwan. In my research, I examine why Master Hsing Yun's order considers itself humanistic, and which fundamental Buddhist teachings are inherently humanistic. This project also studies the history of humanist movements beginning with Socrates through the Italian Renaissance, European Enlightenment, and current secular humanist movement in order to understand how humanist movements have viewed religion over time. While earlier humanistic philosophers appear to accept religious traditions, humanists, beginning with the Enlightenment, often reject theistic religions because of the subjugation of human beings to divine power. Current secular humanists often only address religion as theistic, and Buddhism itself continues to be ignored and misunderstood by many current secular humanist scholars. My research demonstrates that the modern Humanistic Buddhist movement does meet the criteria of 'humanistic' established by more modern humanist secularists, and transcends these criteria as well. To say that it conforms to this criteria entirely would be an over simplification of Buddhist thought and tradition, but Buddhism is humanistic in the sense that through its core teachings relating to free will and reason, it empowers humans to attain enlightenment, an end to suffering in this life. Buddhism accomplishes this through teachings such as universal Buddha nature, the bodhisattva ideal, and karma and rebirth.

Understanding Longevity through the Analysis of Elderly Brains

Author(s): Anastasia V Markovtsova

Mentor(s): John Allman

Institution: California Institute of Technology, Pasadena CA

Considering that many individuals experience memory loss and dementia with age, it is difficult to locate and study the brains of neurologically healthy individuals who lived significantly beyond the average human lifespan. Our lab was able to obtain the left hemisphere of the brain of a 104-year-old female who was in good health and had only mild cognitive slowing up to the time of her death. By performing a series of histological stains—namely cresyl violet, ferrocyanide, and Gallyas fiber—we determined the woman's neuronal count, iron deposits, and myelin patterns, respectively. The cresyl violet stain revealed an apparent abundance of von Economo neurons (VENs), neurons that possibly play a role in intelligent behavior. Stereological techniques are being used to determine whether she has more VENs than the average human, which will allow us to test the alternate hypothesis that a large number of VENs confers a survival advantage. Gallyas fiber staining has revealed global fragmentation of myelin sheath in the woman's axons, suggesting that signal movement down the axons may worsen with age. The ferrocyanide stain revealed substantial deposits of iron in the caudate-putamen complex, a region believed to influence learning. This accumulation may also be age-related. Histological data obtained from the 104-year-old woman's brain will be compared to that of younger individuals' in our lab's database.

Toward Peace: Archaeological Agreement in the Holy Land

Author(s): Rheagan E Martin

Mentor(s): Cynthia Colburn

Institution: Pepperdine University, Malibu CA

In the summer of 2008, at the World Archaeological Congress in Dublin, Ireland, experts discussed a new agreement developed by the Israeli Palestinian Archaeology Working Group. The proposal lays out suggestions agreed upon by Israeli and Palestinian archaeologists that detail what should become of the collective heritage of the holy land should a two-state peace solution be reached. Professors from the University of Southern California and University of California, Los Angeles gathered a group of experts and, with the help of a professional mediator, developed a comprehensive database of archaeological sites affected and established the terms of the agreement. Questions immediately arise concerning this agreement. In an area with fierce fighting and ancestral land disputes, why should politicians focus on archaeology? What good is an agreement contingent on peace in an area plagued by

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political stalemate and violence? I incorporate Kenneth Waltz's first level of analysis in international relations to argue that the archaeology agreement and other agreements like it have the potential to make meaningful progress toward peace and ensure the maintenance of peace once the two parties reach an agreement. Where Theodore Herzl's influential work on Zionism failed based on specificity, academic agreements focusing on a specific issue can fill in the crucial gaps that, left unspecified, would cause contention. Looking at similar academic agreements with a specific focus—such as the politics of water usage in the west bank—proves that even under hostile political circumstances, *de facto* acceptance of well thought out agreements by both parties can make real and positive changes in the lives of Israelis and Palestinians.

Enantiomeric Interactions of D, L, and DL N-Acetyl Leucine in Zeolite NaY

Author(s): Erika Martinez, Hyeran Choi

Mentor(s): Deniz Cizmecian, Robert Senter

Institution: Mount Saint Mary's College, Los Angeles CA

Solid state NMR, Thermogravimetric Analysis (TGA), X-ray diffraction, and Polarimetry techniques are used to elucidate the enantiomeric interactions of D, L, and DL N-acetyl leucine in zeolite NaY. The ^{13}C NMR spectra of N-acetyl-D-leucine and its L counterpart are identical to the spectrum of the racemic N-acetyl-DL-leucine. This indicates that N-acetyl-DL-leucine crystallizes as a racemic conglomerate where the powder consists of microcrystals of pure L or D enantiomers, rather than a racemic compound where the unit cell of the crystals contain a 1:1 ratio of D- and L-enantiomers. It could be speculated that heterodimer adsorption may be limited. The Thermogravimetric Analysis (TGA) spectra of the inorganic/organic composite show three distinct regions of weight loss, which is difficult to discern between amino acid and solvents. A new periodic spacing is detected in the composite not seen in the individual component. Polarimetry and X-ray diffraction techniques will be used to further elucidate the microenvironments of free and adsorbed amino acids.

A Comparative Analysis of Two Native Plants in a Restored and Unrestored Coastal Scrub Habitat

Author(s): Justin A Martinez

Mentor(s): Cheryl Swift

Institution: Whittier College, Whittier CA

We compared two native species in restored and unrestored coastal sage habitat in June and September of 2010. The restored area was irrigated for several years as plants established; the unrestored area had never been ir-

rigated. *Malosma laurina*, is a deep rooted shrub; previous research has demonstrated that it avoids very low water potentials by closing its stomata (Davis, 1989). The second, *Salvia mellifera*, is a shallow rooted, summer deciduous shrub that tolerates more negative water potentials than *Malosma laurina*. We measured xylem water potential, stomatal conductance, leaf area and weight, and chlorophyll content. Kolb and Davis (1994) compared *S. mellifera* to an evergreen shallow rooted shrub, *Ceanothus megacarpus* and found little difference between xylem water potentials; however, both species had significantly lower water potentials than have been recorded for *M. laurina*. In our study, *S. mellifera* individuals in the restored area experienced more negative mid-day and pre-dawn xylem water potentials than individuals in the unrestored area, but *M. laurina* individuals in unrestored and restored areas had comparable pre-dawn and mid-day water potentials. *Malosma laurina* individuals in the unrestored area had higher rates of stomatal conductance than individuals in the restored area, suggesting that individuals in the restored area limited stomatal conductance to maintain favorable xylem water potentials. The specific leaf area of *M. laurina* was almost identical at both sites, while the unrestored *Salvia mellifera* had a noticeably higher specific leaf area than the restored *Salvia mellifera*. There was a significant difference in chlorophyll content between *S. mellifera* and *M. laurina*, but there was no significant difference when restored and unrestored sites are compared to each other. These preliminary results suggest the individuals in the restored area may be experiencing increased water stress due to overcrowding, or decreased allocation to roots as a result of irrigation during establishment

Postmodern Narrative Disorder: The Assassination of President John F. Kennedy in "Libra" by Don De Lillo and "JFK" by Oliver Stone

Author(s): Michael R Martinez

Mentor(s): Roderick Hernandez

Institution: CSU, Dominguez Hills, Carson CA

This paper will discuss how "Libra" by Don De Lillo, and "JFK" by Oliver Stone depict the President Kennedy assassination. François Lyotard's discourse regarding the grand-narrative and David Harvey's concept of time/space compression correspond with the narrative instability that the Kennedy assassination represents when considering the television media and use of technology since World War II. As works of historical fiction and docudrama, *Libra* and *JFK* acknowledge "... the inability of the image to provide answers by 'filling in' what the image could not tell, and attempting to complete the fragmented images of memory." (Sturken 73). Speculation is inevitable, and the truth is a particular issue for characters in their personal "...attempts to capture an ever receding moment of origin, [in] a futile effort to call forth a missing or lacking reality..." (Wilcox 350) There are technological and media implications of this aspect in the novel and film.

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Oswald's dyslexia writing a historic diary, Jim Garrison, Nicholas Branch and Beryl's experience of the JFK assassination correspond with the relevant misguided attempts to impose narrative order upon the history of the John F. Kennedy assassination.

Oligothiophene Liquid Crystals for Photovoltaics

Author(s): Alyssa N Martinez-Finkle

Mentor(s): James Rego

Institution: California State Polytechnic University, Pomona, Pomona CA

Liquid crystals (LCs) are organic materials that possess some degree of order typically associated with crystalline solids while retaining the fluidity of a liquid. Smectic LCs self-organize into layers maintaining both directional and positional order. Organic semiconductors are receiving increased attention due to their potential application in the electronic devices such as light-emitting diodes (OLEDs), field effect transistors (OFETs), and photovoltaics (OPVs). These semiconductors utilize intermolecular π interactions to transfer charges in an applied electric field. The higher the molecular order of the organic semiconductor, the better the charge transport ($1\text{-}5 \text{ cm}^2/\text{Vs}$). Smectic phases are advantageous for charge transport due to the 2-dimensional layered arrangements of close-packed polyaromatic moieties, which should help alleviate trapping of charges due to film defects. Oligothiophenes are well known as some of the most promising of semiconductive organic compounds. We report on our current efforts toward the synthesis of oligothiophene-based smectic LCs. 2,2-bithiophene was acylated in the 2-position under Friedel-Crafts conditions and subsequently iodinated in the 2'-position with N-iodosuccinimide. Resulting methyl ketones have been successfully converted to carboxylic acids with iodine in pyridine. Ullmann-type homocoupling of iodo-acylbithiophenes facilitates the synthesis of symmetric tetrathiophene diesters, while Sonagashira coupling of terminal alkynes to the same iodides affords unsymmetrical bithiophene esters.

Teamwork and Personal Space

Author(s): Kaitlyn M Masai

Mentor(s): Seth Wagerman

Institution: California Lutheran University, Thousand Oaks CA

Human beings rely on each other to accomplish goals in almost every aspect of their life. Teamwork is often the deciding factor between success and failure. Many organizations employ team-building strategies to increase cooperation and efficiency of group members. This research will utilize a 2 (close proximity/ non close proximity) x 2 (group goal-oriented/ non group goal-oriented)

design to test the hypothesis that when personal space is decreased through a close-proximity team builder exercise with a common group goal, participants will report higher group satisfaction and demonstrate more success as a team.

MgO Composite Paints: Protecting Humans against Harmful Bacteria

Author(s): Jeanaye D Mason, David J Zuniga, Daniel E Murrieta

Mentor(s): Tanya Faltens

Institution: California State Polytechnic University, Pomona, Pomona CA

In this work, we are developing a new antibacterial paint containing MgO xerogels and aerogels. Traditional magnesium oxide (MgO) is an ionic crystalline solid with high bactericidal effectiveness. Other forms of MgO, such as amorphous MgO xerogels and aerogels, can be synthesized via the sol-gel process. These novel structures are highly porous, giving them a greater surface area and concentration of structural defects than crystalline MgO. Increasing these two factors is expected to increase the bactericidal effectiveness of MgO. A challenge we have encountered is that MgO reacts with water-based paint, causing it to prematurely solidify. To investigate the reaction of different forms of MgO with water, X-ray diffraction (XRD) analysis was performed. This analysis indicates that MgO reacts with water to yield magnesium hydroxide (Mg(OH)_2). Previous studies establishing the bactericidal effectiveness of finely ground MgO powder suspended in aqueous solution did not investigate possible structural changes of the MgO. We are currently investigating the reactions and final structure of MgO in paints and preliminary results on the structure of MgO in different compositions of paint will be presented. To address the solidification problem, we investigated two possible anti-drying agents: glycerin and methanol. We found that addition of 45-50 wt% glycerin to a commercially available water-based paint prevented the premature solidification, and report drying rates for different compositions of MgO paint. Future work will focus on evaluating the bactericidal effectiveness of different magnesium oxides and hydroxides, the details of the MgO reaction with paint, and the incorporation of MgO into acrylic or oil based paints.

Experimental Methods in Attitude Control

Author(s): Kyle Matthews, Samira Motiwala

Mentor(s): Donald Edbger

Institution: California State Polytechnic University, Pomona, Pomona CA

Implementation of cube-like miniature satellites, or Cubesats, is becoming an increasingly promising solution for low-cost, small spacecraft that have the potential to revo-

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lutionize the future of orbital systems for NASA, DoD, and private industry. Current picosatellites mainly rely on permanent magnets or magnetic coils for attitude control or lack an attitude control system entirely. Our new approach sought to mitigate the lack of attitude control actuators through off-the shelf electrical components attained by the commercial hobby industry that has mass-produced economical actuation servomechanisms for many years. An open-loop and closed-loop system was designed to control servo motors to produce rotation in 3 axes and self-correct for stabilization using gyroscope sensors. An experiment conducted in a microgravity environment showed that servo motors are capable of providing sufficient torque to rotate the spacecraft in all 3 axes.

Vulnerability of Native Caddisfly to Invasive Crayfish in the Santa Monica Mountains

Author(s): Evan G Mattiasen, Anna Chowaniec
Mentor(s): Lee Kats
Institution: Pepperdine University, Malibu CA

The introduction of invasive species to streams of the Santa Monica Mountains has drastically impacted the populations of many native inhabitants. Invasive crayfish, *Procambarus clarkii*, have had a particularly devastating effect on the stream ecology of Trancas and Malibu Creek. There are two families of caddisflies that are common in streams without invasive species, Sericostomatid and Limnephilid, each with a unique shell structure. Sericostomatid caddisflies make cases from sand and sediment particles, while Limnephilid caddisflies make cases by burrowing through leaves. However, since Sericostomatid and Limnephilid caddisflies are uncommon in streams with invasive *P. clarkii*, we are examining which group might be more vulnerable to an invasive predator. We used laboratory experiments to observe interactions between crayfish and caddisflies. The survivorship of caddisflies was recorded over time. We will determine if Sericostomatid or Limnephilid caddisflies have any pre-adaptive advantage against *P. clarkii*, and whether one species is at lower risk for predation due to a behavioral or structural advantage. Preliminary data suggest that Limnephilid larvae are more susceptible to predation by invasive caddisflies than are larvae that build their cases out of sediments.

Mug Drop: Sintered for the Fall

Author(s): Ryan J McCarty
Mentor(s): Michael C Shaw
Institution: California Lutheran University, Thousand Oaks CA

In preparation for the Fall 2010 "Mug Drop" competition hosted by the Keramos Honor Society of the American Ceramics Society, several versions of a ceramic coffee mug

able to survive impacts from drops of successive heights has been designed and synthesized. This project studies the fracture mechanics of various structural and chemical designs in order to create a "winning" mug. An optimal clay body formulation consisting of Alumina (Al_2O_3) Silica (SiO_2) was researched and selected. To increase the fracture toughness an Alumina fiber created though a sol gel process was incorporated into the base clay body. To increase the production stability a variation on the optimal clay body incorporating potassium feldspar (KAlSi_3O_8) and kaolin ($\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$) was designed. The clay body and variations where used in a sequential slip casting technique that produced a functionally gradient ceramic clay body with high resistance to impact fracture. Experimental mug designs where prototyped and the best designs where combined the compositional and structural research of the previous stages in production. The resulting product where a collection of strong ceramic mugs, each with a volume of 500-625 ml, that displayed high strength and fracture resistance properties and conformed to the mug drop competition rules. Seven mugs were tested during the competition; five fractured after dropping from 30 cm, one fractured after dropping from 45 cm and one fractured after dropping from 90 cm.

Anodic Stripping Voltammetric Determination of Copper, Lead, and Zinc in Human Hair Using a Gallium-Modified Bismuth-film Electrode

Author(s): Lauran H McCormick, Stephanie C Davis
Mentor(s): David B Green
Institution: Pepperdine University, Malibu CA

The bismuth electrode has been shown to be a suitable substitute for the mercury film electrode in stripping voltammetric analysis. We demonstrate the use of a gallium-modified bismuth film microelectrode coupled with anodic stripping voltammetry (ASV) utilized for the first time in the analysis of metal content in hair. Improved sample through-put was realized by microwave-assisted digestion of the hair samples in nitric acid and hydrogen peroxide. After buffering to pH 4.5-4.7 using an acetic acid buffer, well-defined stripping peaks were observed at -1100 mV, -592 mV, and -88 mV, attributed to zinc, either lead or iron, and copper, respectively. Quantitation was performed with results consistent with published literature methods.

Affinity Purification of Native Motors for Use in *in vitro* Activity Assays

Author(s): Jackie McCourt
Mentor(s): Matthew Berezuk
Institution: Azusa Pacific University, Azusa CA

Microtubule based motors are responsible for the bidirectional transport of macromolecules, endosomes and

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organelles. Coordination of this movement requires two or more oppositely directed motors and the cofactors that associate them with their specific cargo. The non-motor, cargo liking molecule, dyactin, has been shown to interact with both the minus-end directed motor dynein and the plus-end directed motor kinesin-2. It has also been shown that these two motors interact with dyactin at separate binding sites, opening up the possibility that kinesin-2 and dynein simultaneously bind a single dyactin molecule. To address this question we aim to purify native motors and dyactin so as to isolate binding motifs for kinesin-2 and dynein. We have set out to optimize the purification of native kinesin-2 from bovine liver through antibody affinity purification. Due to the presence of native antibodies we have followed the affinity purification by other biochemical techniques such as MonoQ FPLC and ultracentrifugation. Through optimization of the purification of these proteins we will have the means of applying *in vitro* techniques to understand the coordination between dynein and kinesin-2 for bidirectional transport.

Formation of Nanoscale Self-Assembled Complexes Employing Hydrogen Bonding

Author(s): Kelsi E McCoy
Mentor(s): Richard J Hooley
Institution: UC, Riverside, Riverside CA

The formation of nanoscale assemblies is of increasing importance to the field of functional materials, catalysis and biomimetic chemistry. Self-assembly can be exploited to form complex nanoscale structures without time-consuming synthesis. To date, most supramolecular nanostructures are created via either self-complementary hydrogen bonds or metal-ligand interactions. Our research focuses on the creation of flexible, reversible systems that allow for component exchange by incorporating both concepts in a single system. By using well known, strongly hydrogen bonding species as core components, metal coordinating groups can be attached to the ends to create the final ligand structure. Treatment of these ligands with weakly ligated metal species allows formation of supramolecular polygons, prisms and bowls. Analysis of the species created is possible *via* X-ray crystallography and NMR spectroscopy. The ligands show metal coordinating properties even in water. This is evidenced by performing NMR studies with mixtures of ligand and weakly ligated metals in water. Weakly bound ligands present on the metal before mixing are replaced with the strongly coordinating ligands in solution to produce a final nanoscale structure. The water-solubility of the complex allows for the binding of hydrophobic guests in water. Molecular modeling shows that the complex has a narrow hydrophobic interior region into which flat, ring-like structures fit. Preliminary guest targets include molecules such as benzene, xylenes, naphthalene, or toluene, which would fit within the structure and also interact with the hydrophobic interior of the complex. Our studies suggest that a flexible self-assembled

structure employing hydrogen bonding is achievable and could hold new and interesting properties for selection of guests even in aqueous environment.

Exploring Motivation Processes and Psychosocial Outcome of University Students: An Experience-Sampling Study

Author(s): Jennifer McDonald
Mentor(s): Kimmy Kee
Institution: CSU, Channel Islands, Camarillo CA

Background: Motivation processes are core components of human experience, giving our behavior strength and purpose. Although research has supported the role of motivation in academic performance of adolescents, few efforts have examined this connection in college-age populations. In addition, the relationships between motivational processes and psychosocial outcomes remain unclear. The primary aim of this study is to compare components of motivation between undergraduate students with higher levels of perceived skills and challenges (autotelic) and those with lower levels (non-autotelic). An additional goal is to explore whether motivation processes are related to psychosocial adjustment. **Methods:** Seventy-six undergraduate students have been tested for the current study. Of this sample, data on 20 subjects were used for these interim analyses. Measures of motivation (affect, arousal, concentration, satisfaction, perceived control; perceived future importance; and perceived skills and challenges) were administered using a random time-sampling, self-assessment paradigm known as Experience Sampling Method (ESM). For the ESM procedure, participants were provided with a pager and ESM assessment forms. The pager emitted random signals eight times per day for seven consecutive days. After every signal, the participants reported their motivation processes by completing the forms. Psychosocial functioning was assessed using the Social Adjustment Scale: Self-Report. **Results:** A series of t-tests indicated that non-autotelic individuals demonstrated significantly greater deficits in multiple aspects of motivation (affect, arousal, concentration, satisfaction, and perceived control) compared to their autotelic counterparts ($p < 0.05$). Also, Pearson product-moment correlations revealed that higher levels of these motivational processes were linked to better academic performance and adequate family and social relationships, with the coefficients ranging from 0.48 to 0.70 ($p = 0.05$ to 0.005). **Conclusions:** These findings could potentially expand our understanding of the role of motivational processes that are important building blocks for academic success and optimal psychosocial adjustment in undergraduate students.

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The Effects of Varying Horizontal Boundary Conditions on the Momentum Distribution and Subcritical Turbulent Transition within Taylor-Couette Flow

Author(s): Kimberly R McDonald, C J Czarnocki
Mentor(s): Michael J Burin

Institution: CSU, San Marcos, San Marcos CA

We have experimentally investigated the momentum distribution and transition to turbulence within a wide-gap Taylor-Couette flow using three different horizontal boundary conditions. End-caps between the two cylinders were wholly coupled to either the inner or outer cylinder, or otherwise split in half. By rotating only the outer cylinder we have obtained velocity data from fully cyclonic regimes using Laser Doppler Velocimetry (LDV). The subcritical transition to turbulence is clearly affected by the horizontal boundaries: end-caps that move with either cylinder yield a transition Reynolds number that is higher than when split. These results help clarify the role of secondary flows in the turbulent transition and also add to early torque-based work in this system.

Function of Organizing for America in the 2010 Midterm Elections

Author(s): Meagan M McGinty

Mentor(s): Peter Dreier

Institution: Occidental College, Los Angeles CA

The Democratic National Committee's experimental project, Organizing for America (OFA), promotes the legislative agenda of the Obama Administration. OFA demonstrates versatility and efficacy by functioning as a partner campaign for many national races in the 2010 midterm elections. OFA enhances campaign organizations by offering national leadership in developing strategy, managing new media, utilizing volunteers, and contacting voters. 2010 is the first midterm elections since the formation of OFA. In a volatile election cycle for Democrats, the performance of OFA reasonably determines the post-election organization of Congress and the future agenda of the OFA itself. The study considers how the progression of OFA's campaign influences the future of party polarization and Presidential re-election campaigns. OFA has a unique role of framing an election as an essential pickup for the party or the President instead of a candidate-centered campaign. OFA's message rallies voters and volunteers to support party identification rather than qualifications or positions held by individual candidates. OFA's message supports the President by constantly campaigning on behalf of his agenda and portraying him as the face of the Democratic Party. By contacting voters and volunteers in the midterm elections, OFA creates an updated and active database for Obama's re-election campaign. Research derives from my experience working on OFA's partner campaign for Louisiana's Second Congres-

sional District. The race offers Democrats a rare chance to remove a Republican incumbent and gain a house seat in November 2010. For this purpose, the contribution to Louisiana's Second Congressional race serves as a model for OFA's capacity to influence outcomes in high-stake campaigns. Supporting research comes from interviews with OFA staff an analysis of messaging from both headquarters and state chapters of OFA, and published research on the development of OFA.

Designing the Base Optics System for KAPAO

Author(s): Lorcan P J McGonigle

Mentor(s): Philip Choi

Institution: Pomona College, Claremont CA

We present the optical design for KAPAO, an adaptive optics camera being developed for the Pomona College 1-meter telescope at Table Mountain Observatory. Astronomical adaptive optics is the technique of measuring optical wavefront distortions caused by the atmosphere and correcting for them in real time. The "active" components of the system, which work in tandem at up to khz rates, include a wavefront sensor that measures optical aberrations, a deformable mirror that corrects for high order aberrations and a tip-tilt mirror that corrects for low order aberrations. The static components of the system, built up around these three components, take as input an f/9.6 optical beam that must be re-imaged at multiple wavefront sensing and correcting planes and then brought to a focus at two different science focal planes with minimal additional aberration. We used Zemax, a ray-tracing software package to design and optimize an optical system built around four off-axis parabolic mirrors, a series of fold mirrors and dichroic beamsplitters. The end product presented here includes the 3-d design of the system along with optical performance plots in the form of diagnostics spot diagrams. Assembly and real-world testing of our design are currently ongoing.

The Channel: Christ, Dinah Morris, and the Status of Women in George Eliot's *Adam Bede*

Author(s): Chelsea McGrath

Mentor(s): Constance Fulmer

Institution: Pepperdine University, Malibu CA

The presence of a Christ-figure in Western literature is not uncommon since the juxtaposition of Christ and a fictional character is often a suitable method of elevating that character's moral authority. To say that literary "Christ-figures" are typically men is not an oversimplification of the term. Christ was a man and through the ages, the descriptors "savior," "redeemer," "counselor," "King of Kings," "Messiah," and "God among men" have been used to describe males. If an author desires the reader to view his protagonist as the ideal man, Christ is the most

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apt comparison to draw. Although the divinity of Christ is a matter of contention for the religious and non-religious alike, it is vastly more difficult to deny Christ's faultlessness, the power of his message, and his consuming love of humankind. Working apart from gender restraints, it is conceivable to classify a female character as a Christ-figure. If an author's aim is to raise the status of women within a society dominated by men, there is no better approach than to compare her to the highest ideal of man. Victorian novelist George Eliot was an unconventional woman in a time where women were expected to be rigidly conventional. Her personal and professional life defied the place society determined for her because she believed that women, if properly educated and esteemed, could fulfill their function as essential cogs in the communal machine. In Eliot's first novel *Adam Bede*, Dinah Morris—a woman—is the ideal human, the Christ-figure. Morris is faultless, has a powerful message, and has a consuming love of humankind. Eliot sets out to prove that a woman can be just as much the moral example as the men that confine her influence to the domestic sphere.

An Enantioselective Synthesis of Cymbalta™

Author(s): Colin McKinlay, Vincent Van Rixel
Mentor(s): Donald Deardorff
Institution: Occidental College, Los Angeles CA

A complete synthesis of Duloxetine, marketed as Cymbalta™, is achieved using an enantiomerically conserved route. Cymbalta™ is a potent antidepressant which targets neural serotonin channels, making it successful at treating patients with major depressive disorder, generalized anxiety disorder, diabetic neuropathy, and fibromyalgia. However, Cymbalta™ is a chiral molecule, in which the (S) enantiomer acts as the serotonin reuptake inhibitor, while the (R) enantiomer has little biological activity. Consequently, discovering an enantioselective synthesis of this drug is highly pharmaceutically relevant in treating the aforementioned disorders. The proposed synthetic route utilizes oxynitrilase, an enzyme extracted from raw almonds to establish a chiral center on the substrate crotonaldehyde, affording an (R)-cyanohydrin. This chiral center is maintained through subsequent reactions which add various organic moieties to the molecule. In addition to the cyanohydrins, the two most synthetically critical reactions in this synthesis are a Grubbs metathesis which adds a vinyl thiophene to the substrate, and a substituted palladium catalyzed 1,3-chiral shift. These three reactions have been performed with high yields, establishing our synthetic route as a viable path leading to the final production of Cymbalta™.

The Truth About Entitlement

Author(s): Clarisse L McLeod
Mentor(s): Virgil H Adams
Institution: CSU, Channel Islands, Camarillo CA

Entitlement in adults has been associated with a number of undesirable characteristics including selfishness, narcissism, lack of agreeableness, and even criminology. In other studies, honesty has been related to altruism and competence. The present study extends this line of work by examining the relationship between honesty and entitlement. To examine this question, items were developed and a survey of community adults was conducted in a large Southern California county ($n = 1311$, Mean age = 36.9 years, age range 18–91 years). It was hypothesized that those individuals who reported a higher need for honesty in their lives would also report a lower sense of entitlement. In the present study, entitlement was measured by three subscales: selfishness, parental obligation, and social responsibility (Cronbach alpha of 0.70, 0.65, and 0.75 for selfishness, parental obligation, and social responsibility respectively). A hierarchical regression was used to assess whether these measures of entitlement could account for variance in the need for honesty beyond that associated with demographic variables of age, gender, education, marital status, and household income. The results indicated that the R^2 significantly deviated from zero ($F_{(8, 1303)} = 9.69, p < 0.001, R^2 = 0.05$). In the first step of the model, only age made a significant unique contribution ($\beta = 0.10, p < 0.001$). In the second step, all three subscales made significant contributions, collectively accounting for an additional five percent of variance. Parental obligation and selfishness were negatively related to honesty ($\beta = -0.06 \& -0.07, p < 0.05$, for parental obligation and selfishness respectfully). On the other hand, social responsibility was positively associated to honesty ($\beta = 0.17, p < 0.001$). The discussion is centered on the relationship between a need for honesty and entitlement.

Novel Approaches to the Synthesis and Purification of Water-Soluble Curcumin Analogues

Author(s): Jose M Medina, Brian Kasper, Robert Tincher, Sameh Helmy
Mentor(s): Philip Hampton
Institution: CSU, Channel Islands, Camarillo CA

Recent studies have shown curcumin's potential as a treatment for diseases ranging from various types of cancer to Alzheimer's disease. However, this potential is limited by the molecule's highly hydrophobic character and resulting poor bioavailability due to inability to cross the blood-brain barrier. This research examines the synthesis of hydrophilic analogues through alkylation with amino-bearing agents at the phenolic position. When attempts at direct alkylation of curcumin proved unsuccessful, a convergent synthesis of O-alkylated curcumin and

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curcumin analogs was examined. Endione analogs of curcumin could be produced by O-alkylation of 4-hydroxy benzaldehyde, followed by condensation with benzoyl-acetone under reduced pressure. Based on this strategy a novel synthesis and purification has been developed. This process offers the advantages of significantly improved yields and purities over the methods reported in the literature.

Narrowing in on Our Target: A Pharmacological Approach to Confirm the Molecular Target of Cone Snail Neuroexcitatory Peptides

Author(s): Karen Medina

Mentor(s): Joseph Schulz

Institution: Occidental College, Los Angeles CA

Neuroexcitatory peptides (NEX) in the A-superfamily of peptides in the venom of fish-hunting cone snails are known to cause tetanic paralysis (spastic movements due to overstimulation of neurons). The precise mechanism by which NEX peptides cause tetanic paralysis and their molecular target remains unknown. One prevalent NEX peptide in the prey-injected venom of *Conus catus* is c4a, which is similar in sequence and mass to another NEX peptide of *C. catus*, c4e. Based on previous research done in our lab, we hypothesized that a possible molecular target for NEX peptides is the persistent sodium current. In this study we used a spinal motility assay of larval zebrafish, *Danio rerio*, to compare the physiological effects of our NEX peptides with pharmacological reagents. We tested two pharmacological reagents: SKA-31, an activator of certain types of Ca^{2+} -activated K^+ channels and veratridine, which activates persistent-like sodium currents. Our data showed that at high doses SKA-31 interferes with the stimulation of the CPG and antagonizes the effect of c4a/e in zebrafish larva. This is notable because the activation of Ca^{2+} -activated K^+ channels interferes with the persistent sodium current. Our data also shows that veratridine induces low levels of c4a/e-like spastic activity at a very high dose suggesting different selectivities of veratridine and c4a/e for their targets. Veratridine is the first neuroexcitatory molecule, beside c4a/e, to induce motility in our assay. This helps to strengthen our hypothesis that NEX peptides, like c4a/e, target the persistent sodium current.

Sensor Based on Single-mode–Multi-mode–Single-mode (SMS) Fiber Structure

Author(s): Michael Medrano

Mentor(s): Ertan Salik

Institution: California State Polytechnic University, Pomona, Pomona CA

We investigated the sensitivity of an optical fiber sensor. An optical fiber is a thin thread of glass that has the ability to transmit light between two ends of fiber. The sensor we

investigated is fabricated by connecting a piece of multimode fiber between two pieces of single-mode fiber using a fusion splicer. In this Single-mode–Multi-mode–Single-mode (SMS) structure, light that travels in the single mode fiber splits its power into the two modes of the multimode fiber. Interference occurs when light transitions back into the single-mode fiber from the multi-mode one. As stress or temperature is varied, the effective refractive indices of the modes and to a lesser degree- the length of the path each mode travels must change, resulting in a change in relative phase of the modes and ultimately the transmission of light through the sensor. Two sensors were created- both with a multimode fiber length of 10 cm. Light from a broadband light source was launched into the sensor and transmission was monitored with an optical spectrum analyzer. We placed the sensors on two fiber holders mounted on translation stages in order to determine the sensitivity to stress. Temperature sensitivity was determined by placing each sensor in a water bath. We independently monitored the temperature with a platinum-resistor type temperature probe. The sensor is sensitive to both temperature and stress. Sensitivity depends upon the measurement wavelength and is greatest at a wavelength of 1523.5 nm. We have confirmed that the SMS sensor is capable of 0.5 microstrain stress resolution, which means that the sensor can detect a change of 50 nm over 10 cm length. Our results for temperature resolution will be presented at the conference.

Trapped in the Mirror: The Use of Self-Referential Metaphor in Chesa Boudin's *Gringo*

Author(s): Dawn Megli-Thuna

Mentor(s): Brian Rasmussen

Institution: California Lutheran University, Thousand Oaks CA

Chesa Boudin's *Gringo* is the author's personal narrative of his journeys in South America beginning in 1999 and spanning the next ten years. Written as an autobiographical travel memoir, the text is dominated not by character profile and development, but by political discourse and commentary. This deflection away from his personality is not to the neglect of his personal portrayal. According to theorist of autobiography James Olney, "the self cannot be known in and of itself," rather, "expresses itself by the metaphors it creates and projects, and we know it by those metaphors." Rather than depicting himself through the typical tropes of narrative exposition, Boudin invokes the language of inequitable global relations and historical economic exploitation to explore the terms of his own identity, purpose, and place within these relations. The term "gringo" functions on the personal level as a metaphor for Chesa's alienation, isolation, and apartness, while inviting references to broader topics of division, disjoint and journey. By interweaving the arc of his personal development into the fabric of Latin American social realities, Chesa embeds his personal portrait within the matrix of

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Latin American cultural history, expanding his personal themes of development to an international frame of reference. This layering of personal and national development is significant because it enables the writer to portray the self through objects other than its own, while the writing of the self provides a hermeneutic through which to understand the larger context, not just of this text, but perhaps the world of poverty and inequity beyond it.

Rationally Insane: An Exploration of the Euripidean Effect

Author(s): Alyson L Melzer

Mentor(s): Damian Stocking

Institution: Occidental College, Los Angeles CA

Throughout the extensive history of classical studies, Euripides has been frequently labeled a radical who brought the noble tradition of Greek tragedy to an end with his avant-garde methods. He is accused by such prominent figures as Nietzsche and Aristophanes of destroying tragedy with sophistic rationality. The sophists were philosopher-teachers who inspired many 5th century Athenians to abandon their conventional beliefs, and instead use logic and persuasion to justify their individual desires. Euripides frequently used their trademark rhetoric for his characters who are able to rationalize their horrendous actions, as Medea does before murdering her children, or as Orestes does after murdering his mother. This disturbing juxtaposition of logic and amorality often leads critics to assume Euripides endorsed the sophists and that his work is beyond the definition of "authentic" tragedy. However, it can be argued that Euripides was actually fulfilling the function of tragedy under new cultural conditions. Euripides depicted a world where everything was justifiable and morally available because of sophistry. When an individual believes that anything is within his reach, he begins to see himself as an autonomous entity with no need of others. The fundamental function of tragedy, according to Prof. Damian Stocking, is to disrupt this vision of immanence and allow for the formation of community. By displaying the tragedy of autonomy through the use of sophistic rhetoric, Euripides disrupts the sophistic self and allows for the possibility of this necessary community.

"We're No. 1!" Dire Prospects for America in the Digital Age

Author(s): Stephanie N Mensah

Mentor(s): Kurt Meyer, Joon Kil

Institution: Irvine Valley College, Irvine CA

Thomas Jefferson cautioned that "a democratic society depends upon an informed and educated citizenry." So too, Jefferson might well have said, does an economically stable and prosperous society. The advanced world is fast becom-

ing a knowledge-based economy, leaving those who lack the necessary intellectual skills unable to compete for well-paying jobs, thereby stultifying their nations' economy and political influence. While students in much of the advanced world are entering graduate schools in significant numbers, doing research and creating new knowledge and products, fewer Americans are doing the same. Some studies by prominent think-tanks suggest that the growing gaps in educational achievement between America and other leading nations impose the "economic equivalent of a permanent national recession," and assert that this is a threat to American competitiveness and national security. This study investigates these claims by exploring the relationship between two reciprocal variables – Generation Y's use of the Internet and the self-indulgent, narcissistic behavior that characterizes adolescents of every generation. The relationship between the two variables appears to be the driving force behind rising levels of a-literacy (or voluntary illiteracy, specifically as it pertains to book readership and declining levels of reading comprehension) in America. Many scholars argue that a-literacy is breeding a generation that lacks critical thinking skills, is unable to synthesize information or think historically, and that shows no real desire to make use of the vast online stores of history, literature, and culture. Through personally conducted, non-scientific online surveys of the habits and attitudes of Generation Y, and interviews of academics, politicians, and businessmen, this study probes the extent to which Internet usage by Generation Y correlates to a rise in a-literacy and a decline in critical thinking skills, as well as the implications of that correlation for the sustainability of America's economic prosperity and political power.

BP p.l.c.: External Environment, Industry Analysis, and Company Assessment

Author(s): Borislav Merinov, Andy Bua, Joon Kim, Kirk Nankivell, Cory Nolan, Bumjoon Suh

Mentor(s): Venkatachalam Seshan

Institution: Pepperdine University, Malibu CA

Increasing oil prices, prolonged economic downturn and political conflicts have a strong effect on global economy. In 2009, after several years of steady growth, the global Energy and Oil & Gas Industries shrank by 3.5% and 3.1% respectively. Currently the Oil & Gas Industry market is recovering and accelerating at compound annual growth rate of 8.5%, and is expected to reach a value of \$3,193 billion by the end of 2014. Global oil and gas market is characterized by the presence of large, diversified international companies with highly vertically integrated operations throughout oil exploration, production, refining, transportation and marketing. These giant companies act as buyers and sellers within different segments creating significant barriers to entry. The Industry has a direct impact on the global economy and plays a crucial role in our everyday life. As such, it is important for the companies to assess the External Environment in order to secure Inter-

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nal stability and explore future growth. BP is currently the third largest company in the Energy Industry with a global market share of 9.0%. The company's operations primarily include the exploration and production of gas and crude oil, as well as the marketing and trading of natural gas, power, and natural gas liquids. This Undergraduate Research Project takes a closer look at the company's 3 reportable business segments: Exploration and Production, Refining and Marketing, and Other Businesses and Corporate. BP's future depends on ability to maintain and improve the efficiency of business operations, advancements in technology, exploration of new markets and implementation of successful strategies.

Screening to Determine the Aggregation Prone Regions of the Parkinson's Disease-Linked Protein α -Synuclein

Author(s): Michelle E Metchikian, Jose F Dominguez

Mentor(s): David A Moffet

Institution: Loyola Marymount University,

Los Angeles CA

The aggregation of the protein α -Synuclein is believed to be a major contributor in the development of Parkinson's disease. The exact role of α -Synuclein in the development of Parkinson's disease is still unclear; however, amyloid aggregates of this protein are known to be highly toxic to neuronal cells. The death of these cells appears to ultimately lead to the development of Parkinson's disease. We describe the construction of an Enhanced Green Fluorescent Protein (EGFP) conjugate to α -Synuclein for detecting either soluble or aggregate forms of this amyloidogenic protein. Using random mutagenesis to build a library of α -Synuclein mutants, we identified many mutations that lead to aggregation-resistant variants. The compilation of these results indicates the most important aggregation-prone regions of α -Synuclein.

Mechanical and Structural Analysis of Western Fence Lizard Eggs

Author(s): Sam Meyer, Johnson Qu, William Villagomez

Mentor(s): Stephen Adolph

Institution: Harvey Mudd College, Claremont CA

Most lizards lay eggs that absorb water from the soil; these eggs can expand up to 2 or 3 times their original mass during the incubation period. The flexible eggshells must stretch enough to allow this expansion but also be strong enough to not break under the pressure of the growing embryo. We studied the material properties of western fence lizard (*Sceloporus occidentalis*) eggs. We hypothesized that the mechanical properties of the eggs would change over the first two weeks of growth, after which the egg stops growing significantly. Eggs were collected and mechanical properties were analyzed by uniaxial testing

each week during the first two weeks of growth. During development, the eggs' Young's modulus and ultimate tensile strength both increased by 50%, while the strain at failure decreased by 20% ($P < 0.05$). Shortly after the eggs were laid, we found an average Young's modulus of 5.6 MPa, a maximum tensile stress of 3.5 MPa, and an average strain of 72.2% before failure. These properties dictate the rate at which water will enter the egg, and how much water an egg can hold before failure. The structure of the eggs was also examined. Using scanning electron microscopy, we observed that eggshells have crystalline and fiber composite structure with several different layers. Raman spectroscopy revealed that the crystals are calcite (a calcium carbonate mineral). Our uniaxial strain tests confirmed this by showing a stress strain relation similar to a rubber crystal composite.

Dispersion Model Improvement for Distributed Generator Emissions

Author(s): Manuel F Michel, Annemarie Fata

Mentor(s): Marko Princevac

Institution: UC, Riverside, Riverside CA

Increasing energy demand and cost are major concerns for southern California businesses. To be able to continue with normal operations during blackouts, many institutions, like hospitals, are equipped with smaller power generators known as distributed power generators (DG). Although this solves the problem of power dependency, these generators may create localized air quality problems. Since DGs are situated in urban environments, the exhaust from DGs may be harmful to the public in close range. In order to predict the effects a DG would have on its surroundings, dispersion models are used. These models attempt to predict how the exhaust plume will spread. The dispersion model that is recommended by the United States Environmental Protection Agency was designed for elevated emissions from large, centralized power plants. This model does not accurately describe the ground concentrations associated with DGs in urban areas, where buildings have a significant effect on dispersion and emissions are released in an inhomogeneous boundary layer where the meteorology varies substantially with height. Therefore there is a need for methods to improve the aforementioned dispersion model so it can account for these complexities. Here we are reporting on experiments that have been done in the Laboratory for Environmental Flow Modeling (LEFM). In LEFM we modeled different meteorological conditions, DG positions, building configurations and buoyancies of the emissions in a water channel. Mixture of water, alcohol and fluorescent dye were used to simulate pollutants of different buoyancies. The average behavior of the plume was recorded through the long exposure imaging of the fluorescent dye released from the modeled DG. Using this technique, plume rise associated with release of pollutants from DGs under different conditions has been measured. Results of buoyant plume rise above different

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urban like geometries will be presented and discussed.

Extraction of Copper, Cadmium, and Lead from Seawater Samples Prior to Anodic Stripping Voltammetric Analysis Utilizing the Gallium-Modified Bismuth Film Electrode

Author(s): Michelle A Miguelino

Mentor(s): David B Green

Institution: Pepperdine University, Malibu CA

The gallium-modified bismuth film electrode (GaBFE) has been shown to be an excellent alternative to the mercury film electrode for anodic stripping voltammetric (ASV) analysis of a number of metals, including copper. However, in the presence of as little as 20 mM chloride, the benefit of the BFE disappears making the electrochemical analysis of copper in samples of high ionic strength, such as seawater, difficult. We present the construction of a simple extractor consisting of Ambersorb XAD-4 resin impregnated with 1-(2-pyridylazo)-2-naphthol (PAN) and the results for the ASV analysis of copper, cadmium, and lead extracted from deionized and synthetic seawater samples after isolation using the extractor. The extractor gives consistent and linear recovery of lead and copper ions when desalting 10mL samples with concentrations from 10-50 ng/mL in each metal. We also demonstrate linear calibration curves for 1-5 ng/mL Cu and Pb solutions after a 10x enrichment when the extractor is utilized for metal preconcentration. The extractor was used to prepare seawater samples collected from Marina Del Rey Harbor, California, as part of a marine water quality survey. Through standard additions, we demonstrated a 12 to 15 ppb concentration of copper after extraction.

Radio Controlled Vehicle with an Attached Self-Stabilizing Platform

Author(s): Eric Miranda, Davis Nguyen, Peter Wang

Mentor(s): Norali Pernalete

Institution: California State Polytechnic University, Pomona, Pomona CA

Problem Statement: Transporting objects or substances that might be hazardous to deliver could be a disaster while traveling on rough terrain that requires stability. A Radio Controlled Vehicle with an attached Self-Stabilizing Platform was designed to assist to this current problem.

Methods: The project consisted of two separate systems: a Radio Controlled Vehicle (RCV) and a Self-Stabilizing Platform (SSP). The RCV consisted of two DC motors, a Quadruple Half H-Driver (QHHD), an Arduino with Xbee-shield, two Xbee's, a wireless router, a PC, and an iPhone. An iPhone can establish communication to a PC using the Open Source Control protocol while being on the same wireless network. In LabVIEW, a UDP receiving block is used to acquire commands from the iPhone. After

processing, sub-commands are sent to an Xbee through RS232. The Xbee wirelessly transmits the sub-commands to an Xbee located on the vehicle for the Arduino to control two DC motors using a QHHD. The SSP system consisted of an MMA7260QT XYZ-axis accelerometer used as a tilt sensor that is attached horizontally to the platform, an Arduino Duemilanove board, four 12V DC motors, and two QHHD. The Arduino's microcontroller reads the analog signal for the X- and Y-axis from accelerometer then converts the signals to digital and stores them as reference values. The microcontroller periodically reads the accelerometer's output signals and subtracts them from the reference values. Now the accelerometer can detect eight possible tilt positions using Cartesian Coordinate System which will allow the microcontroller to activate the corresponding DC motors using the H-bridges and PWM signals to oppose the tilt, therefore, the platform returning to horizontally stable. *Conclusion:* Combining two systems allow objects to be transported through rough terrain at an inclination with an iPhone without worrying that the object will spill or fall off the platform.

An Historical Critique of an Historical Critique: Edith J. Simcox on Ancient Egypt

Author(s): Ashley C Mobley

Mentor(s): Constance Fulmer

Institution: Pepperdine University, Malibu CA

Victorian author Edith J. Simcox (1844-1901) published the two-volume *Primitive Civilizations, or an Outline of the History of Ownership in Archaic Communities* in 1894. This study looks at the work within its historical context. As a feminist and an advocate of equality, Simcox proclaimed the legitimacy of the then-subjugated Egypt and in doing so promoted the equality of and respect of all subjugated, colonised, and non-Western peoples. She effectively catalogues the histories of the world's ancient civilizations by emphasizing the ownership of property. She wrote to a society which neither fully understood the value of women nor considered women as being equal to men. Most Victorians viewed all non-Western civilizations, including Egypt, as being inferior in all capacities. The style and content of Edith Simcox's book challenged these and other of Victorian society's ideals, establishments, and norms. Simcox critically responds to the Victorian era's materialism, its view of women as property instead of property owners, and Britain's unethical involvement in Egypt by using Ancient Egypt as her first example of how a society should handle ownership and the rights of women.

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Towards Parallel Control of Biomolecular Function by Addressable Photocleavable Surfaces of DNA

Author(s): Allen Mok

Mentor(s): Philip Lukeman

Institution: California State Polytechnic University, Pomona, Pomona CA

DNA-based nanotechnology (DBN) utilizes the tools of biotechnology to control the construction and manipulation of matter at the nanometer scale. DBN enables the construction of nanoscale switches that can control covalent chemistry, operate autonomous molecular machines, modulate protein and aptamer binding interactions and act as logic gates. These switches are currently controlled by manual addition of solutions of DNA ‘set’ and ‘fuel’ strands. Manual addition of these strands limits the complexity of DBN-based sensing and computing devices, as it is difficult to multiplex. We describe progress towards a different approach: using solid surfaces that display an array of sterically inaccessible DNA strands that can be arbitrarily released into solution and activated for switching by spatially controlled photocleavage. We outline successful construction of a model switching system, a non-radioactive methodology for quantifying the set strands released from the surface, functionalization of surfaces along with preliminary demonstrations of photo-controlled switching.

The Effects of Nutraceuticals on the Proliferative Activity of Aging CD4+ and CD8+ T Cells

Author(s): Brenda M Molgora

Mentor(s): Hector F Valenzuela

Institution: Whittier College, Whittier CA

When not affected by disease or abnormalities, most human cells have the ability to replicate and divide in order to maintain a consistent number of healthy, specialized cells within the body. Cells can only replicate a certain amount of times before reaching their limit, known as cellular senescence. Constant replication of cells causes telomere length to decrease at a rapid rate. This progressive shortening of telomere length is therefore one cause of cellular senescence. Reverse transcription and extension of telomere DNA, which is the body's way of combatting this shortening of length, is caused by the presence of telomerase. Unlike most other cells found in mammals, T cells upregulate telomerase upon activation by invading pathogens. The extension of telomere length allows the T cell to delay cellular aging. However, as the organism ages, telomerase concentrations are reduced even when T cells are activated. Therefore, the search for compounds that will upregulate telomerase activity in aging T cells is desirable. Studies have shown that certain nutraceuticals have been found to aid in preventing certain diseases and ailments that occur with age and have been found to

increase and extend the lifetime in which telomerase activity occurs within cells. This study tests resveratrol and resveratrol analogs on the effects of T cell longevity. The nutraceuticals were specifically tested on the effects of T cell proliferation (both CD4+ and CD8+ T cells), telomerase activity (by RT-PCR), CD28 cell surface marker (by flow cytometry). Our results demonstrate that resveratrol and its analogs all had strong anti-inflammatory effects on both types of T cell populations as demonstrated by reduced cell proliferation, reduction of telomerase activity and downregulation of CD28 expression. Although we did not observe any cellular proliferative increases, the strong anti-inflammatory properties of these nutraceuticals may have other benefits not tested here.

Waiting to Begin: Procrastination and Self-Esteem

Author(s): Blanca A Moncayo

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

Previous research on procrastination has examined its relationship to self-esteem (Charlebois, 2007). Procrastination was separated into two types; decisional and behavioral, but Ferarri in the end, found that both types of procrastination “separately and combined were related to low self-esteem” (1994). Others demonstrated that those with high “self-handicapping behavior were significantly more likely to engage in the strategy of procrastination” (Beck, 2000). The present study aims to examine high versus low self-esteem as they relate to procrastination and further examines the aforementioned research by focusing on the Latino community. The study consisted of a sample of community dwelling adults ($n = 101$) residing in Southern California. The hypothesis of this study is that there is a difference between those with high self-esteem versus those with low self-esteem and their inclination of reported procrastination in the Latino community. Results supported the hypothesis in that respondents with high self-esteem are less likely to procrastinate than those with a low self-esteem.

Comparison of the Temperature Derivatives of Elasticity for Polycrystalline and Single-Crystal Enstatite

Author(s): Jacob G Montague

Mentor(s): Donald G Isaak, Gabriel Gwanmesia

Institution: Azusa Pacific University, Azusa CA

Reliable information on the elastic properties (bulk and shear moduli) of various minerals is important for estimating the composition of Earth's mantle. In general, a material's elastic properties, including their temperature and pressure dependences, are experimentally determined. These results are compared with

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Earth's elastic profile developed from seismic studies to determine candidate mineral assemblages for the deep Earth. Sometimes, only polycrystalline materials are accessible for experimental examination. For example, wadsleyite, a high-pressure phase of olivine, is an important candidate mineral in Earth's mantle, but macroscopic quantities are available for study at ambient pressure only in polycrystalline form. Some investigators have recently questioned the reliability of data on the temperature dependences of elasticity for minerals when measurements are made at ambient pressure on polycrystalline rather than single-crystal specimens. In order to understand what differences, if any, might arise between ambient pressure elasticity measurements on polycrystalline and single-crystal specimens at elevated temperature, we have examined the elastic properties of a polycrystalline enstatite specimen fabricated by hot-pressing techniques. Enstatite is compositionally close to wadsleyite, but it is available in both single-crystal and polycrystalline form. By using resonant ultrasound spectroscopy (RUS), we measured the elastic properties of polycrystalline enstatite from 295–640 K during four temperature excursions. Elasticity data were retrieved while heating and cooling during each temperature excursion. Results from these experiments will be presented and carefully compared with our previous elasticity data obtained on single-crystal enstatite. Our preliminary analysis of the new polycrystalline elasticity data at elevated temperature indicates good agreement with single-crystal enstatite, provided residue materials, such as water, from the fabrication process are eliminated from the polycrystalline specimen. These new results suggest reliable results for the temperature dependence of elasticity at ambient pressure can be obtained when only polycrystalline specimens are available. (Done in collaboration with Gabriel Gwanmesia, Delaware State University)

Imaging DNA Microarrays with a Phase-Modulated Ellispometric Scanner

Author(s): Estuardo Monterroso

Mentor(s): Feimeng Zhou

Institution: CSU, Los Angeles, Los Angeles CA

Rapid, accurate, and label-free detection of selected agents is highly desirable for disease diagnosis and drug development. In this presentation, the principle behind and instrumentation of a phase-modulated ellispometric scanner (PMES) will be described. The PMES technique was applied to the label-free detection of DNA hybridization reactions in a flowing liquid stream. Specifically, a DNA array consisting of single-stranded DNA (ssDNA) probe molecules were immobilized onto Si chip surfaces by spotting amine-modified oligonucleotides to silanized Si wafers. The probes were then characterized with the PMES, which is capable of resolving thickness variation as small as 0.03 μm. The advantage of the PMES technique is that it allows for the label-free detection of DNA hy-

bridization in liquid. By mounting the probed chips to a homemade cell and scanning the surface of the chip, the spots covered by the probe molecules, before and after hybridization, can be imaged in real time. Probe concentration of 500 nM was used for the microarray formation and a sample DNA concentration of 100 nM was used for the hybridization reaction. The potential application for rapid and high-throughput detection of bacterial cDNA molecules will also be discussed.

A Governess and a Chauffeur

Author(s): Jessica P Montoro

Mentor(s): Linda Palumbo

Institution: Cerritos Community College, Norwalk CA

In Charlotte Bronte's *Jane Eyre* and in Aravind Adiga's *White Tiger*, the protagonists mirror one another, as they both battle the inner and outer conflicts of restricted societies in which institutional and familial oppression seeks to defeat them. Jane Eyre finds herself battling between chaotic rebellion and quiet submissiveness, yet manages to find a steady balance within her class divided world by the end of the novel. On the other hand the witty, dark character of the *White Tiger* practices complete submission and fulfills his master's every demand, all while plotting his boss' cold and abrupt murder. Balram Halwai's character encompasses the social dynamics of India, highlighting the confinement within the country's class divisions and the corruption attendant upon globalization. The Creole and Indian subtext in *Jane Eyre* with Bertha and Rochester's characters reflect Jane's ungoverned passions. This draws a parallel with Jane Eyre's occupied and preoccupied consciousness restraint at Rochester's Thornfield Hall. The exploitation of the middle class is seen in *White Tiger* via Balram's emails with Wen Jiabao along with his other business endeavors with other countries. In this paper, textual evidence, literary criticism and research in colonial and post-colonial studies will be applied to further illustrate how the social contexts of both *Jane Eyre* and *White Tiger* generate conflict within and among characters and contexts, forever creating a bond between these two literary works.

The Pursuit of Diffucult Goals

Author(s): Adrienne E Moore, Nick Stauner, Michael Boudreaux

Mentor(s): Daniel J Ozer

Institution: CSU, Dominguez Hills, Carson CA

The study of individual differences has long been a dynamic force in predicting behavior (Ozer & Benet-Martinez, 2006). Although the development and use of the Five Factor Model of Personality is useful in assessing personality traits, a new wave of theorists suggest alternative methods of assessing personality, arguing personality

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is much more than traits alone (McAdams, 1995). Indeed, interest in the development of valid and reliable methods of personality assessment is a key stimulus in the study of individual differences. Moreover, developments in studies of goal pursuit and motivation have generated a new methodological framework for personality research. In the present study, relations among individuals' goals and the Big Five personality traits were measured in a sample of 153 participants. A free response method was used to obtain ten goals from participants; goals were then categorized into a goal taxonomy for college students (Kaiser & Ozer, 1997). Participants also rated their goals on difficulty and stress, as well as the likelihood of success in attaining their goals. Mean ratings of difficulty, stress, and success were used to determine which goals were most difficult, stressful, and least likely to attain. Correlations between participant mean goal ratings and Big Five trait scores were obtained to evaluate the relation between goals and traits. Neuroticism was positively associated with goal difficulty and stress, and negatively with the likelihood of success. Conscientiousness was positively associated with the likelihood of success, and negatively associated with goal difficulty. The data suggest that individual goals are an effective way to predict personality traits, the experience of goals, and behavior patterns.

Stress Levels within the Latino Community

Author(s): Jessica L Morales

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

The Latino population has increased over the past decades in the United States (Torres, 2010). Due to this growth, it is important to study the factors that influence psychological difficulties among this community (Torres, 2010). Previous research has examined post-traumatic stress disorder within the Latino community (Elsenman et al., 2008). There is also evidence that women are more likely to have negative reactions to life events (Thoits, 1982). The present study examines the difference between men and women regarding stress levels within the Latino community. Utilizing a sample of community dwelling adults drawn from Southern California, this study was based on analyses from a sub-sample of the larger survey ($n = 316$). It was hypothesized that females had higher stress levels compared to males among Latinos. Results indicated that contrary to the hypothesis, it was males who were more stressed overall as well as within the last month. Interestingly enough, females were significantly more likely to use humor as a coping mechanism while males did not. The discussion centers on individuals' stress levels in relation to well-being.

Gases vs. Particles: What's Causing Secondary Organic Aerosol Formation?

Author(s): Faith Morel

Mentor(s): David Cocker

Institution: UC, Riverside, Riverside CA

Secondary organic aerosols (SOA) are an important factor in urban pollution, health, visibility, and climate change, which are escalating problems in our current world. This project addresses the following questions: What is causing SOA's in the atmosphere, what are the different chemical pathways to particle formation, and what are the parameters related to SOA formation. Aromatic precursors including *m*-xylene are known to form SOA. At the University of California, Riverside, an environmental chamber that is used to investigate particle formation has conducted over 400 *m*-xylene SOA experiments. After compiling the immense database of the experimental data, an aerosol yield curve was generated, demonstrating that the traditional 2-product empirical fit model used widely in atmospheric modeling was insufficient to describe the variability of the data. It was found that the aerosol formation for all experiments did not commence until NO_x was severely depleted. However, the statistical correlation was not significantly improved once the aerosol formation after NO_x depletion was investigated. A semi-quantitative result was found that shows that SOA formation potential for the same amount of *m*-xylene increased for systems with elevated hydroxyl radical concentrations, lower temperature, and lower $\text{NO}_x:\text{VOC}$ ratio, while humidity had little impact on SOA formation. These trends and their impacts on SOA formation from aromatics will be discussed in this presentation. This research will explain some of the chemical pathways leading to increased particle formation in the atmosphere and will be the basis for various new experiments concerning what connects hydrocarbon decay to SOA formation, and furthermore what can be done to stop it from forming.

Factors that Constrain How Children Reason about Magic

Author(s): Caitlin Morgan

Mentor(s): Andrew Shtulman

Institution: Occidental College, Los Angeles CA

The purpose of this study was to determine whether pre-school-aged children use their knowledge of everyday causal principles to interpret events that explicitly defy those principles – i.e., magical events. Participants were children between the ages of four and five, who were old enough to understand the task demands but not old enough to have had significant exposure to the fantasy/magic genre. They were shown pairs of spells depicted visually on index cards and asked to sort them into one of two buckets: an "Easy" bucket, labeled with a picture of Harry Potter, and a "Hard" bucket, labeled with a picture

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of Dumbledore. The children sorted 18 pairs of spells, 6 involving physical principles (e.g., a spell for making a basketball float in the air vs. a spell for making a bowling ball float in the air), 6 involving biological principles (e.g., a spell for turning an adult into a teenager vs. a spell for turning an adult into a baby); and 6 involving psychological principles (e.g., a spell for making a person smile vs. a spell for making a person laugh). Children, like adults, demonstrated a statistically reliable sensitivity to the spells' implicit causal ordering, judging spells that represented a greater departure from the status quo as more difficult to perform. Although children's discriminations were less robust than adults, they were significantly above chance in all three domains, implying that causal expectations guide our interpretation of magical events from an early age.

Geographic Variation of A-Superfamily Venom Peptides in *Conus catus*

Author(s): Michelle Morioka
Mentor(s): Joseph Schulz
Institution: Occidental College, Los Angeles CA

Conus catus is a venomous fish-hunting cone snail that uses an extremely rapid prey-capture mechanism that involves extending its proboscis, quickly shooting its radular tooth into the fish, and injecting venom through the tooth into its prey. One major group of venom peptide encoding sequences is the A-superfamily, which includes α -conotoxins and neuroexcitatory peptides. α -conotoxins inhibit acetylcholine receptors and cause flaccid paralysis while neuroexcitatory peptides cause titanic paralysis. Neuroexcitatory peptides are the most active components in *C. catus* venom, and their molecular target is currently under investigation. Preliminary data indicated that there might be geographic variation between Samoan *C. catus* and Hawaiian *C. catus*, thus mature toxin sequences from the Samoan snail were compared to those from the Hawaiian snail to determine whether geographic variation of the peptide encoding sequences exists in *C. catus*. Using selective primers, A-superfamily encoding genes were PCR amplified from Samoan *C. catus* gDNA before being cloned and sequenced. After looking at 128 sequences, I found three α -conotoxins in common with Hawaiian *C. catus* and one novel α -conotoxin not found in Hawaiian *C. catus*. In addition, I have found two neuroexcitatory peptides that are also in Hawaiian *C. catus*, and one neuroexcitatory peptide not found in Hawaiian *C. catus*. I have also found support for a new subfamily of neuroexcitatory peptides. These data suggest that there is geographic variation in the venom peptide encoding sequences in *C. catus*, thus there could exist a greater number of biologically active peptides. These peptides could potentially be used for therapeutic purposes or reagents for basic biology research.

Beyond a "Woman's Issue": Men & the Prevention of Gender-Based Violence

Author(s): Jessica C Moronez
Mentor(s): Anjana Narayan
Institution: California State Polytechnic University, Pomona, Pomona CA

Gender scholars have generally reflected on theories of male violence against women based on the literature regarding males as perpetrators, but few studies have focused on men as advocates against violence. Studies regarding the construction of masculinities have often ignored the agency of men to define their own identity without subscribing to societal norms of masculine ideals. This study suggests that men are active agents in defining and performing diverse masculine identities relating to the prevention of gender-based violence. By redefining masculinities, men are able to discuss and participate in the prevention of violence against women on a forum that depicts anti-violence as a collective effort among sexes rather than a "woman's issue".

Critical Discourse Analysis of the Representation of Diversity at Seaver College

Author(s): Nicolette Morrow
Mentor(s): Juanie Walker
Institution: Pepperdine University, Malibu CA

The purpose of this study was to conduct a critical discourse analysis of organizational artifacts about diversity at Pepperdine University. The research question that guided the study was, "What are the tacit messages imbedded in the discourse?" The team examined forms of diversity using Pearce's communication forms (ethnocentric, monoculture, modernistic, cosmopolitan; see Grimes & Richard, 2003) in order to understand the representation of diversity in university, student, and faculty artifacts about diversity. Data consisted of university diversity statements, written literature from student clubs and Social Action And Justice (SAAJ), and faculty writings about diversity at Pepperdine. Findings provided insights about the forms and content of communication used to represent diversity. Recommendations are made for ways to attend to construction and deconstruction of diversity messages.

Optimizing Upscaling of Organically Modified Silicates (ORMOSILS)

Author(s): Jillian S Z Morse, Jem de los Reyes
Mentor(s): Winnie Dong, Tanya Faltens
Institution: California State Polytechnic University, Pomona, Pomona CA

Organically modified silicates (ORMOSIL) are being synthesized using the sol-gel method. This method cre-

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ates a composite material which, when dried results in an aerogel or a xerogel. In previous experimentation, the composite aerogels had forty percent higher absorption than that of commercial fiberglass. This absorption is possible because the ORMOSIL has a lower bulk modulus than a pure silica network which increases the viscoelastic dissipation of sound. Two primary reactions are occurring in the sol gel synthesis of the ORMOSIL. These two reactions are hydrolysis and condensation. Variation of the reaction conditions (the ratio of water to TEOS, the catalyst type and concentration, the solvent, the temperature and the pressure) cause modifications to the structure of the ORMOSIL. This fact stimulates curiosity about the reaction itself and the relationship of the structure to the absorption capabilities of the ORMOSIL. Homogeneity of samples decreased when sample size increased, leading to investigation into methods to increase homogeneity of the reaction by adjusting solvent content. Qualitative characterization of the material is attained by means of visual inspection and IR-spectroscopy. Completely homogeneous samples were created by variation of solvent content. Future characterization of the structure of the material will include testing by means of BET and SEM.

Creating a Hydroxyapatite Scaffold to Improve Mechanical Strength and Porous Structures to Ensure Successive Cell Proliferation

Author(s): Kao Tang Ying W Moua

Mentor(s): Michael Shaw

Institution: California Lutheran University, Thousand Oaks CA

Our project focused on exploring the relationships between the microstructure and compressive fracture strength of porous hydroxyapatite, a ceramic material with similar properties to the human bone. In turn, controlled porosity was introduced through fugitive phase processing via potato starch granules. The starch particles are known to oxidize during sintering, leaving behind an interconnected network of pores. The combination of hydroxyapatite, potato starch and binder enabled us to construct a green body that sintered properly under a strict firing protocol. Volume, pore size, sintering temperature differentiation and density all varied as we changed the compositional makeup. Initial experiments established the basic firing profile, to temperatures of 1050 °C, and resulted in sintering behaviors of the raw hydroxyapatite material. The microstructure of the sintered, homogeneous hydroxyapatite was examined using the scanning electron microscopy (SEM). Specifically, the scaffolds were imaged to reveal their surface structure, initial pore size and overall density. For all specimens, after the images were obtained, the uniaxial compressive strength of the scaffolds was measured using established techniques. Finally, the fracture surfaces of the compressive strength specimens will be presented in a subsequent study imaged via SEM to determine the primary mode of damage.

External World Skepticism

Author(s): Michael Anthony Moval

Mentor(s): Charles Wallis

Institution: CSU, Long Beach, Long Beach CA

Philosophers since ancient Greece have forwarded and debated various skeptical theses in their writings. Contemporary philosophers continue to forward and debate vibrant and compelling writings on skepticism. The most common form of skepticism considered in contemporary academic philosophy is called "external world skepticism". The skeptical argument seeks to deny claims that we know about the external world on the grounds that to know of the external world one must show that other possible explanations of our experiences must be known to be false. In my thesis, I propose to explore some well-known arguments for (and against) external world skepticism and, in so doing I will offer my own counterarguments against external world skepticism, which may or may not be supplemented by the arguments against external world skepticism discussed therein; more broadly I will reject the presuppositions of the skeptic's arguments developing a principled criticism of those presuppositions recently attributed to Quine. As aforementioned, I propose to explore some historic arguments for external world skepticism. Primarily, my theses explore arguments from two historic periods i.e. Early Modern Western Philosophy and 20th Century Analytic Philosophy. My discussion of external world skepticism in Early Modern Western Philosophy will draw specifically, but not exclusively, from the philosophical corpuses of Hume, Berkeley, and Descartes. In regards to my later discussion concerning 20th Century Analytic Philosophy, I will mostly be concerned with Putnam's brain in a vat thought experiment and Moore's *A Defence of Common Sense* and *Proof of an External World*.

Central Nervous System Expression of Myostatin in Genetically-Modified Mice

Author(s): Stephen Murata, Lizeth Martinez

Mentor(s): Sonsoles de Lacalle

Institution: Charles Drew University, Los Angeles CA

Inhibition of Myostatin (Mst), a secreted protein that negatively regulates skeletal muscle mass, is a promising therapy for muscular atrophy. Administration of an Mst antibody slows the progression of motor neuron loss in the ventral horn of a model of Amyotrophic Lateral Sclerosis. We report behavioral differences between wild-type (WT) and mice in which the Mst gene has been modified to either abolish (KO) or overexpress (TG) Mst protein. TG animals are more active than WT or KO mice, are faster learners during the treadmill training stage, and also show higher exercise tolerance. To clarify a possible neural component in these effects, we have investigated the differential expression of Mst in the brain of these mice. Western blot analysis identified the 52 kDa unprocessed protein in TG mouse brain. Tibialis muscle protein extracts were used as

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control from WT, TG and KO mice. RT-PCR analysis revealed mRNA transgene in the brain of the TG animals. We also identified expression of the Mst receptor ActRIIB. A comparison of four regions dissected from the brain (cerebellum, hypothalamus, cortex and basal ganglia) did not reveal differences in receptor expression levels, but TG mice exhibited almost twice the levels of expression of WT mice, while KO had none. Application of a Pathway Finder Array identified significant upregulation in a number of signal transduction cascades in the brain of the TG mice, such as the Jak-Stat pathway, as well as a substantial down-regulation of signaling in the KO mice, affecting the Wnt pathway among others. Among the genes represented in these arrays, the expression of several was significantly altered compared to WT. Our preliminary results challenge the current paradigm that Mst function is exclusively related to muscle. Further behavioral analysis will be needed to understand Mst function and its role in health and disease.

Implementing Support for Multiple Species in XMLPipeDB's GenMAPP Builder

Author(s): Don B Murphy

Mentor(s): Kam D Dahlquist, John David N. Dionisio

Institution: Loyola Marymount University,
Los Angeles CA

GenMAPP Builder is a Java program used for the creation of species-specific gene databases for use with GenMAPP, a bioinformatics program for viewing and analyzing DNA microarray data on biological pathways. However, organisms with larger and more fully annotated genomes, such as *Saccharomyces cerevisiae*, may exceed GenMAPP's memory capacity, causing the program to crash. To overcome this obstacle, GenMAPP Builder has been extended. In previous builds, GenMAPP Builder had required databases to be built using all Gene Ontology (GO) terms. To allow species with larger genomes to be used with GenMAPP, exports can be performed with single subtypes of the GO annotation terms, biological process-only, cellular component-only, or molecular function-only, creating smaller gene databases. Additionally, previous versions of GenMAPP Builder held Gene Ontology association (GOA) files in memory during database export, slowing the export process and limiting the potential size of databases further. We have moved the import of the GOA linking file to the step where source data is brought into PostgreSQL, instead of the export step. This change allows the PostgreSQL database itself to be used for applications beyond GenMAPP alone. Finally, we have altered GenMAPP Builder so that it can handle importing and exporting data from multiple species at once. This functionality allows for cross-species comparison of microarray data in GenMAPP. These upgrades to GenMAPP Builder have been used in the creation of databases used in the analysis of microarray data for species such as *Saccharomyces cerevisiae* and *Staphylococcus aureus*.

Degradation of Hydrogen Fuel Cells

Author(s): Holly M Murphy, Rebecca Jenkins

Mentor(s): Timothy Usher, Kurt Koessel

Institution: CSU, San Bernardino, San Bernardino CA

With the current trend of "going green" spreading all across the world, there is no better time to discover what science has to contribute, especially in the field of fuel cell technology. One specific area currently being researched is the degradation of the fuel cell membrane. Fuel cell technology will not only positively impact our environment with the use of low-emission, Fuel Cell Vehicles, but also in its aeronautical applications with NASA's aircrafts in high altitudes and satellites in space where radiation occurs. Fuel cell membranes that have experienced radiation and Fenton treatments, a standard degradation treatment where the membrane is put under harsh chemical conditions degrade in performance and structure. As with any piece of technology, durability is a staple element for success, and this research will help determine the lifetime of fuel cells, and what to do to optimize it. Electronic measurements of the fuel cells under load help us monitor the performance of membranes with varying types of radiation. We use an X-ray Diffraction (XRD) machine with a dose rate estimated to be 400 Gy/h, to mimic the radiation occurring in the atmosphere and in space, and giving it a Fenton treatment. The electronic measurements of membranes that have had 0, 24, and 48 hours of XRD exposure were compared to the Fenton treated membranes to find a trend in degradation. The results are consistent with our original hypothesis. Membranes that have been exposed to XRD radiation degrade in performance, as do membranes that have undergone Fenton treatment. The results also show that membrane's performance degrades minimally up until the point where it completely fails.

Periodic Ammonia Excretion and the Role of Glutamine in Intertidal and Terrestrial Isopods

Author(s): Maya Nakamura

Mentor(s): Jonathan C Wright

Institution: Pomona College, Claremont CA

Water conservation strategies are an important adaptation for the majority of terrestrial and intertidal crustaceans, since they rely on ammonotelic excretion. Some adaptations include diel patterns of gaseous excretion in terrestrial isopods and tidal patterns of aqueous excretion in marine crabs, where both selectively exploit high humidity or water availability. We hypothesized the intertidal isopod, *Ligia occidentalis*, like marine crabs, would also have a tidal excretion pattern. Ammonia excretion was assayed by comparing acid dissolved ammonia concentrations between animals with and without access to water. Glutamine, a primary form of sequestered nitrogen, was also measured by comparing *in vivo* concentrations in animals collected 2 hours before and after high tide as evidence for a tidal excretion pattern. Ammonia excre-

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tion was found to be significantly higher when water was available, while glutamine assays indicated greater accumulation during low tide, as predicted. Both provide support for the tidal hypothesis of ammonia excretion. Glutaminase activity in *Ligia* was lower than in terrestrial isopods, possibly indicating a need for more rapid deamination and higher ammonia concentrations to drive volatization.

The Effects of Music on Perception of Emotion and Felt Emotion

Author(s): Samuel O Nelson

Mentor(s): Marylie Gerson

Institution: California Lutheran University, Thousand Oaks CA

Music is a complex and multi-faceted aspect of society. The purpose of this study was to see if emotionally charged music (music that elicits happiness, sadness, or fear) would have any effect on participants' perceptions of emotion in ambiguous facial expressions or affect their own personal emotional levels. Of the 62 participants the majority were Caucasian and female ranging from 18 to 29 years old. Participants listened one of three pieces of music for 1 minute and then were shown a series of photographs and were asked to rate the emotion they perceived in the face and the emotion that they personally felt. The two hypotheses for perceived emotion were not supported, however, the third hypothesis, regarding personally felt emotion, was supported. Participants' emotions seemed to be most congruent with the musical emotion during the happy condition. This study sheds light on the notion that positive stimuli are more influential than negative ones.

The Effects of Flourescent Dye on Cercariae of *Acanthoparyphium spinulosum*

Author(s): Courtney A Neumann

Mentor(s): Alice Nguyen

Institution: UC, Santa Barbara, Santa Barbara CA

Parasites can reach high abundance and biomass in estuaries. As such, they can influence the ecosystem at individual, population and community levels. The ecology of a parasite and its effect on an ecosystem is dependent on many factors including host-specificity, the number of hosts a parasite can successfully infect at a particular stage. Current knowledge of the host-specificity of a parasite has primarily relied on observations of both natural and experimental infections. For the latter, it may be difficult to distinguish pre-existing infections from infections obtained in the experiment. We examined the use of a fatty-acid analog fluorescent dye (BIODIPY FL C₁₂) to label a larval trematode parasite, *Acanthoparyphium spinulosum*, as a possible aid to experimental infections. Our aim was to evaluate the effect of varying concentrations of the dye

on the survivorship and behavior of labeled larvae and to determine if the parasites could be detected post-infection. The three dye treatments: 2 μ M, 400 nM, and 200 nM, all successfully labeled larval *A. spinulosum*. Parasites treated with 2 μ M of dye had a significantly lower survivorship ($p < 0.01$) compared to those in the other two dye treatments. However, the remaining two dye treatments showed no significant difference in survivorship from the control. Experimental infections were then conducted using *A. spinulosum* larvae treated with 200 nM of dye to infect a representative second intermediate host, *Polydora nuchalis*. Results from this study provide support for the usefulness of this method in future experimental ecological parasitology studies in trematode-host systems.

Does the Video Game Secondary Market Affect a Consumer's Intention to Buy New?

Author(s): Hannah Newman, Karissa Vargas

Mentor(s): Nicole F Velasquez, Scott Miller

Institution: Pepperdine University, Malibu CA

Some believe the secondary market for used video games is unfair to video game developers and even call it a form of piracy. Others, however, contend that a consumer's ability to participate in a secondary market may actually lead to an increase in new video game sales. In this research project, the objective is to determine whether or not the secondary market for video games affects a consumer's intention to purchase a new video game. Using the Theory of Reasoned Action (TRA) to guide our research, we investigate the affects of user attitudes and subjective norms on a consumer's intention to buy new video games. The user attitudes include the ability to participate in a resale market, the reputation of games and game makers, any previous experience with both new and used video games, and the user's accessibility to the market. The subjective norms are external influences on both playing and purchasing video games. We survey 81 undergraduate business students whose ages fall within the target demographic for the video game market. The survey items are written following existing methodologies and are adapted from previous measures when possible. Factor analysis and validity testing yield eight reliable constructs. Regression analysis is used to test the hypothesized relationships, three of which are significant predictors of intention: previous experience in the primary market, access to the secondary market and the reputation of games and game makers. These constructs present beta scores of 0.386, 0.179, and 0.497, respectively, with an R² of 0.682. The results of this study highlight several potential consequences of making the resale of video games a crime. These results have significant implications for both game developers and lawmakers.

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BMP-2 Coupled - Nanosilver-PLGA Composite Grafts Induce Bone Repair in Infected Segmental Defects

Author(s): Richard Ngo

Mentor(s): Janette Zara

Institution: UC, Los Angeles, Los Angeles CA

The regeneration of contaminated bone defects in organisms that display multi-antibiotic resistance has proven to be a clinical challenge. Recently, antiseptic silver, which is an efficient yet less toxic antimicrobial with a reduced potential of inducing bacterial resistance, has received greater attention. We hypothesize that silver in nanocrystalline form has bactericidal effects that can be combined with bone morphogenetic protein 2 (BMP-2) to treat contaminated segmental bone defects. We performed in vitro microplate proliferation assays of 20-40 nm nanocrystalline silver particles (nanosilver). MC3T3-E1 pre-osteoblasts were cultured on 0, 1, and 2% nanosilver coupled poly-lactic-co-glycolic acid (PLGA) scaffolds to measure levels of toxicity. Nanosilver PLGA scaffolds + BMP-2 or PLGA only scaffolds + BMP-2 were implanted into 6mm rat femoral defects contaminated with 10^8 *Staphylococcus aureus* Mu50 to determine effects of BMP-2 osteoinductivity in vivo. Nanosilver demonstrated strong bactericidal properties in vitro and in vivo. Nanosilver particles did not influence the osteoinductivity of BMP-2. Moreover, nanosilver particles-PLGA composite grafts failed to inhibit adherence, proliferation, alkaline phosphatase activity, and mineralization of ongrowth MC3T3-E1 pre-osteoblasts when compared with PLGA controls. Unlike BMP-2 coupled PLGA control grafts, which failed to regenerate with the introduction of bacterial colonies, infected femoral defects that were injected with BMP-2 coupled 2.0% nanosilver particles-PLGA composite grafts recovered in 12 weeks without residual bacteria. These findings reaffirm the antibacterial and non-cytotoxicity property of nanosilver while also implicating nanosilver as a promising antimicrobial for bone regeneration in infected wounds.

Re-Reading Her Story: Expressions of Gender and Sexuality in South African Literature

Author(s): Geoffrey E Nguyen

Mentor(s): Arthur Little

Institution: UC, Los Angeles, Los Angeles CA

The various South African AIDS narratives that arise from moments of solemnity are eclipsed by a dominant Western narrative, which propagates AIDS as the birthplace of the epidemic by imposing meaning and contextualizing a foreign culture. Yet the voices of impacted South African women are rarely heard or given attention when juxtaposed with the narratives from Western non-profits, governments, and research sciences. I will analyze a part of the South African AIDS/HIV experience by foreground-

ing it on subaltern literary representations of HIV positive women in post-apartheid South Africa. In analyzing the psyche of a nation that is undergoing numerous transfigurations, distinctive sexual and gender formations result from South Africa's attempt to form an identity amidst the intersection of nationalism, multiculturalism, and post-colonialism. I will conduct a textual analysis on a variety of social panoramic texts that speak to being a post-apartheid female in South Africa, including: Phaswane Mpe's novella *Welcome to Our Hillbrow* (2001) and Scheub Harold's edited collection of oral poetry, *The Way We Traveled* (2006). Stemming from non-canonical works, these texts challenge the way Western NGOs and academia tell HIV/AIDS narratives by dually foregrounding the narrative outside of the literary canon and re-inscribing women into the narrative. Metaphors represent the interplay among borders, foreign contagions, and neocolonialism. As an examination on female gender, the female body becomes a site in which language feminizes the disease and re-imagines the body in terms of its social discursive function. With one million dead and ten percent of the population infected, literature has the ability to ignite consciousness, create cross-cultural understanding, and challenge the given knowledge veiled by ineffectual governments.

Heart Failure Patients Show Global and Regional Volume Loss in a Motor and Movement Regulatory Brain Region

Author(s): Haidang D Nguyen, Rajesh Kumar, Gregg Fonarow

Mentor(s): Ronald Harper

Institution: UC, Los Angeles, Los Angeles CA

Heart failure (HF) patients demonstrate significantly reduced learning, motor, cognitive, planning, and emotional skills that contribute to inadequate coping with the disease. The putamen, the outer-most portion of the basal ganglia, contains dopaminergic neurons that serve many of the affected functions. However, the overall or localized tissue integrity of this structure in HF is unclear. We used a 3.0-Tesla magnetic resonance imaging scanner to collect two high-resolution T1-weighted brain scans from 16 HF (age, 54.1 ± 8.3 years; body-mass-index, 28.9 ± 5.6 kg/m²; male 12; left-ventricular-ejection-fraction, 27.8 ± 6.8) and 32 control (52.4 ± 7.3 years; 24.6 ± 2.9 kg/m²; male 24) subjects. Both T1-weighted image volumes were realigned, averaged, and reoriented into a common space, followed by manual outlining of the putamen structures. The putamen tracings were normalized for head-size, global volumes determined, and surface models created for three-dimensional surface morphometry. We compared the demographic data between groups using independent samples t-tests and Chi-square, evaluated global putamen volumes using independent samples t-tests, and examined regional volume differences using surface models with two-sample t-tests, based on surface morphometry. No significant differences in age ($p = 0.48$) or gender ($p =$

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1.0) emerged between groups. However, body-mass-index differed significantly ($p = 0.008$) between HF and control subjects. HF patients showed significantly reduced right (controls vs HF; 4769.3 ± 651.9 vs 4193.7 ± 876.2 mm 3 , $p = 0.014$) and left (4842.1 ± 740.0 vs 4224.1 ± 894.4 mm 3 , $p = 0.014$) putamen volumes over controls, containing significant localized volume losses in medial-caudal, bilateral rostral, and mid-dorsal regions (left, $p < 0.003$; right, $p < 0.0001$). Putamen structures exhibit localized and global volume reductions in HF over control subjects. Regional volume losses, which are evident in HF subjects, provide a basis for deficits in movement and motor functions. The processes underlying the localized volume reduction are unknown, but may result from unique targeting of these areas by hypoxic and ischemic processes.

Investigating the Role of Pili and Exopolysaccharides in *Burkholderia tuberum* Nodulation by Inframe Deletion

Author(s): Tommy D Nguyen, Elise H Vo, Andrew Morris

Mentor(s): Michelle Lum

Institution: Loyola Marymount University, Los Angeles CA

The symbiotic relationship between rhizobia of the alpha-proteobacteria and plants of the Leguminosae is one that is relatively well-studied. Rhizobia cause the formation of nodules on plant roots in which the bacteria can fix atmospheric nitrogen to ammonia, a form that is readily utilized by plants. In return, rhizobia receive nutrients from the plant. Recently it was demonstrated that *Burkholderia tuberum*, a member of the beta-proteobacteria, can also nodulate some legumes. This association has not been well-characterized and we are interested in identifying the bacterial genes involved in the symbiosis. The *B. tuberum* genome contains homologues for genes for the synthesis of pili and exopolysaccharides, both of which are known to have a role in attachment of alpha-rhizobia to plant roots. To study the role of pili and exopolysaccharide in *B. tuberum*, particularly whether they are involved in nodulation, we are working on generating inframe deletion mutants in *B. tuberum* of genes necessary for their synthesis. For each separate deletion, we designed primers and amplified by the Polymerase Chain Reaction the regions bordering each gene to make the vectors required to delete *pilA*, which is the primary subunit of Type IV pili or *exoY* or undecaprenyl-phosphate glucosyl-1-phosphate transferase, both of which are involved in exopolysaccharide biosynthesis. We are now generating mutants in *B. tuberum*. Once the mutants have been generated, we will inoculate the individual mutant bacteria onto roots of legume plants to determine if nodulation is affected, and if so, how. We will also determine if other processes, such as biofilm formation, are affected.

Selection of Internal Protein Dielectric Coefficient for Poisson-Boltzmann Calculations Involving Im9-E9 DNase Protein Complex

Author(s): Aaron Alan Nichols

Mentor(s): Dimitrios Morikis

Institution: UC, Riverside, Riverside CA

Poisson-Boltzmann calculations are used to quantitatively describe the electrostatic character of proteins, providing an efficient alternative to the computationally expensive problem of explicit solvation. In order to reduce computational cost, the solvent surrounding the protein is modeled as a continuum and quantitatively represented using bulk parameters such as ionic strength and dielectric coefficient. Various numerical methods have been developed to solve the linearized Poisson-Boltzmann equation, using as input the solvent parameters along with the geometry and charge information describing the protein, and yielding the spatial distribution of electrostatic potential within and surrounding the protein or protein complex of interest. The potential can then be used to calculate electrostatic free energy values. Selection of Poisson-Boltzmann calculation parameters, particularly the internal protein dielectric constant, has been the subject of much debate and thus provides an opportunity to investigate this controversial area of protein electrostatics. We screened the effect of dielectric coefficient selections on correlations between calculated and experimental free energy data for single-mutant alanine mutants of the Im9-E9 DNase protein complex. As Im9 and E9 DNase are excessively and oppositely charged we expect their interaction to be significantly influenced by their respective electrostatic character. Consequently, selection of a dielectric coefficient that best represents microenvironments within and around the protein will greatly improve the accuracy of electrostatic calculations. We noticed that as the value of the protein dielectric constant increased, substantial improvement in the correlation between our computational data and experimental data were observed, suggesting that the use of higher dielectric coefficients for the protein's core may be appropriate for future simulations.

Role of Women in Sustainable Development and Community Organizing in Cameroon

Author(s): Kayla Nolan

Mentor(s): Anthony Chase

Institution: Occidental College, Los Angeles CA

In 1990, the Cameroonian government passed a series of laws referred to as the Freedom Laws which allowed for the legal formation of organizing cooperatives and voluntary associations within the country. This research study looks specifically at the impact that the 1990 Freedom Laws have had on the advancement of women's rights in Cameroon and the involvement of women in sustainable development. How have these laws impacted the ability of women

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to access resources for economic and social advancement that were not previously available to them? How has the ability for women to create state funded community organizing groups impacted awareness for gender equity with in rural communities and in the greater Cameroonian society? This study was conducted in Cameroon over a five week period in which women involved in community organizing and officials involved in development were interviewed. Interviews took place in multiple locations through out the nation in both urban and rural locations in order to gain a diverse understanding of the ways in which the Freedom Laws have affected the lives of women in Cameroon. Since 1990 multiple local and national all women organizing groups have formed to provide greater access to economic, political and social resources for women at the local and national level. As a direct result of the establishment of these groups, women in rural settings have found greater financial independence due to increased access to loans and economic support. These organizations have also legitimized and enforced the role of women in sustainable development from the community level to the governmental level. By creating space for women to organize, support one another and actively contribute to development efforts in Cameroon, the Freedom Laws have inadvertently acted as a catalyst for greater equity and opportunity for women in Cameroon.

The Trouble with DNA

Author(s): Ashleigh Norman

Mentor(s): Jack Reilly

Institution: CSU, Channel Islands, Camarillo CA

Fine art for me is a form of therapy wherein I unleash my personal demons onto canvas. This painting in particular is about family feuds, and being torn between the two people who contributed to my genetic make-up. Do I side with my mother or with my father? It's a source of tension that I think a lot of people can identify with, as we've all been in situations where we feel pulled in two separate directions. My work focuses on a kind of meditative reflection of personal feeling and emotion. I use myself as the main subject frequently, because projecting my personal emotions onto another person feels inauthentic and presumptuous of me. Still I think viewers can relate to the basic emotive substance of the work. My painting are heavily influenced by the work of the mid 20th century surrealist, as well as Frida Kahlo and painting produced during the Northern-Late Gothic time period, particularly the fantastical art of Hieronymous Bosch.

Extraterritorial Application of the US Constitution: Endorsing the 'Impracticable and Anomalous Standard' as refined by the *Boumediene* Court

Author(s): Alexander M Nourafshan

Mentor(s): Thalia Gonzalez

Institution: Occidental College, Los Angeles CA

Prompted by cases regarding the legality of detentions at Guantanamo Bay Naval Base, the Supreme Court recently considered fundamentally important questions regarding application of the US Constitution extraterritorially. In the Guantanamo cases, decisions were issued outlining the circumstances under which the US constitution is operational outside De Jure US territories, and when it is applicable to non-citizens. There is over a century's worth of case law on this subject, however there are several competing interpretations of these cases. The three most prominent schools of jurisprudence on extraterritoriality are functionalism, which aims to extend the constitution on a case-by-case basis, globalism, which supports universal application of the constitution, and strict-territorialism, which supports adjudication using the constitution only in territories where the US is lawfully sovereign. This paper supports the jurisprudence advanced by the Supreme Court on the Guantanamo rulings, endorsing the functional standard, represented by the 'Impracticable and Anomalous' test. The 'Impracticable and Anomalous' test seeks to evaluate whether or not the relationship between the person seeking constitutional protections and the United States merits extension of the constitution, as well as whether the US has jurisdiction in that particular territory. Despite criticisms that functionalism is too subjective, a standard used to make this determination, I argue that the court in the most recent Guantanamo Bay case, *Boumediene v. Bush*, sufficiently clarified the scope of the functional standard by refining the parameters for considering extraterritorial application. In *Boumediene*, this approach extended constitutional protections to non-citizen detainees at Guantanamo, thereby upholding the constitution, and promulgating conformity to international human rights considerations.

Analyzing the Production of Aerogel Using Fiber Optic Sensors

Author(s): Liliana I Nunez

Mentor(s): Winny Dong

Institution: California State Polytechnic University, Pomona, Pomona CA

The goal of this project is to use tapered fiber sensors to gain an understanding of the stresses that develop during the gelation and drying of MgO aerogels. Aerogels are amorphous and highly porous structures that have been used to collect heavy metals in water and pollutants in the atmosphere. Stresses that develop during the aerogel syn-

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thesis affect the aerogel structure and may cause fracture. These stresses are not easily measured. We hypothesize that tapered fiber optic sensors can detect stress and temperature changes during the synthesis of MgO aerogels. A tapered fiber sensor can be inserted into the sol-gel to monitor the stresses present throughout the synthesis. A tapered fiber is a single mode optical fiber that has a tapered end or central portion. When stress acts upon the fiber sensor, a change in light transmission results from either distortion of the axis or a change in refractive index in the fiber. Tapered fibers are especially responsive to changes in the index of refraction of the surrounding environment. We report preliminary data obtained using a single-mode-multi-mode-single-mode (SMS) optical fiber. The fiber was inserted in approximately 160 ml of sol at room temperature, as gelation takes place the transmission was recorded by an optical spectrum analyzer. A 0.02-0.03 change in transmission was observed during gelation. In future work the stress change during the supercritical drying of the aerogel will be studied. Future applications of tapered fiber sensors include the study of interactions between MgO aerogels and atmospheric pollutants.

Kullback-Leibler Divergence of Diffusion MRI Fractional Anisotropy (FA) Maps as a Tool to Measure Nonspecific Effects of Diseases on the Brain

Author(s): Roda Nur

Mentor(s): Roland Henry

Institution: UC, Los Angeles, Los Angeles CA

The effects of nonspecific diseases, such as Lupus, on the normal appearing brain are unknown and poorly characterized with current MRI imaging techniques. In order to potentially treat these patients, there needs to be a method which is sensitive and can quantify how the brains of these patients differ relative to healthy individuals. The Kullback-Liebler Divergence (KLD) is a metric which is capable of distinguishing the similarities or differences between two probability distributions. We developed an in-house program in the programming language Python which finds the KLD from diffusion MRI FA maps. FA maps are made up of voxels which measures the degree of anisotropy due to the diffusion of water in white matter tracts. This program was first tested with controls, and then compared with Lupus patients. As a result, we found the KLD to be sensitive to the differences in FA between the patients and controls. This metric was invariant with age, head size, and gender for both groups. For the age group 21-40 of the patients and controls, we found the KLD to be a low value close to 0. This result tells us that the brains between the Lupus patients and controls are very similar. For the age group 40-70, we found the KLD of the patients to be much higher than the controls. This tells us that Lupus appears to be a degenerative disease with more

damaging effects occurring to the brain with older age. Further data analysis with an ROC curve (Receiving Operating Characteristic) proved that the KLD was a more sensitive metric in comparison to the mean, median, and standard deviation of the FA maps.

Using Promoter Fusions to Characterize the Role of Type IV Pili in the *Rhizobium*-Legume Symbiosis

Author(s): Amanda Nystrom

Mentor(s): Michelle Lum

Institution: Loyola Marymount University, Los Angeles CA

The *Rhizobium*-legume symbiosis involves the association between bacteria that fix nitrogen for the plant and plant roots on which nodules form and house the bacteria. The plant provides the bacteria carbohydrates in exchange for fixed nitrogen. We want to understand the mechanisms by which this association occurs. Type IV pili have been shown to be important in many microbial-host interactions, playing a crucial role in adhesion, aggregation and host cell invasion. We hypothesize that Type IV pili are involved in the symbiosis and help the bacteria attach to the root in a biofilm and enter the plant root. We therefore are investigating the expression of the gene *pilA*, which encodes the major subunit for Type IV pili in *Sinorhizobium meliloti*, a symbiont of alfalfa. To do this, we are looking at the activity of the promoters of the two *pilA* genes by analysis of *pilA* promoter fusions to the green fluorescent protein (GFP) reporter gene. If our hypothesis is correct, then we would expect to see GFP expression when bacteria are in a biofilm and associated with the plant root. GFP expression was found in bacteria growing as colonies on petridishes, suggesting that Type IV pili are produced in this type of high density of growth. We are currently looking at the activity of the promoters during biofilm formation and when the bacteria are in association with plants to determine if Type IV pili expression is more specifically associated with attachment and the symbiosis.

Sophocles' Blind Seer: Awareness, Irony, and Subversion

Author(s): Helen O'Brien

Mentor(s): Roger Kaye

Institution: California State University, Chico, Chico CA

This paper explores the mostly detrimental effects foreknowledge has on Tiresias in Sophocles' *Oedipus Tyrannus*, and how the blind seer's prophetic, angry lines belie his true motivation—entertainment. The play's dramatic irony relies on characters' ignorance of what the audience knows, so Tiresias, who sees the future, subverts our idea of how characters in Greek tragedy should act, destroying themselves through ignorance. He can voice the

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audience's frustration with Oedipus's ignorance, because he knows as much as they do, but as with Cassandra in Aeschylus's *Agamemnon*, nobody believes Tiresias. Rather than go mad with despair as she does, he lashes out at Oedipus with anger and dry humor. His stubborn, unswayable insolence makes him one of the play's most memorable figures, but he has no effect on the plot, failing to change the events he foresees. But Tiresias is not just a farmer or messenger cross-examined by Oedipus: he is the only one who can see the play's devastating irony without being destroyed by it. That Tiresias's actions are inconsistent in everything except being memorable suggests that Tiresias has a Pirandellian awareness that he is a character in a play, and, since he cannot change the way the play ends, he tries to make the pieces before the end as entertaining as possible. He's crazy and sarcastic and frustrated because he is the only character aware of the endlessly repeating nature of the tragic performance in which they take part.

The Victorian Woman as Seen Through Art and the Subsequent Appeal of the Gothic Heroine

Author(s): Meggan E O'Neil

Mentor(s): Jullianne Smith

Institution: Pepperdine University, Malibu CA

Art and literature are unique in that they explore and explain both the physical and mental lives of the people living in the society that produced them. By studying the art from Victorian England and synthesizing it with an analysis of the literature from the same period, we see a correlation between the private, sheltered lives of Victorian women and their subsequent attraction to the heroines of the Gothic novel. An analysis of the visual arts gives an understanding of how the Victorians saw themselves (through portraiture), their moral values, and their perceptions of appropriate gender roles. The literature provides a commentary on what the Victorians found entertaining, terrifying, revolutionary, and ideal. By overlaying these two studies, a balanced understanding is achieved of who they were, what they liked, and why. Victorian women's sheltered, repressed, and isolated lives, as seen in paintings by John Everett Millais and other Pre-Raphaelite painters, led them to find an escape within literature—specifically in the Gothic novel. Novels, as an indoor activity, fell within the female realm; however, the heroines of these novels, as seen in Charlotte Bronte's *Jane Eyre*, are bold, confident women who live their lives by their own rules, pushing the boundaries of what society sees as acceptable behavior and the social norm. Victorian women, while maybe not ready to actually become these heroines, relished the escape into a world where these achievements were possible. She found solace, escape, and adventure in the thrilling tales of the Gothic novel—her socially acceptable way of rebelling against the society that bound her.

Further Tiltmeter Characterization for Seismic Attenuation Systems in Advanced Laser Interferometer Gravitational Wave Observatory

Author(s): Amanda O'Toole, Morgan Shaner

Mentor(s): Riccardo DeSalvo, Vladimir Dergachev

Institution: UC, Los Angeles, Los Angeles CA

Gravitational waves can have multiple sources, such as supernovae explosions or colliding pulsars. However, in order to detect the extremely weak signals, the two detectors making up the Laser Interferometer Gravitational Wave Observatory (LIGO) need to have sensitivity on the order of 10^{-22} meters. All sources of noise must be reduced, including thermal, optic, and seismic noise. The designed prototype tiltmeter focuses specifically on the last source by helping to differentiate between horizontal ground motion and ground tilt. The ultimate sensitivity goal for this knife-edge tiltmeter is $3e-10$ radians/ $\sqrt{\text{Hertz}}$ at 10 milli-Hertz. Previous tests on the system yielded hysteresis and noise measurements, but more recent advancements include detailed characterization of the knife-edge on which the tiltmeter arm balances as well as improvements to the software control program. Regarding the knife-edge, after microscopic cracks were found propagating along the edge of the blade, a new cutting scheme was implemented, and the new blades photographed. Once no breaks or cracks were seen, test knife-edges were polished and coated with diamond-like carbon, to determine the better coating deposition method – physical (PVD) or chemical vapor deposition (CVD). In the end, PVD was decided on due to high surface tension in CVD. The final knife-edge is currently being manufactured, polished, and coated. In addition to knife-edge development, new code was put in the tiltmeter program in order to control the working point position, viscous damping, and an offset-dependent electro-magnetic anti-spring. Further tests continuously advance the tiltmeter sensitivity past its current value of $2e-9$ radians/ $\sqrt{\text{Hz}}$ at 1 Hertz, and an interferometric position readout system and vacuum chamber testing are only two of the many future advancements for the prototype.

Satisfaction in Communication

Author(s): Alycia N Obregon

Mentor(s): Virgil H Adams

Institution: CSU, Channel Islands, Camarillo CA

The boom of online social networking and new technological advancements has led some researchers to suggest that some people may have lower quality relationships than when encountering face-to-face interactions. This is exacerbated by ever growing increase in dependence on mobile communication devices. Yet, others argue that specific types of communication result in stronger family bonds, build mutual support, and facilitate friendships. The present study expands on this research by examining the relationship between the type of communication used

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(postal mail, social networks, telephone, and etc.), global well-being, and hope. Utilizing a sample of adults drawn from a large Southern California county, the present study is based on analyses from a sizable sub-sample (n=831). The data were collected over a three month period through an instrument developed by the research team. Several established measures were utilized including the Delighted-Terrible Scale (i.e. well-being), and the Adult Dispositional Hope Scale as well as an extensive background battery. It was hypothesized that the type of communication used enhances the individuals' well-being and hopefulness. Hierarchical regression results did not support the hypothesis that increased well-being is based on their way of communicating. The results were clear for both well-being and hope. The more often respondents talked with family members, the more likely they would also report increased levels of both well-being and hope. Perhaps most interesting, was that fact that this relationship remained even after controlling for the demographic variables. This study shows that both well-being and hope can be significantly increased through frequent communication with family members.

Administration of Daidzein, a Soya Derived Phytoestrogen, is Correlated with an Increase in Lifespan Within the Nematode *Caenorhabditis elegans*

Author(s): Jessica M Ochoa
Mentor(s): Sylvia A Vetrone
Institution: Whittier College, Whittier CA

Isoflavones are a group of plant-derived neutraceuticals that act as phytoestrogens (plant estrogen-like molecules) in humans, and have been shown to reduce reactive oxygen species (ROS) and oxidative damage. Interestingly, in vitro studies have shown that increases in ROS and subsequent oxidative damage can result in shortened lifespan. The nematode model *Caenorhabditis elegans* (*C. elegans*) has been widely used to study the effects of oxidative stress and aging. In this study we tested the administration of daidzein, a soy plant phytoestrogen, on *C. elegans* to investigate if this neutraceutical would have any beneficial effects on oxidative stress and lifespan. Young L4 stage *C. elegans* were fed OP50 *E. coli* with or without the addition of 100 µg/mL of daidzein and maintained at 22 °C. All nematodes were monitored for 20 days and the number of living (responsive to touch stimuli) nematodes were scored daily. A total of 6 trials were completed for each experiment; for each trial, 100 nematodes per group were compared. For oxidative stress studies, nematodes were exposed to either a low dose (40 M, for 24 hrs) or high toxic dose (472 M for 4 hrs) of juglone to induce oxidative stress. Our findings show that daidzein administration to the normal food regimen of *C. elegans*, correlated with a significant improvement to their lifespan and response to oxidative stress ($P \leq 0.05$). These results suggest that

within *C. elegans*, daidzein may be reducing the amount of ROS accumulation and subsequent oxidative stress damage which therefore correlates with an extension in lifespan. Further biochemical studies must be conducted to determine whether the beneficial effects of daidzein are in fact due to a decrease of ROS accumulation and, if so, by which mechanism this effect is being mediated.

The Prevalence and Characterization of *Clostridium* Species in Horses

Author(s): Noelle Olson
Mentor(s): Wei-Jen Lin
Institution: California State Polytechnic University, Pomona, Pomona CA

Studies have implicated species of *Clostridium*, particularly *C. difficile* and *C. perfringens*, as the cause of severe equine diarrheal infections. The prevalence of toxin-producing *Clostridium* species, however, has not been well-established. The objective of this project is to determine the prevalence of *Clostridium* isolated from fecal samples of healthy horses at three local ranches. Ten composite samples were collected from each site over four seasons and frozen. One gram per sample was mixed with equal volume of thioglycolate broth and added to anaerobically prepared cooked meat media. Samples were heat shocked, followed by an incubation period. The enriched culture was streaked on Egg Yolk Agar, incubated anaerobically, and the obtained isolates were saved. Gram staining and catalase tests were performed and hemolytic, lipase, and lecithinase activity was observed on differential agar. Unique species were identified with API-20. The isolate count for all seasons is 180 – with 66 from the first, 43 from the second, 49 from the third, and 22+ from the fourth. Of all samples collected, there were ten unique *Clostridium* species identified and a high prevalence of toxin and non-toxin producers such as *C. beijerinckii*, *C. bifertamentans*, *C. septicum*, and *C. sporogenes*. The targeted pathogenic *Clostridia*, *C. perfringens* and *C. difficile*, were present in low frequency at all sites. The isolate count per horse varied from zero to six. Half of the sampled horses have only one dominant *Clostridium* isolate, whereas the other half have two or more *Clostridium* isolates. Our analysis of *Clostridium* species in horses will aid in understanding the prevalence of these bacteria in the horses in our region. Further studies of these isolates may reveal the roles of *Clostridium* species in the health and diseases of horses. Further characterization will include antibiotic resistance, toxin profiling, and the probiotic application of these isolates.

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Identification and Characterization of Motility Mutants in *Burkholderia unamae*

Author(s): Michael Onofre, Janelle Ruiz, Reyn Higa
Mentor(s): Michelle Lum
Institution: Loyola Marymount University, Los Angeles CA

Burkholderia unamae is a nitrogen-fixing species of bacteria found in endophytic relationships with crops like maize, sugarcane, and coffee plants. The bacteria play an essential role in converting atmospheric nitrogen into a form that can be utilized by the plant. We are studying the ability of *B. unamae* to interact with the roots of these plants, as well as the genes responsible for this association. Based on previous research, we hypothesize that motility in *B. unamae* will play a critical role in the bacteria's ability to interact with plants. We are therefore screening for *B. unamae* mutants defective in motility. We introduce a transposon into *B. unamae* by using a biparental mating strategy between a rifampicin resistant *B. unamae* strain and *Escherichia coli* carrying a vector that carries a transposon containing a kanamycin resistance gene. We have been selecting for transposon-tagged mutants by selecting for colonies resistant to rifampicin and kanamycin. We then screen the mutants for defects in motility by using 0.3% agar. The presence of a halo is indicative of swimming into the agar, therefore the absence of a halo suggests a defect in motility and is used to identify putative mutants. At this point at least one motility mutant has been confirmed, and many more putative mutants are being further screened. From here identification of the disrupted gene will be done and further characterization of the mutant phenotype will be assessed by inoculating the bacteria on plants to see if the lack of motility alters the plant growth promoting properties of *B. unamae*. This process will help us gain further understanding into the genetic make up of *B. unamae*, as well as provide insight into the role motility may have in the nitrogen-fixing association this species has with plants.

Influence of Growth Media on *Escherichia coli* Surface Characteristics

Author(s): Stephen R Opot, Ian Marcus
Mentor(s): Sharon L Walker
Institution: UC, Riverside, Riverside CA

Bacterial adhesion to various aquatic surfaces is important in environmental applications; especially, in mitigating the impacts of pathogenic water contamination. However, while investigating the fate, adhesion, and transport of bacteria in the laboratory, non-representative results arise from culturing cells in rich experimental media such as Luria-Bertani (LB) broth. As a result, data from the experimental investigations do not reflect the actual cells' surface characteristics as would exist in the natural environment. In this study different natural *Escherichia*

coli isolates of dairy cattle (DP) strains were used to understand the influence of growth media on these cells' surface characteristics. Cells were analyzed after simultaneous incubation in two different media; one ideal (LB) and the other a real growth media (manure extract), simulating a natural breeding environment for bacterial cells. Extensive cell characterization techniques were conducted to evaluate the cells' hydrophobicity, electrophoretic mobility, zeta potential, extracellular polymeric substances (EPS) analysis, size, and surface charge density. Results indicate that there is substantial variation in the cell characteristics whether grown in LB or manure. This research helps us to, further, understand different bacteria surface characteristics and behavior in real environment, and to utilize the research outcome to optimize effective water treatment and distribution. Results to date of this ongoing extensive surface analysis will be presented.

Union Organizing for Latinos in Los Angeles

Author(s): Donna Orozco
Mentor(s): Julie Collins-Dogrul
Institution: Whittier College, Whittier CA

Union membership and organizing has declined nationwide since 1983, when the Bureau of Labor Statistics first began collecting data on union membership. I found that while union membership has been decreasing nationwide, in Los Angeles, unions have been more successful in terms of organizing members starting with the Justice for Janitors Campaign of the 1980's. In order to explain why Los Angeles has had better union membership rates, I will discuss the structural organization and strategies unions in Los Angeles have adopted. Unions in Los Angeles have structured themselves to involve working with community groups, worker centers, and grassroots organizations. The combination of top-down, where the organizing process begins directly with the union, and bottom-up tactics, where the organizing begins with the workers themselves, is a big source for success in the Los Angeles area. Besides union strategies, California and especially Los Angeles, has a major hub of immigration from Latin America because of the demand for low-wage labor. It is the low wage industries that are often targeted by unions to organize and the demographics of the people in these sectors are very important to the mobility of organizing. The mobilization of the Latino community has helped increase union membership due to the stronger family and friendship networks found particularly in Los Angeles among the Latino community. The literature I have read illustrates that the union organizing strategies used in Los Angeles have been quite effective in which union recognition is accepted and working conditions are improved once the group is organized. Because the low-wage sectors are the most prominent to Latinos in Los Angeles, it is important to understand the ways unions can increase their organizing to provide better standards in these industries particularly for Latinos.

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The Digital Age Endangering America's Future

Author(s): Sogol Pahlevan

Mentor(s): Kurt Meyer

Institution: Irvine Valley College, Irvine CA

Critics have rightly observed that today's Millennials (eighteen to thirty year-olds) are becoming one of the least educated generations of all times. One would think that with the vast amount of information available in today's digital age, America's youth would be amongst the smartest, since much information is readily accessible to them via advanced technology as compared to those of previous generations. The significant decrease in intellectual capacity of today's youth, observed by the fall in standardized test scores, is brought about by the increased dependence on technology. According to studies conducted regarding the effects of the digital era on intellect, the total amount of time youth spend involved in media per week is the equivalent to a full time job. For example, those between the ages of eight to eighteen spend eight and a half hours on media content each day, mostly watching television, using a computer and playing video games, while only, spending an average of twenty minutes reading. Recent studies show that literacy rates have dropped dramatically compared to past generations. Reading is a significant contributor to intellectual incline. A-literacy, which is the knowing how to read but choosing not to, is a growing trend among youth that has undermined their academic achievements. Leisure reading regularly significantly promotes academic performance. The decreased reading rates have led to the young's dismal academic knowledge in math, science, civics, and history. In turn, this is rapidly decreasing their general knowledge of the world, our culture, history and other aspects of life and living. The rise in aliteracy is resulting from a sole dependence on technology, leading to a significant downfall of intellectual skills amongst the young generation. This intellectual decline, therefore, has led to an increasing disconnect with the world of culture, tradition, context and history.

Development and Implementation of a Programmable Automated Controller (PAC) for Liquid Level Control

Author(s): Andrew Palmer, Jeremy Norton, Hyun Cho

Mentor(s): Gregory Smith, Mingheng Li

Institution: California State Polytechnic University, Pomona, Pomona CA

A Programmable Automated Controller (PAC) was developed to provide a more comprehensive solution in minimizing liquid level fluctuation in a process tank. The PAC system, programmed using Think & Do, was implemented in a liquid level control experiment in the department of Chemical and Materials Engineering at Cal Poly Pomona. As compared to the original analog controller, PAC offers a user-friendly interface and allows

for real-time monitoring and logging of liquid level and valve position without compromising control accuracy. Experimental data of the closed-loop tests show that the developed controller is very effective in controlling the liquid level under set-point change and disturbance in the inlet flow rate.

Optimization of Frozen hERG Channel Cell Line for High Throughput Screening

Author(s): Alexis S Pammit

Mentor(s): Brian Ro

Institution: UC, San Diego, La Jolla CA

hERG (human Ether-a-go-go) is a cardiac potassium channel currently being screened in high throughput mode using IonWorks Quattro planar patch technology, the high throughput instrument we use for electrophysiological data acquisition. The inhibition of hERG channel is important for drug screening as blockage the hERG channel may lead to QT prolongation, which increases the risk of torsades-de-pointes, cardiac incidents and death. Currently, drug interaction with this channel is examined by planar patch screening with cells in continuous culture. The goal of this study is to evaluate the feasibility of using frozen cells for this hERG assay. We have a two-part validation to evaluate success of the effort: a) to optimize the frozen cell preparation for robustness using the IonWorks Quattro and b) to compare the pharmacology of the frozen cell based platform with that of the current assay with continuous culture cells, the QPatch clamp assay, a alternative, lower throughput electrophysiological method with a close approximation to manual patch, i.e. close to the "gold standard", and what has been documented in literature. For the frozen cell based platform to prove viable, it will have to provide equivalent guidance as the continuous culture cell line. In order for the frozen cells to replace the current platform it will have to show same or better characteristics than the current continuous culture line. Of the initial comparisons, the frozen cells, with optimal preparation conditions, are superior continuous cells in terms of pharmacology. Our hypothesis is that frozen platform will increase assay reproducibility and efficiency, while increasing flexibility in the hERG screening process.

The Effect of Soy-Phytoestrogens, Genistein and Daidzein, on Lifespan and Oxidative Stress in the AKT-1 *Caenorhabditis elegans* Mutant Nematode

Author(s): Vanessa E Parada

Mentor(s): Sylvia A Vetrone

Institution: Whittier College, Whittier CA

In an effort to explain the aging process in human beings, several studies have focused on explaining the determinants of an organism's lifespan and oxidative

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stress. Soybeans are rich in phytoestrogens (non-steroid estrogen-like compounds) and *in vitro* studies have shown phytoestrogens can decrease oxidative stress and increase lifespan. Recently, our *in vivo* studies testing two phytoestrogens, daidzein and genistein, have shown similar results using the nematode *Caenorhabditis elegans* (*C. elegans*), a commonly used animal model to study aging. It has been shown that the DAF-2 Insulin-like pathway plays a major role in determining oxidative stress, lifespan, and immunity in *C. elegans*. AKT-1 is a protein, which mediates signals between AGE-1 and DAF-16 in the DAF-2 pathway. In this study, we tested the administration of daidzein or genistein on the AKT-1 *C. elegans* mutant to elucidate if our previous findings are mediated through the DAF-2 pathway. Young L4 stage *C. elegans* were feed OP50 *E. coli* with or with the addition of 100 ug/mL of genistein or daidzien and maintained at 22 °C. All nematodes were monitored for 20 days and live (responsive to touch stimuli) nematodes were scored daily. A total of 7 trials were completed for each phytoestrogen, in which 100 nematodes per group were compared. Our findings show that when daidzein is administered to AKT-1 mutants, their lifespan and response to oxidative stress are significantly improved ($P \leq 0.05$). While these findings suggest that our previous findings are being mediated through the DAF-2 insulin-like pathway, further studies must be executed on the AKT-1 mutant to address if these phytoestrogens affect oxidative stress and immunity, the two other outcomes of triggering the DAF-2 Insulin-like pathway. Likewise, performing similar studies using other *C. elegans* DAF-2 pathway mutants will ensure that the results gathered are not a stand-alone incident.

Magical Realism and Production Design in the Film *Big Fish*

Author(s): Cara L Pardo

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

Because magical realism relies so heavily on the creation and manipulation of reality in film, it is essential to look at the world of the characters and how this world both conforms to and challenges the expectations of the characters and the audience. This establishment of spatial perception is inextricably linked to production design as a means to express the film's symbolic nature. There has, however, has been no formal research done to explore the relationship between magical realism and production design. Therefore, I analyze the importance of Dennis Gassner's production design in the creation of a magical realist aesthetic in Tim Burton's *Big Fish* (2003), particularly the importance of color and scenic design to provide symbolic subtext in perceptions of space. Several texts discuss the subject of production design and symbolic characterization. Patti Bellantoni discusses color theory in her book *If It's Purple, Someone's Gonna Die*, arguing that colors reflect changing emotions in a film, both literally and

symbolically. C.S. Tashiro's book *Pretty Pictures and the History Film* speaks directly to elements of production design that provoke change in the characters while furthering the audience's understanding of the film's intentions. Using these theories of production design as a basis for my research, I expand on their ideas within a magical realist context. I explore the various properties of color and scenic design in *Big Fish*, illustrating how Gassner's use of evocative and spontaneous production choices in an otherwise controlled filmic atmosphere relates directly to sub textual elements of the magical realist aesthetic. Ultimately, production design is the medium through which the magical realist aesthetic is expressed, driving the film forward while supplying subconscious meaning and historical significance to filmic narrative.

Improvement of Tantalum Complex for Asymmetric Hydroamination Catalysis

Author(s): Kyoung-Joo Park

Mentor(s): Adam R Johnson

Institution: Mount San Antonio College, Walnut CA

Substituted pyrrolidines are valuable synthetic targets for pharmaceutical applications. The hydroamination reaction is a highly atom economical method for synthesizing substituted derivatives of these compounds—by adding an N-H bond across an unsaturated C-C bonds, the products are produced without losing any carbon atoms. However, the reaction requires a catalyst to proceed due to its high activation energy. The project was focused on synthesizing N,N-dimethyl-N'-tert-butyl-o-phenylenediene (HN[R]Ar_L) which would be used as a co-ligand for the asymmetric hydroamination of aminoallenes. The Buchwald coupling of 2-bromo-N,N-dimethylaniline and t-butylamine was used for this experiment. The lithium salt of the aniline was treated with TaCl(NMe₂)₄ and the product was analyzed by NMR spectroscopy. Hydroamination of 6-methylhepta-4,5-dienylamine was performed with (N[R]Ar_L)Ta(NMe₂)₄ combined with a chiral bidentate amino-alcohol; the resulting pyrrolidine was obtained in up to 71% enantiomeric excess.

Using XMLPipeDB to Create a GenMAPP-compatible Gene Database for the Analysis of DNA Microarray Data for *Staphylococcus aureus* MRSA252

Author(s): Kelly C Parks

Mentor(s): Kam D. Dahlquist, John David N Dionisio

Institution: Loyola Marymount University, Los Angeles CA

The GenMAPP suite is a powerful tool for analyzing DNA microarray data on biological pathways and performing Gene Ontology term analysis. However, the use of GenMAPP and MAPPFinder is limited to species for which a

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GenMAPP-compatible Gene Database exists. To simplify database updating and maintenance, and to be robust to changes in file formats, XMLPipeDB, an open source tool chain for building relational databases from XML sources, was created. XMLPipeDB provides functionality for database configuration, importing data, performing queries, and exporting GenMAPP-compatible Gene Databases based on UniProt and Gene Ontology data. We used XMLPipeDB to create a Gene Database for *Staphylococcus aureus* MRSA252, an antibiotic-resistant human pathogen. We have used the new Gene Database to analyze published DNA microarray data from O'Neill *et al.* (2009), who measured gene expression changes associated with inhibition of early-stage cell wall biosynthesis, a new target for antibiotic development, specifically at the three major enzymes, MurA, MurB, and MurE, involved in that pathway. Focusing on MurE inhibition and using MAPPFinder, we found that there was an increase in expression of genes related to ion and transmembrane transport, ATP synthesis, and ribonucleoprotein biogenesis. Genes whose expression decreased were related to cellular amino acid biosynthesis, substrate-specific transmembrane transporter activity, and response to stress. Our results support the O'Neill *et al.* (2009) conclusion that there was little deregulation in genes related to the inhibition of early-stage cell wall biosynthesis. However our results, enabled by the new Gene Database, suggest additional cellular processes that should be further investigated with regard to the mode of action of antibiotics that target the cell wall. Additionally, the success of this analysis for strain MRSA252 suggests that a meta-analysis across multiple strains of *S. aureus* may be possible in the future through the creation of a multi-strain GenMAPP compatible database.

Are Crash Severities Really Related with Alcohol and Other Drugs Use?

Author(s): Kishan M Patel

Mentor(s): Wen Cheng

Institution: California State Polytechnic University, Pomona, Pomona CA

A large number of research studies have shown that driving performance is impaired by alcohol and many other drugs. However, considerably less research has been dedicated to identifying the effects of alcohol and other drugs on traffic crash severities. The main objective of the study is to establish the relationship between the use of alcohol and illicit drugs and the severity level of crashes. A wide variety of statistical methods have been proposed and developed to evaluate the outcomes of categorical nature which include multiple logistic regression, ordered probit (or logit), multinomial, nested, and mixed logit models. Based on the comparison of various methods, the multinomial logit model was selected in the study due to its consistent parameter estimates. The Hausman-McFadden Test was performed to check the assumption of independence of irrelevant alternatives (IIA). The study used crash

data for an 18-mile stretch of State Route 77 in Tucson, AZ. To ensure the accuracy and reliability of study findings, three types of models were developed based on the collision types containing single vehicles, car-car collision, and car-truck collision. The study results reveal that the use of alcohol significantly affects the severities of the injury crashes. However, the use of illicit drug and other physical conditions has not exhibited an apparent influence on the crash severities. Interestingly, in contrast to injury accidents, none of the parameters associated with fatal accidents are found to be statistically significant. The potential reason might be due to the smaller sample size of the fatal accidents.

Attitudes Toward End of Life Decisions

Author(s): Pamela R Perez, April Valenti

Mentor(s): Pamela Perez

Institution: Crafton Hills College, Yucaipa CA

Purpose: While medical advances may help prolong life, the ethical and moral implications can prove challenging. This study explored attitudes toward euthanasia and physician assisted suicide in a sample of individuals ($n = 221$) age 18 to 65+. Hypotheses: (1) religious individuals would reject such interventions due to moral concerns, (2) older adults would be less accepting of such measures as too foreign and unfamiliar, and (3) that there would be a greater willingness to help a brain tumor patient over an AIDS patient due to prejudice and bias. Age, gender, ethnicity, and education were also considered. Method: Participants were randomly given one of two versions of a questionnaire. Each contained two short vignettes involving either a patient with six months to live or a patient on life support. In version one, participants were asked whether a patient with an inoperable brain tumor should be given the option of dying a painless death with the help of a physician. The second vignette involved a 75 year-old patient in a coma for six months; participants were asked whether the patient should be removed from life support. The alternate version was worded the same, except that the first patient had AIDS and the second on life support was "very young" rather than old. Results: Religiosity was not a predictor of decisions. Overall, participants were more willing to remove the older patient from life support than the younger. Women were more likely than men to remove patients from life support regardless of the patient's age. Younger and middle age adults (ages 18-55) supported euthanasia for the older patient but not the younger while those in the 56-65+ age group were equally likely to support these measures. Finally, participants were more willing to help to the brain tumor patient than the AIDS patient.

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Oxidative DNA-Protein Crosslinking in B-DNA and Quadruplexes

Author(s): Zitadel A Perez, Amanda Madison
Mentor(s): Eric D A Stemp
Institution: Mount Saint Mary's College, Los Angeles CA

Oxidative DNA damage contributes to aging, cancer, and other degenerative diseases. Guanine is particularly vulnerable to oxidation, creating guanine radicals which form irreversible crosslinks to proteins. DNA-protein crosslinks are an understudied yet significant form of oxidative damage. This project investigates how oxidative DNA-protein crosslinking depends on DNA secondary structure, comparing quadruplex and B-DNA. Given that quadruplex DNA contains guanine clusters, known to be hotspots for oxidation, it may potentially result in more crosslinking than B-DNA. Also, since guanines within the quadruplex are not base paired to cytosines, they might create more reactive radical cations more readily. We synthesized DNA duplexes which formed either quadruplexes or B-DNA, and the 3' end of the G-rich strand was fluorescently labeled (Alexa Fluor 546). Guanine radicals were created through a photochemical method called the flash-quench technique, in which a photo-excited DNA-bound intercalator, Ru(phen)₃dppz²⁺ (phen = phenanthroline, dppz = dipyradophenazine), is quenched by an oxidative quencher, Co(NH₃)₅Cl²⁺, forming a strong oxidant on the DNA. Preliminary findings with both agarose and polyacrylamide under non-denaturing conditions indicate that quadruplex DNA does crosslink, but is less efficient than B-DNA; this difference is less pronounced in denaturing polyacrylamide gels. Time-resolved emission quenching experiments reveal comparable quenching efficiencies for quadruplex and B-DNA using the flash-quench technique. Transient absorption spectroscopy experiments determine the relative ratio between absorbances at 390 nm and 700 nm and reveal the presence of the neutral guanine radical in both quadruplex and B-DNA. Work is underway to characterize the quadruplex by circular dichroism spectroscopy and to determine the relative stabilities of both types of DNA through thermal denaturation experiments. The presence and involvement of quadruplexes in areas related to genomic stability provides the motivation to study the relationship between DNA-protein crosslinking and DNA secondary structure.

Effects of DNA Mismatches on DNA-Protein Crosslinking from Guanine Oxidation

Author(s): Zitadel A Perez, Kelsey Miller, Amanda Madison
Mentor(s): Eric D A Stemp
Institution: Mount Saint Mary's College, Los Angeles CA

Oxidative DNA damage contributes to aging, cancer, chronic inflammatory diseases, and degenerative diseases. Guanine is particularly vulnerable to oxidation,

forming guanine radicals which can form irreversible crosslinks to proteins. DNA-protein crosslinks are an understudied yet significant form of oxidative damage. Here, we investigate whether guanine radical reactivity in DNA-crosslinking reactions for the oligonucleotide 5'-ATATGATATGGATATGATAT-3' depends on its base pairing partner in DNA mismatches. According to base dynamics, the G:T mismatch is the least stable and the most vulnerable to oxidation. DNA duplexes containing mismatches across from the 5'-G of the GG doublet were synthesized, and fluorescently labeled (Alexa Fluor 546) at the 3' end of the G-rich strand. Guanine radicals were created through a photochemical method called the flash-quench technique, in which a DNA-bound intercalator was quenched by an electron acceptor, forming a strong oxidant on the DNA. Crosslinking was detected using the agarose and polyacrylamide gel shift assay. Under both nondenaturing and denaturing conditions, crosslinking decreased in the order of G:G > G:A > G:T ≈ G:C ≈ G:U. Emission quenching experiments were performed for all duplexes and showed some variability in quenching, but these differences in quenching do not explain the trend in crosslinking. Thermal denaturation studies revealed that all mismatch duplexes were destabilized by ~15 °C compared to the G:C duplex. The amount of crosslinking seemed to have no correlation between duplex quenching and stability. The enhanced reactivity for guanine-purine mismatches was attributed to the formation of a lower oxidation potential sink, indicating that oxidation potential was a more significant factor for crosslink formation than base dynamics. Analogous experiments involving the insertion of 8-oxo-G across from the DNA mismatch are underway. These findings indicate that guanine reactivity in oxidative DNA-protein crosslinking reactions depends on its base pairing partner in DNA mismatches.

Genetic Assessment of Introgressive Hybridization between Subgenera of Chaparral

Author(s): David P Perrault, Caitlin D Ishibashi
Mentor(s): Rodney L Honeycutt, Stephen D Davis
Institution: Pepperdine University, Malibu CA

Ceanothus, a common plant genus occurring in chaparral communities of Southern California, can be subdivided into two subgenera, *Ceanothus* and *Cerastes*. Although members of these subgenera are adapted to both drought and fire, they differ in their physiology, development, and morphology. Based on these differences, it is assumed that natural hybridization between members of this subgenus is unlikely. Recently, morphologically intermediate plants between *C. megacarpus* (subgenus *Cerastes*) and *C. arboreus* (subgenus *Ceanothus*) were discovered on Santa Catalina Island. Microsatellite genetic markers were used to compare genotypic variation between the intermediate plants and plants collected from sites on Santa Catalina that contained pure stands of either *C. megacarpus* or *C. arboreus*. A principle components analysis and

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an assignment-based analysis suggest that the genotypic combination of the intermediate plants is consistent with their being of hybrid origin. This study represents the first time that such natural hybrids between these two sub-genera have been observed. Research is now underway to determine the maternal origin of these intermediate individuals

Validation of Crater Detection Software

Author(s): Carlotta C Pham, Yang Cheng, Andres Huertas

Mentor(s): Yang Cheng

Institution: UC, Irvine, Irvine CA

The Computer Vision Group at the Jet Propulsion Laboratory has developed algorithms and software to identify lunar surface hazards for mission planning analysis and landing site selection. A tool that detects craters automatically using Lunar Reconnaissance Orbiter Camera (LROC) Narrow Angle Camera (NAC) orbital images is being used to automatically assess lunar surface hazards at 25 regions of interest, and in particular, for the proposed NASA Moonrise sample return lunar mission. Validation, an element of the software development process, is a process to confirm the reliability of the software's results and to establish the credibility of the tool. The paper discusses the summer internship effort in developing a validation procedure for evaluating the performance of the crater detection software. Ground truth crater lists for three representative areas were manually created and they were then used in comparison with the automatically detected crater lists. We evaluated the algorithm's performance in three aspects: detection rate, position accuracy, and craters consistency. We found that the detection rate for fresh craters (hazardous craters) is better than 94.5%, the position accuracy is within 2.2 meters, and crater consistency is better than 93%. All these findings indicate that the automatic crater detection algorithm meets the mission requirements. Furthermore, the paper offers a suggestion that the current standard by which hazardousness is evaluated be amended.

Health Care Coverage among California Firms based on Type and Demographics

Author(s): Amanda E Phelps

Mentor(s): Geetha Rajaram

Institution: Whittier College, Whittier CA

This paper is an econometrics project that studies what factors influence firms to provide health care coverage. The survey used for this study is the California HealthCare Foundation/Mercer Small Business Health Insurance Survey, 2000. Specifically this study estimates the relationship between type of firm, size of firm, and demographic factors as to which firm's offers health care coverage. Sta-

tistically significant variables at the five percent level which contributed to the firms offering health care coverage were the manufacturing firms, the gender of the owner, and if they offered extra items such as a retirement plan or other health related benefits, for example, vision and dental plans. These percentages are based on larger small businesses which have 26-50 employees and are twice as likely to offer health care compared to smaller small businesses. The results show that manufacturing companies are 5.7% more likely than service firms to offer health care. Perhaps this is because manufacturing firms tend to have a larger amount of employees. This study found that firms are more likely to offer health care coverage to their employees when it was included as part of a larger package. For instance when companies offered dental benefits they were 44.8% more likely to offer health care coverage. When companies offered programs for retirees such as a retirement plan and health care coverage they were 4.1% and 10.6% respectively, they are more likely to offer coverage for current employees. Offering paid time off made the company 14.4% more likely to offer coverage. Also vision plans made the firm's 13.1% more likely to offer health care coverage for their employees. In summary, manufacturing and larger small business are more likely to provide health care coverage as part of an overall package compared to other types of firms.

Isolation of a Nodulating, Nitrogen-Fixing Bacterium of Dune Lupine

Author(s): Michael R Piña, Sean Villafloros

Mentor(s): Michelle R Lum

Institution: Loyola Marymount University, Los Angeles CA

Lupinus chamissonis (dune lupine) is a known nodulating species of the legume plant family found natively along the California coast. In the Ballona wetlands and El Segundo sand dunes near Loyola Marymount University, there is an ongoing effort to understand the effects of urban runoff on sand dunes, where dune lupine grows. In particular, this study observes the symbiosis between *L. chamissonis* and nodulating, nitrogen-fixing rhizobia bacteria. We are interested in observing how heavy metal contamination can affect this symbiosis. To do this, we first needed to identify the nitrogen-fixing symbiont of dune lupine. Roots of *L. chamissonis* were obtained from the El Segundo sand dunes. Nodules were isolated from the roots of the plant and then surface sterilized, crushed, and plated on selective media. Sterile *L. chamissonis* plants were re-inoculated with the bacterial isolates and found to form nodules, fulfilling Koch's postulates and confirming we had isolated the dune lupine symbiont. To identify the bacterial isolates, polymerase chain reaction (PCR) is being performed on the 16S rDNA gene and the product will be sequenced and compared to the database. Now that we have the symbiont, we are beginning assays to determine whether heavy metals such as copper and zinc have an

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impact on the symbiosis. The purpose of this experiment is to determine how plants are affected by living in urban environments.

Digital Destruction: How Digital Technologies Short Circuit Knowledge

Author(s): Morgan D Pinedo

Mentor(s): Kurt Meyer

Institution: Irvine Valley College, Irvine CA

Given that the most recent academic studies indicate that Millennials (individuals 18–30) are spending on average eight hours a day utilizing digital technologies, it is no wonder that while their social lives are soaring, their academic performance is plummeting. These youths are increasingly putting down books and picking up friends on Facebook. This over-reliance on digital technologies among Millennials is contributing dramatically to aliteracy, and mounting screen time. Their immediate and complete emersion in digital technologies significantly contributes to a decline in academic performance, a decline in general knowledge, and, most alarmingly, a decline in young people's intellectual abilities, namely critical and analytical thinking skills. Among these is the ability to interpret, analyze, and especially evaluate information—regardless of its content, context, accuracy, and worth. This assertion is supported by comparing both reading rates and online screen time of Millennials today with the rates of the Millennials of just ten years ago, and by analyzing how the structure and nature of websites and electronic information replaces actual literacy with visual literacy. Today's youths are replacing general literacy with viewer literacy, multitasking and navigating through various electronic environments, when the pages get to complicated they revert to skimming and even skipping reading text all together. Overall, the youth's reading skills and patience levels turn up insufficient to navigate the Web effectively. Parents and mentors can help to reverse these effects by making these technologies less easily accessible, and turning kids' bedrooms back into electronic media-free areas. If this behavior continues we will not only begin to see the increase in their intellectual abilities, but an overall general lack of the world.

Bee Sampling Has No Effect on Bee Abundance in Montane Meadows

Author(s): Robert F Polanco

Mentor(s): Rebecca E Irwin, Zak Gezon

Institution: California State Polytechnic University, Pomona, Pomona CA

One of the most talked about potential consequences of climate change is that of phenological mismatches between interacting species, such as flowering plants and their pollinators. While there are ample long term data

for plant phenology, there are little data on pollinator phenology. It is becoming more common to monitor pollinator populations over long periods of time to look for phenological mismatches. The standard method of bee population monitoring uses pan traps, which are bowls containing soapy water. The bowls are brightly colored to mimic flowers and attract bees, killing them when they fall in the water. It is unknown if sampling using pan traps affects bee abundance, especially when implemented repeatedly. Thus, I asked two questions: Is there a difference in bee abundance between sites that have been repeatedly sampled using pan traps and sites that have never been sampled? And, how does bee abundance change over two years of repeated sampling? To address the first question I used ten control sites: five dry meadow sites and five wet meadow sites. Control sites were sampled once, and bee abundance was compared between these control sites and six sites that were repeatedly sampled over the 2009 and 2010 flowering season using the same techniques. In total we caught 2060 bees at the repeated sites and 333 bees at the control sites. I found no significant difference in bee abundance at the control versus the repeatedly sampled sites. I also found no significant difference in bee abundance in 2009 versus 2010. I also compared floral abundance at the sites and weather to ensure that factors other than sampling were not confounding my results. I found no significant difference in flower abundance or temperature between sites. Taken together, these data suggest that sampling using pan traps has no effect on bee abundance.

Change We Can Believe in: Venom Variation during Prey Capture and Development in *Conus*

Author(s): Cecilia Prator

Mentor(s): Joseph Schulz

Institution: Occidental College, Los Angeles CA

In *Conus* species, we would like to investigate whether venom composition variation occurs during development and prey-capture. Previous studies show a change in radular tooth shape revealing that through development, morphological changes occur that mirror changes in prey preference from worm-hunter to fish-hunter. It would also make sense then that there must be a point where venom composition also undergoes a change to specifically target the new prey. Studies such as these have never been done on any species of cone snail. Efforts were made to develop a systematic protocol to raise *C. catus* larvae through metamorphosis as has been done for other species. If *Conus catus* larvae reach metamorphosis further studies could investigate whether venom composition switches from a worm-hunting ancestral-like set to the adult fish-hunting set, as well as help to understand radular tooth morphology transformations. Observations of the mollusk-hunter *Conus textile* during feeding reveal that prey are often injected multiple times in succession. Species that inject prey multiple times during a single feeding event may have

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compositional changes in injected venom. This would not be a concern in a species like *Conus catus* where there is only one observed injection during prey-capture. Whether venom composition changes occur after each shot and how changes are related to the biomechanics of prey-capture are areas of great interest. *Conus textile* venom was milked through a novel milking approach that enabled collection of multiple shots in succession. Injected venom samples will be analyzed through MALDI-TOF Mass Spectrometry.

Painting 3a

Author(s): Miles A Prowse

Mentor(s): Avery Falkner

Institution: Pepperdine University, Malibu CA

My work has a lot in common with street art or graffiti, presenting visually direct and unfettered ideas. Despite what some may say about graffiti, – ‘a low form of art’ – it is actually one of the more honest art forms, without elitism or hype, and available to all audiences. I use a variety of mediums in my artwork. I can work spontaneously and expressively with a multitude of materials available in my studio. Most of my abstract paintings contain recognizable images, such as figures, symbols, numerals, letters, patterns, and/or collage elements, that are mixed into colorful, painterly environments that skew traditional scale and perspective rules. The paintings presents a broad spectrum of cultural and global situations, so the viewer has a chance to interpret and discover possible connections between the unexpected juxtapositions found in the painting’s color, space and subject matter.

Optimization of an Assay to Determine a Diagnostic Biomarker for Hereditary Inclusion Body Myopathy (HIBM)

Author(s): Emily Putnam

Mentor(s): James Osborne

Institution: Keck Graduate Institute, Claremont CA

HIBM is a rare autosomal recessive disease associated with a mutation in the GNE gene, which codes for a key enzyme in the synthesis of sialic acid. Conflicting research in this disease has suggested that there may be a reduction in sialic acid levels in some diseased serum and muscle protein. Currently, there are no therapies for HIBM, however efforts are underway, using a transgenic mouse model of HIBM, to explore the therapeutic potential of replacing missing metabolic precursors of sialic acid biosynthesis. In order to accurately monitor any potential improvement in the HIBM mouse, an accurate assay must be developed which can monitor metabolic improvements in the production and utilization of sialic acid. We hypothesized that we could monitor changes in sialic acid modification by performing lectin-based detection of sialic acid levels

on proteins resolved and blotted from one-dimensional SDS-gels. Consequently, we developed an assay which utilized SDS-PAGE electrophoresis followed by lectin blotting and chemiluminescent detection of mouse serum and mouse muscle tissue. To create a mock control of hyposialylated serum and muscle protein, some samples were treated with sialidase, an enzyme which is known to remove sialic acid. Sialidase treatment resulted in the elimination of SNA (elderberry bark) lectin binding to mouse serum and the lactoferrin control and reduced the signal in mouse muscle. Notably, sialidase treatment resulted in increased binding of PNA (peanut agglutinin). These experiments validated our ability to detect specific changes in sialylation with sialic acid binding lectins. Further optimization of this assay must be completed to improve resolution before this protocol can be applied to transgenic mouse model samples.

Retinal Ganglion Cell Quantification by Rbpms Immunohistochemistry in Retinal Ganglion Cell Degeneration Models

Author(s): Ann T Quan, Jacky MK Kwong,

Mentor(s): Natik Piri, Joseph Caprioli

Institution: UC, Los Angeles, Los Angeles CA

We previously demonstrated that RNA binding protein with multiple splicing, Rbpms, is a retinal ganglion cell (RGC) marker, a protein whose detection indicates the presence of RGCs. The study characterizes Rbpms expression in the retinas after optic nerve crush (ONC) injury and N-methyl-D-aspartate (NMDA)-induced excitotoxicity. RGCs function to carry the final neuronal output of the retina by collecting visual signals from bipolar and amacrine cells, and transmitting information to the brain. The death of RGCs and degeneration of their axons in the optic nerve are the cause of vision loss in optic neuropathies, including glaucoma. The experiment’s purpose is to evaluate the progressive loss of RGCs in these two models through topographical and quantitative analysis of RGCs, which have been immunolabeled with Rbpms in the rat retina. Immunohistochemistry with antibody against Rbpms was performed on the retinal wholemounts. Adult male Wistar rats weighing 300–350g were used. For the ONC injury model, retinas were collected 1, 2, and 4 weeks after optic nerve crush ($n = 4$ each). For the retinal excitotoxicity model, retinas were obtained 1 week post-injection of 1.2, 3, 12, 30, and 120 mM NMDA ($n = 4$ each). The numbers of Rbpms-positive cells at locations from posterior to peripheral retina were quantified. The cell densities at 1, 2, 3, and 4 mm from the center of optic nerve head in the control retinas were 2881 ± 349 , 2722 ± 372 , 2319 ± 619 and 1762 ± 659 per mm^2 respectively. The mean densities in the retinas 1, 2 and 4 weeks after ONC were 1537 ± 147 , 306 ± 55 , 168 ± 20 respectively. The cell densities after injection of 1.2, 3, 12, 30 and 120 mM NMDA were 2442 ± 528 , 2304 ± 537 , 504 ± 127 , 200 ± 57 and 233 ± 35 per mm^2 respectively. The temporal and dose-dependent loss of RGCs after ONC

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injury and excitotoxicity indicate that Rbpm is useful to evaluate RGC survival in animal models of glaucoma.

Identification of Enantiomeric Interactions in Zeolites by Solid State NMR, X-Ray, & TGA

Author(s): Lauren E Que, Jessica Cardenas, Tram Duong, Hyien Huyieng

Mentor(s): Deniz Cizmecian

Institution: Mount Saint Mary's College, Los Angeles CA

Drug molecules are often chiral, where only one of the mirror images is useful. We are investigating the selectivity of Zeolite NaY in enhancing the relative abundance of one enantiomer over the other in the adsorption of D, L, and DL amino acids and their N-acetyl derivatives. Being achiral, zeolites cannot favor one enantiomer over the other. However, any tendency for the mixed dimer (DL) adsorption, by removing a 1:1 ratio of enantiomers, would lead to enantiomeric enrichment of the remaining solution. We are using solid-state ^{13}C NMR to probe the microenvironment of the adsorbed solutes. D- and L-Cysteine exhibit ^{13}C NMR peaks at 175, 54 and 35 ppm for the carbonyl, a and b carbons respectively, while the racemic DL mixture shows a second peak for each chemical group, implying strong interactions and conformational differences between the enantiomers. The spectra for the D- and L-alanine differ from the racemate DL, which shows changes when adsorbed, verifying that the microenvironment of the adsorbed molecules impacts the NMR signals. Spectra of pure enantiomers of N-acetyl-Alanine change significantly upon adsorption while their racemate's one carbonyl peak at 175 ppm is replaced with three when adsorbed, as is the a-Carbon peak at 51 ppm. The interactions occurring inside the zeolite will be further investigated by thermal gravimetric analysis, TGA, and x-ray diffraction, XRD. A new avenue to enantiomeric enrichment in zeolites is important for the pharmaceutical industry and also as a possible explanation for the prebiotic development of enantiomeric purity.

3D Versus 2D Movies and the Effects on Memory and Presence

Author(s): Saira Rab

Mentor(s): Mark L Carrier

Institution: CSU, Dominguez Hills, Carson CA

The recent advances in three-dimensional (3D) movie technology and the apparent popularity of 3D technology amongst moviegoers may lead 3D movie viewers to have a heightened sense of presence and perception during film presentations. The purpose of this study is to investigate the effects of 3D technology on presence and perception during movies, specifically by comparing the differences between viewers of 2D versions and 3D versions of the same movie. Participants at a Southern California univer-

sity completed an anonymous online questionnaire soon after they viewed a recent movie in either 2D or 3D. The questionnaire included: (1) a "presence" scale that measured participants' mental space of being "there", (2) a memory test of the movie, and (3) an emotional involvement checklist. In addition, the study sought to determine if emotions and memory responses from the questionnaire might differentiate between 2D and 3D movie experiences. It is expected that viewers of 3D movies will experience intensified emotions and memory as well as an increased sense of presence and perception. Further implications for 3D usage could also be for entertainment purposes; this has caught the idea that could possibly change the way people recall information based on movie format and can affect their presence and emotion levels. Preliminary results show a trend in this direction, although a formal follow-up study on presence is currently in progress. Future implications for 3D usage may change the way students recall information based on format by altering presence and emotion levels.

Sumoylation of Sp3 is Required for Tooth Development

Author(s): Tojan B Rahhal

Mentor(s): Jonathan M Horowitz

Institution: North Carolina State University, Raleigh NC

Sp proteins are responsible for the regulation of a wide variety of genes, many of which play important roles in animal development. One Sp protein, Sp3, has been linked to tooth development. Sp3 encodes three isoforms (Sp3, M1, and M2) that are synthesized from a single mRNA. Each isoform carries the Sp3 DNA-binding domain as well as lysine 551 (K551), the major site of a post-translational modification termed sumoylation. Sumoylation of Sp3 isoforms at K551 has been shown to control Sp3 function *in vitro*. To determine if sumoylation of Sp3 is required for tooth development, transgenic animals expressing wild-type and mutated Sp3 proteins in ameloblasts, cells important for tooth development and enamel deposition, were created. The focus of my work has been to note the phenotypes of these transgenic strains and correlate resulting phenotypes with the inheritance of each transgene. Interestingly, the teeth of mice carrying a sumoylation-deficient M1 transgene wear rapidly, break easily, and these animals develop a distortion of the alignment of their jaws (malocclusion). Microscopic analyses indicate that the teeth of these animals are coated with an abnormally thin layer of enamel, accounting for their rapid wear and high incidence of breakage. Thus, our results indicate that Sp3 sumoylation is required for proper enamel deposition. Interestingly, the phenotypes of these sumoylation-deficient animals are reminiscent of a human disorder termed amelogenesis imperfecta (AI). Consequently, we believe that our sumoylation-deficient transgenic animals may be a useful model of this debilitating human syndrome.

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Function of MicroRNAs in TGF- β -Induced Hypertrophy of Cultured Kidney Glomerular Mesangial Cells

Author(s): Anand V Rajan

Mentor(s): Rama Natarajan

Institution: Gretchen Whitney High School, Cerritos CA

Diabetes mellitus, a disease which can cause an imbalance of glucose in the body, can lead to many complications including diabetic nephropathy, or kidney glomerular fibrosis caused by hyperglycemia. TGF- β , or transforming growth factor beta, is known to play a role in nephropathy by upregulating certain microRNAs (miRs), single stranded non-coding RNA molecules about 21 nucleotides in length, to increase fibrosis in kidney glomeruli and cause hypertrophy of the mesangial cells. TGF- β has been shown to upregulate microRNA-192 under diabetic conditions in mice. miR-192 downregulates the E-box repressor Zeb2, leading to the upregulation of miRs-216a and 217. This leads further downstream to the upregulation of Akt, cellular hypertrophy, and diabetic nephropathy. The main objective was to prove that miR-192 controls TGF- β induced hypertrophy through this Akt pathway. Using cell culturing methods, both wildtype (WT) mouse mesangial cells (MMCs) and miR-192 knockout (KO) MMCs were obtained. We counted cell numbers, measured the protein levels of each of these groups, and calculated the protein/cell ratio. We also stained the cells, took pictures, and quantified their average cellular and nuclear sizes. miR-192 and its downstream microRNAs 216a and 217 were shown to cause increased cellular and cytoplasmic expansion compared to the negative control. Also, MMCs transfected with inhibitors of miR-192 and miRs-216a and 217 were shown to have decreased cellular expansion compared to the TGF- β negative control. Moreover, TGF- β treated wildtype MMCs had significantly increased size; however, the TGF- β treated miR-192 knockout cells did not show a significant increase in expansion compared to KO SD control. Because TGF- β upregulated miR-192 in wildtype cells and did not do so in the knockout cells, it can be inferred that miR-192 played a key role in the cellular expansion of the MMCs. Therefore, miR-192 controls a significant portion of the TGF- β induced hypertrophy of MMCs.

Photoelectrochemical Study of a Layer-by-Layer Assembled CdS QDs Film

Author(s): Angela M Ramos, Yunfei Long, Dianlu Jiang, Kuangyu Hou

Mentor(s): Feimeng Zhou

Institution: CSU, Los Angeles, Los Angeles CA

Quantum dots (QDs) assembly is explored for photovoltaic applications. Photovoltaic cells are devices that harness solar energy by converting it into electricity. For the device to generate electricity, the device has to absorb light, pro-

duce electrons and holes. More importantly, the electrons and holes so generated have to be separated and stay separated long enough to allow the charges to do work in the form of electricity. CdS QDs are one of the most studied nanocrystalline materials, having longer excitation due to the quantum confinement effect. A layer-by-layer method is used to assemble onto a conductive substrate of Indium Tin Oxide (ITO glass). In brief, we first assemble a layer of the positively charged Poly-diallyldimethylammonium (PDDA) polyelectrolyte onto a negatively charged ITO glass substrate via electric static interaction. Then assemble a layer of negatively charged CdS QDs. The assembly can be alternated as many times as needed. The assembled films were checked by using ultraviolet-visible spectroscopy (UV-Vis). The photoelectrochemical behavior of the film was studied by using a xenon lamp from a commercial fluorometer and a Digi-Ivy potentiostat (model DY-2300). UV-Vis measurements demonstrated the CdS QDs were successfully immobilized onto the substrate. The impact of QDs film thickness and QDs size on their photoelectrochemical behavior were optimized. We also investigated the sensitization of the QDs film with a few novel Pt complex dyes. It was found that sensitization of the film changed the photocurrent direction, indicative of the redox reaction swap from oxidation to reduction.

Secondary Pollen Transfer by Honey Bee (*Apis mellifera*) & Native Bee Pollinators in Seedless Watermelon (*Citrullus lanatus*)

Author(s): D Michael Ramos, Jacob M Cecala

Mentor(s): Joan M Leong

Institution: California State Polytechnic University, Pomona, Pomona CA

Seedless watermelon, *Citrullus lanatus*, can be pollinated by native bees and honey bees. Previous studies measured the deposition abilities of bee pollinators by quantifying primary pollen transfer to female flowers. Our research goal is to assess whether bee pollinators of seedless watermelon pollinate through the mechanism of secondary pollen transfer. Secondary pollen transfer occurs when pollen grains are transferred to a flower by an initial pollinator, and are subsequently transferred to a stigma by a second pollinator. Our specific research objective is to determine how much secondary pollen transfer occurs from petal surfaces to the stigma of the same female flower. We examined pollen remobilization rates from petals and rates of intrafloral pollen transfer from petals to stigmas. Petals of experimental flowers were marked with stained pollen grains and placed in floral arrays. We allowed pollinator visits for 30 & 180 minute time intervals between 8:00 am and 12:00 pm, pollen grains were then counted in the laboratory. Pollen was also counted from the petals of open control female flowers to establish a pollen accumulation curve. At Spadra Ranch (Pomona), an average of 32% of stained pollen grains were collectively remobilized by native bees and honey bees during the 30 minute

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arrays and an average of 88% were remobilized during the 180 minute arrays. During the 30-minute arrays an average of 34% of pollen grains were secondarily transferred to the stigma whereas in the 180 minute arrays, an average of 21% of pollen grains were transferred. At Tanaka Farms (Irvine), an average of 46% of stained pollen grains were remobilized and an average of 42% of pollen grains were secondarily transferred to the stigma during the 30-minute arrays. Our results provide the first empirical evidence that secondary pollen transfer can occur in field populations.

Gender and Stress: Do Men or Women Report More Stress?

Author(s): Amanda Reyes, Theresa Cao, Christopher Plant, and Brook Adams

Mentor(s): Juliana Fuqua

Institution: California State Polytechnic University, Pomona, Pomona CA

A growing number of men and women are moving to the Southern California Inland Empire, and many are engaging in long commutes (driving to jobs primarily located in Los Angeles County). According to previous research, a positive correlation exists between stress and longer commutes, particularly congested commutes. More attention is needed to determine whether women are at greater risk of commuting stress. Previous studies have suggested that, compared to males, females report significantly more stress from commuting due to familial obligations. In accordance with past research, it was hypothesized that females would be more likely to be affected by stress. One hundred and ninety-six males and 264 females randomly selected from the Inland Empire were surveyed by phone about their level of stress during commuting. Contrary to past studies, the results of the present study indicate a statistical trend toward *males* being more stressed during commutes. Male participants' slightly greater stress was independent of a higher level of employment outside the home. However, it may be possible that males' greater stress was due to having long commutes because men were found to have a longer commute time than women. Implications and future directions will be discussed.

Males Raised by Emotionally Absent Mothers and their Perception of Women as Adolescents: All Nature No Nurture

Author(s): Emmanuel Reyes

Mentor(s): Jeff Davis

Institution: CSU, Long Beach, Long Beach CA

This research focuses on sons who were raised by emotionally absent mothers and their influence on sons' perceptions of women as adolescents. The goal of this study is to explain why certain men in society find it difficult

to create and maintain interpersonal relationships with women as adults. In this study, an "emotionally absent mother" is defined as a mother who is physically present in their child's life but does not provide the emotional support or emotional assurance necessary to ensure positive child development. Sociologists recognize the need for more research on males and their relationships with their mothers. The majority of research has focused on the impact of absent fathers on developmental outcomes of sons and daughters. The data for the study come from the National Longitudinal Study of Youth, Child/Young Adult survey (1986-2006). A subsample of males was analyzed. These males were raised by both biological mother and biological father. Between the ages of 14 and 16 males were asked once about their attitudes towards women. Emotional support was measured in 1986. Control variables included self efficacy and self esteem. A preliminary correlational analysis of the data suggests that sons whose mothers provided greater emotional support had more progressive views of women and their roles in society. The relevance of the findings for child development and marriage and family therapy are discussed.

Riverside's Chinese Immigrant Commemoration Projects: How Unearthed Memories still Remain Buried.

Author(s): Vanessa Reynaga

Mentor(s): Georgia Mickey

Institution: California State Polytechnic University, Pomona, Pomona CA

My research is a case study of the City of Riverside's attempts to commemorate Chinese immigrants who helped build California and made Riverside the richest city per capita during the citrus boom of the late nineteenth century. Three projects were proposed: a Chinese-style pavilion in downtown Riverside, the archeological excavation of a lot in the area that used to be Riverside's Chinatown, and a historical museum and park. After the death of the old Chinatown site's last owner George Wong, the Office of the Riverside County Superintendent of Schools wished to develop the old Chinatown site. Threat of development provided the impetus needed for the Southern California Chinese community to propose an archaeological dig, which was carried out from 1984 -1985. The pavilion was built and commemorated with a week-long festival in 1987; however, instead of becoming a tourist attraction as its supporters intended, the pavilion today is deserted, gated to keep out the homeless. Although the Riverside County Parks Department launched a Chinatown Historical Feasibility Study—also in 1987—for the museum and park, this proposal has never come to fruition. I explore the reasons why these commemorative projects to honor Chinese immigrants did not achieve their objectives. I argue that the project to construct the Chinese pavilion was conceptually flawed: the pavilion's design elided the memory of the men and women for whom the

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pavilion was constructed. The other two projects became enmeshed in competing claims over the local resources required to complete the archeological excavation and build the museum and park. The result of these well-intentioned efforts is a commemoration that cannot withstand time, as a memory fades with time, so did the work and contributions of Riverside's Chinese immigrants. Their history remains buried and forgotten.

Synthesis of Assymetric NNO Schiff Bases with Electron Withdrawing Groups

Author(s): Nomaan M Rezayee

Mentor(s): Joseph Fritsch

Institution: Pepperdine University, Malibu CA

Asymmetric NNO Schiff base ligands with one electron withdrawing group and one electron donating group on the ketoimine backbone were prepared through the condensation of 1,3-diketones 1,1,1- trifluoro-5,5-dimethyl-2,4-hexanedione, and 4,4,4- trifluoro-1-phenyl-1,3-butanedione with either 8-aminoquinoline or 2-methyl-8aminoquinoline. With CF_3tBu only one regio-isomer was produced while CF_3Ph yielded two region-isomers in a 4:1 ratio where the quinolyl moiety had been added to either the CF_3 or Ph side of the 1,3-diketone. The NNO Schiff bases were isolated with column chromatography and characterized with ^1H , ^{13}C , and ^{19}F NMR and mass spectrometry.

Assessing the Generality and Stability of Ontological Confusions

Author(s): Lee Richardson

Mentor(s): Andrew Shtulman

Institution: Occidental College, Los Angeles CA

Ontology is the study of how people classify entities in the world. People use ontological categories to attribute properties to the entities subsumed by those categories (Slotta et al., 1995). For instance, entities like "dogs" and "flowers" are subsumed by the ontological category "living things" and are thus attributed properties true of living things (e.g., needs food, dies) in addition to properties unique to those entities. Empirical research on ontological knowledge has only focused on one domain at a time, such as factual knowledge about the physical sciences (McCloskey, 1983; Reiner et al., 2000; Wiser, 2001), superstition and rational thinking (Lindeman & Aarnio, 2007), or religious beliefs (Barrett & Keil, 1996; Shtulman, 2008), with each case using different materials and measures. The present study attempted to clarify the occurrence of ontological confusion across multiple domains and two response types. Participants ($n = 49$) completed a two-part questionnaire in which their beliefs about five entities (plants, God, heat, force, and rainstorms) were explicitly assessed using a closed-ended property attribution task

and implicitly assessed by an open-ended paraphrasing task. Participants' explicit scores were calculated using the difference between their endorsement of ontologically inconsistent versus consistent properties. The implicit scores were the number of responses containing ontologically inappropriate word choices. A correlational analysis showed some significant correlations between scores for specific entities in one of the sections, but there were no generalizable trends. The results in the explicit section were interesting in that participants endorsed the ontologically consistent statements less than the inconsistent statements for God, while doing the opposite for other entities, indicating that ontological confusion about God is unique when compared to the other entities. A clearer understanding of the difference between religious cognition and reasoning in other domains could be reached by further research in ontological confusion.

Death and Dying in the Sakhalin Penal Colony: The Influence of Social Environment on Attitudes Toward Death

Author(s): Jeffrey K Richason

Mentor(s): Sharyl Corrado

Institution: Pepperdine University, Malibu CA

On Sakhalin Island, in Russia's Far East, the conditions of the late nineteenth century fostered a unique social system: the island was a penal colony where exiles were sentenced for life. Through a close reading of Russian journalist Vlas Doroshevich's 1903 book, *Sakhalin*, I made several observations regarding the views toward death on Sakhalin. I found that Sakhalin convicts distinguished between death and dying. For them, death was not a source of fear, as most of Sakhalin's inhabitants were criminals, living in a violent setting where murder was commonplace. The notion of dying, in contrast, inspired sheer terror among Sakhalin residents, known as *Sakhalintsy*. I found that concern for personal pain and religious factors had little influence on the inhabitants' fear of dying. Instead, the act itself, when something imposed, represented to them losing control of the one thing that the *Sakhalintsy* had power over – their own lives. When dying was something they had control over – as in the case of suicide – it was not a source of fear. Suicide, like murder, was discussed frequently – even in a positive light - yet appears to have been rare on the island despite offering a means to escape a painful existence, a fact noted by Doroshevich when he visited the island in 1897. While there, Doroshevich collected hundreds of interviews and first-hand accounts from the island's inhabitants which provide a rich base of material on the views of the lower and criminal classes. Doroshevich's collected writings on Sakhalin have only recently been translated into English, allowing for the latest realization that on Sakhalin – a setting free of the normal social, cultural, and religious restraints that would prevent an individual from committing suicide – other factors have the same restraining effect.

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Enforcing Nodes in a Damped Elastic Structure Subject to Harmonic Forcing

Author(s): Jennifer M Rinker

Mentor(s): Philip D Cha

Institution: Harvey Mudd College, Claremont CA

In this poster, a method is developed to enforce locations of zero displacement, called nodes, in damped elastic structures that are undergoing harmonic forcing. It is possible to enforce these nodes by attaching properly tuned damped vibration absorbers (DVAs). Instead of solving for the oscillator parameters directly, one uses Gaussian elimination to solve for the necessary restoring forces that the DVAs must exert for proper node enforcement. It is then possible to determine values for the masses, springs, and dampers such that the DVAs exert the required restoring forces and enforce the desired nodes. Design plots are shown for several cases that detail feasible oscillator parameters for different forcing and attachment arrangements, and the method proposed for enforcing nodes is validated using numerical experiments.

Accuracy of Eyewitness Identification of a Car Theft Suspect Under Multiple Levels of Illumination and Facial Transformation

Author(s): Christopher B Rios

Mentor(s): Nancy Alvarado

Institution: California State Polytechnic University, Pomona, Pomona CA

This study explored the effects of illumination and facial transformation on eyewitness identification in the context of a car theft. Eyewitness identification is generally accepted as being the most common reason for wrongful convictions in the USA. Therefore, the social impact of examining what affects a person's ability to correctly identify a suspect is crucial. 35 male and 69 female undergraduate students from California State Polytechnic University, Pomona observed a video of an implied car theft under two illumination levels in which the perpetrator was wearing a disguise. The disguise consisted of sunglasses and facial hair. Facial transformation from the time of the crime to the presentation of the photo spread was also investigated. A 2x2 between subjects factorial design was utilized. One of two videos were presented to the participants; daylight or evening twilight. Participants then viewed one of two photo spreads; disguise (no facial transformation) or no disguise (facial transformation). The study found that there was a significant effect of illumination when the perpetrator in the photo spread looked as he did in the video (disguise/no facial transformation). Highest confidence was found for the participants who viewed the daylight videos. Overall, it was found that illumination level and not facial transformation had the most significant effect on eyewitness identification accuracy and eyewitness confidence.

Identification of Enantiomeric Interactions in Zeolite NaY by Solid State NMR, Thermogravimetric Analysis, and X-ray Diffraction

Author(s): Jasmine A Rios

Mentor(s): Deniz Cizmecian

Institution: Mount Saint Mary's College, Los Angeles CA

We are investigating the selectivity of Zeolite NaY in enhancing the relative abundance of one enantiomer over the other in the adsorption of amino acids. ^{13}C CPMAS spectrum of D- and L-N-Acetyl methionine exhibit peaks at 170, 55 and 30 ppm for the carbonyl, α and β carbons respectively, while the racemic mixture shows a second peak for the carbonyl group at 165 ppm implying that the latter crystallizes as a racemic compound. This gives reason to speculate an increased tendency for heterodimer adsorption onto the zeolite. Thermogravimetric analysis and powder X-ray diffraction techniques have been used to explain the microenvironments of adsorbed amino acids. A new avenue to enantiomeric enrichment in zeolites is important for the study of prebiotic development of enantiomeric purity. Furthermore, this mechanism can be useful for the pharmaceutical industry where enantiomeric purity is important.

Against the Evolution of Cheese; Place, History and Marketplace, a Case Study of AOC Designation in Etivaz, Switzerland

Author(s): Emily Ritchie

Mentor(s): Bob Gottlieb

Institution: Occidental College, Los Angeles CA

This research addresses the topic of Geographical Indications (GI) in Switzerland, specifically for Etivaz cheese, asking what are the cultural values and the way of life associated with Etivaz cheese, and to what extent does the continued manufacture of that cheese depend on the Appellation d'Origine Contrôlée (AOC) status that Etivaz products achieved in the year 2000? AOC translates to Controlled Designation of Origin, but is generally referred to as Protected Designation of Origin. AOC (a specific type of GI) is a system that protects a product based on the region where it is made, or the terroir. GIs are a step towards reducing pressures due to global trade and they give farmers a chance to compete with industrial agriculture. An AOC cheese has to have strong ties to terroir, meaning it must be unique because of the region and its history. The Etivaz co-operative easily qualifies as it has been producing cheese for many years in the same region using labor-intensive methods inherited from the nineteenth century. Etivaz's AOC has helped preserve a culture that participates in the 21st century, but is not in Europe's liberal mainstream. Success, and Etivaz's dependency on AOC are difficult to measure exactly, but the current situation is a good marriage between accepting innovation and keeping with tradition.

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College Graduates and Social Responsibility

Author(s): Lauren Rivera

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

Research has shown that a sense of purpose comes from young people having a passion and desire to make a particular contribution beyond the self. Social responsibility was operationally defined as the degree to which individuals engage in prosocial activity. Some have concluded that higher education has the potential to foster more social responsibility. The present study extends this research to examine whether or not the children of college graduates exhibit higher social responsibility. Employing a sample of community dwelling adults concentrated in Southern California, questionnaires were designed and administered over a three month period. Results are based on a subsample ($n = 826$). It was hypothesized that those individuals with parents who were college graduates would be more socially responsible. Results from a two-step Hierarchical Regression model supported this by demonstrating that the children of college graduates are more socially responsible. These results were obtained when age, gender, job status, marital status, and income were controlled in the first step of the model. The discussion focuses on increasing social responsibility to improve the condition of society.

Pedagogical Model for the Transport of Contaminants in Ground Water Systems

Author(s): Moises Rivera

Mentor(s): Monica Palomo

Institution: California State Polytechnic University, Pomona, Pomona CA

The transport of contaminants in groundwater systems is a complex and relevant topic for civil engineering students. It has been traditionally taught in lecture format composed of intense mathematical derivations, in-class problem solving exercises, and homework assignments. Quantitative data showed that students had experienced difficulty understanding solute transport theory. Student academic performance was investigated after integrating a hands-on learning module composed of three sub-modules: column transport study, numerical simulation of the column experiment, and sorption study. Population tested consisted of a total of fifty students, twenty five who took the class in 2009 without the module, and twenty five students taking the class in 2010 with the module included as part of the laboratory. Knowledge assessment was conducted, and 2009 and 2010 data were compared. Results showed an increase of success when students were asked to identify breakthrough curves (28% students with all the answers correct in 2009, versus 74 % in 2010). Clear rational visualization of solute transport theory applied into a complex engineering problem increased from 36% in 2009

to 52% in 2010. Results demonstrated that student learning and academic performance were enhanced through implementation of hands-on laboratory activities that focused on student understanding of core ground water contaminant theories.

Using the *Drosophila* Vesicular Monoamine Transporter to Investigate Neuroprotection and Identify Novel Pathways Regulating Locomotion

Author(s): Logan Roberts, Jennifer Jang, Richard Hadi, Varun Shahi

Mentor(s): David E Krantz, Hakeem Lawal

Institution: UC, Los Angeles, Los Angeles CA

Parkinson's disease is characterized in part by the death of dopaminergic (DA) neurons in the substantia nigra resulting in severe motor deficits. The oxidative properties of DA have been proposed to play a role in PD pathology and to account for the susceptibility of dopaminergic neurons to cell death in PD. However, the mechanisms underlying PD and an approach for effective therapeutic treatment are still uncertain. The Vesicular Monoamine Transporter (VMAT) is a twelve transmembrane domain protein essential for regulating the packaging of all cytosolic monoamine neurotransmitters including dopamine, serotonin, and octopamine. Studies have shown that octopamine is critical for the activation of the central pattern generator that controls behaviors like locomotion. We investigated whether reduced locomotion in VMAT-mutants could be rescued by potentiating the octopaminergic circuit. Recent evidence suggests that VMAT function is also neuroprotective against models of PD. We hypothesize that molecules capable of increasing VMAT function would therefore serve as neuroprotectors. Accordingly, we sought to identify drugs capable of increasing VMAT function. Using locomotion as a phenotype, we conducted drug screens to identify molecules capable of increasing *Drosophila* VMAT (dVMAT) function in dVMAT mutant larvae. DVMAT mutants show severely retarded locomotion and drugs capable of rescuing this were selected for further screening. This screen revealed 41 drugs that significantly improve locomotion; some of which may act directly through dVMAT. These agents have the potential to serve as novel therapeutic agents for PD as well as further our understanding of the mechanisms underlying dopaminergic cell death in PD. We are currently developing a robust system for assaying DA neuron loss in response to pesticide exposure, and we report a robust loss of DA neurons in *Drosophila* larva exposed to the pesticide rotenone. This model will allow us to test the neuroprotective potential of drugs identified in our screen.

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Towards the Electrochemical Synthesis of Graphite Oxide

Author(s): Andrew Robertson

Mentor(s): David Saiki

Institution: CSU, Bakersfield, Bakersfield CA

Recent studies of the synthesis of graphite oxide are of considerable interest due to the unique electronic properties of graphene. Experimental results and procedures of an electrochemical method used to generate graphite oxide will be presented. This method generates a deep yellow color in acidic solution which may be attributed to the production of a complex of graphite oxide and Fe³⁺. Work using an Ocean Optics UV/Vis spectrometer to measure the amount of Fe³⁺ in solution will provide insights supporting the hypothesis that graphite oxide is produced electrochemically. Future plans that include the electrochemical reduction of graphite oxide and the subsequent deposition of graphite oxide onto a copper electrode will be discussed.

Facebook and the Warrantig Theory

Author(s): Jaclyne Rodriguez

Mentor(s): Sharon Docter

Institution: California Lutheran University, Thousand Oaks CA

This study applied the warranting theory to Facebook. The warranting theory contends that individuals are more likely to place greater credence on information shared by others rather than by the individual himself/herself. Subjects were shown two mock Facebook profiles and were asked to complete a questionnaire about the personality of the individual based on his/her Facebook profile. Preliminary results supported the warranting theory. That is, in assessing the personality of the Facebook user, 57% of subjects were more influenced by what others wrote on the Facebook users' wall, while only 15% of subjects were influenced by what the Facebook user wrote about himself/herself. About 28% of subjects were influenced by both what others wrote on the Facebook user's wall and what the user wrote about himself/herself. This suggests that users of Facebook will assign more credibility to what others represent on Facebook walls rather than what the individual represents about himself/herself.

Comparing Biomass Distribution on Carbonate Rocks at the Costa Rica Margin at Active and Inactive Methane Seeps

Author(s): Marcela Rodriguez

Mentor(s): Lisa A Levin

Institution: UC, San Diego, La Jolla CA

The deep sea was once thought to be biologically ho-

mogenous. The last 30 years of research have shown that biodiversity and heterogeneity exist even at depths of 5000m. The effects of human activities such as deep-sea fishing and oil extraction, as well as climate change, have the potential to alter deep-sea biological processes. Before they are disturbed, it is imperative that we understand the ecological role of different habitats and organisms including those at methane seeps, where the food web is dependant on chemosynthetic microbial mediated processes. We hypothesize that there is a relationship between anaerobic oxidation of methane (AOM) at methane seeps and macrofaunal biomass. To investigate this relationship, we sorted, identified, counted, and biomassed macrofauna from carbonate rocks at active and inactive environments on the Costa Rica Margin. The taxa included Annelids, Crustaceans, Molluscs (limpets, snails, and other molluscs), and other macrofauna. Preliminary results suggest increased availability of methane corresponds to larger individual biomass and animal density for most annelid and mollusc samples. We found high abundances of one or two taxa in each sample, reflecting high dominance and low diversity. Our results show a relationship between seepage activity and macrofauna biomass. Human disturbances that affect the seepage of methane could also impact deep-sea communities and ultimately larger linked ecosystems.

Aqueous Corrosion of Titanium Alloys with Boron Additions in Physiologically Relevant Media

Author(s): Shaun Rogers, Mehnaz Malek, Isaac Priddy, Daniel Surmenian

Mentor(s): Vilupanur Ravi

Institution: California State Polytechnic University, Pomona, Pomona CA

The service life of prosthetic implants is limited by their failure due to mechanical overload and corrosion. Thus, there is ongoing interest in the development of longer lasting bio-implants that can withstand mechanical stresses and the physiological environment. Metallic alloys, such as stainless steel, cobalt-chrome, and titanium, are currently being used as implant materials. A new class of titanium alloys is being developed with boron additions that strengthen the alloy; however, the effect on their corrosion resistance is only recently being understood. Several boron-containing titanium alloys were prepared using standard metallographic techniques. Once prepared, the samples were exposed to a saline environment (0.9 wt% NaCl) using a flat cell connected to a Gamry Reference 600 Potentiostat/Galvanostat. The open circuit voltage was measured prior to applying a cyclic potential from -1.0 to 8.0 volts. Pitting corrosion was observed in the base alloy and also the ones containing boron additions. However, the extent of pitting and the morphology of the pits varied. A proposed mechanism for pitting is that TiB needles (present in the B-containing alloys) could play a role in reducing the passivity of the titanium dioxide per-

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haps by forming electrically conducting pathways that short circuit the normally protective oxide layer. Results of electrochemical tests and the role of alloy chemistry and microstructure will be discussed.

Generation of Mutant *Proteus mirabilis* Lipases as Improved Catalysts for Fatty Acid Methyl Ester Production

Author(s): Katherine J Rosen
Mentor(s): Tyler Korman
Institution: UC, Los Angeles, Los Angeles CA

Biodiesel or Fatty acid methyl esters (FAMEs) is an alternative fuel currently used in the U.S. Standard production methods using chemical catalysts are energy-intensive and produce toxic side products. Currently, use of alternative catalysts based on enzymes is prohibited by high costs, due to low expression yields and denaturation (by alcohols) during the esterification. It is our hypothesis that mutations that confer increased catalytic activity to the lipase can be combined with temperature-stable mutations to produce a robust catalyst that is inexpensive, fast, and can be reused multiple times without losing activity. The short-term goal of the project is to isolate mutant lipases that are more stable than the wild-type protein in the presence of heat and/or methanol. Thus far, we have established a high-throughput agar plate assay that allows for the screening of thousands of mutants generated by error-prone PCR (epPCR) for residual activity following incubation with methanol and heat. Colonies transformed with the epPCR library are lifted onto filters, incubated with buffer, methanol, and triton detergent and heated. After 45 minutes, the mixture is decanted and a chromogenic substrate, A-naphthyl palmitate, is added to detect lipases with residual activity. Colonies expressing active lipase will be picked, re-grown, confirmed active, then sent for sequencing and characterized. Mutants isolated thus far display increased tolerance of methanol and/or heat compared to the wild-type lipase with mutant K208N retaining $\geq 90\%$ activity when heated at 45.5 °C in the presence of 60% MeOH, conditions under which the wild-type enzyme is inactivated. Subsequent rounds of ep-PCR on mutant PmLip will be done to further increase its temperature stability and methanol tolerance in the given reaction mixture.

Attitudes toward Acquaintance Rape: The Impact of Social Context & Feminist Consciousness

Author(s): Marina Rosenthal
Mentor(s): Jaclyn Rodriguez
Institution: Occidental College, Los Angeles CA

This study examined relationships between a non-linear measure of feminism, the Feminist Identity Development Scale (FIDS), and responses to two rape vignettes one de-

picting a clear rape scenario and the other an ambiguous rape scenario. Dependent measures assessed perceptions of the female's desire for sex, the male's intentions, and ideal outcomes for each condition. Two hundred and one female college students completed the FIDS, filler personality inventories, and responded to one rape scenario. ANOVAs revealed main effects for condition and feminist identity, as well as an interaction. Participants in the clear rape condition were more likely to define the scenario as rape than those in the ambiguous condition. Participants who scored higher at Stage 1 of the FIDS model, which assesses passive acceptance of sexist values, were significantly more likely to perceive both the female and male as desiring sex than those who scored lower. Alternately, respondents with higher scores at Stage 5 of the FIDS model, which measures the extent to which individuals are actively committed to social justice, were less likely to report that the female should have behaved differently and more likely to report that the male should have behaved differently than low scorers. Feminist Identity also interacted with condition. Individuals who scored high in Stage 5 were less likely to victim blame in the ambiguous rape situation than those who scored low. No differences were evident in the clear rape scenario for high and low scorers at Stage 5. These results suggest that feminist identity influences responses to rape scenarios, both clear and ambiguous, in complicated ways. Rape conditions continue to pose attribution challenges. Future research should explore a broader sample, including males, additional conditions impacting attributions of responsibility, and educational steps to correct misconceptions regarding rape.

Design, Construction, and Testing of a 15 cm, m=0 Helicon Plasma Source

Author(s): Victor Ruiz
Mentor(s): George R Tynan
Institution: UC, San Diego, La Jolla CA

Helicon plasma sources (HPS) are useful for fundamental research in nuclear fusion because of their ability to produce high density plasmas in a wide range of external control parameters. An HPS uses a radio frequency (RF) antenna operating at 13.56 MHz to ionize gas inside a bell jar under a high vacuum. The current HPS utilizes a 10 cm outer diameter (OD) bell jar which serves as the unit's vacuum chamber. A larger HPS featuring a 15 cm OD bell jar was designed for use in physics studies of turbulence in larger and denser magnetized plasmas. The temperature difference between the plasma and the environment produces a thermal gradient that creates stress in the glass. For thick glass, the thermal gradient would lead to fracture of the bell jar. To ascertain the required wall thickness for the larger bell jar, one dimensional heat transfer and pressure vessel models were used. Temperature readings of the bell jar's exterior surface were taken at varying power inputs and magnetic field strengths to verify estimates of the bell jar's inner surface temperature that were derived from

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the heat model. Results revealed higher temperatures than expected (180 °C) indicating that high temperature mechanical failure is more likely to occur. The installation of cooling lines decreased the effect of the heat flux through the glass and lowered the outer surface temperature of the bell jar. Consequently, a bell jar with thicker glass (3.5 mm) can be utilized resulting in added safety.

Future of the Internet: How Americans See Our Technological World in 2020.

Author(s): B B I Rush

Mentor(s): Larry D Rosen

Institution: CSU, Dominguez Hills, Carson CA

With the Internet becoming more entwined in our everyday lives what changes should we expect in the near future? Further, what impact will these changes have on different generations of Americans? In 2009/2010 the Pew Internet & American Life Project asked 895 technology "experts" to select one option in 10 pairs of statements such as: "By 2020 Internet use will enhance peoples' intelligence" vs. "By 2020 Internet use will not enhance our intelligence and may even lower the IQ of people who use it a lot." The purpose of the current study was to compare the experts' opinions with those of four generations of Americans - Baby Boomers, Generation X, Net Generation, and the young, teen iGeneration. It was hypothesized that Americans would view the future of the Internet more negatively than the experts and that there would be differences across generations with older generations having more negative beliefs in the future. An online survey queried 889 teens and adults from the greater Los Angeles area asking eight of Pew's questions as well as collecting data about typical daily media usage and technology ownership. Preliminary results indicate that experts are more positive about the future of the Internet than the American public and that older generations are somewhat less positive than younger ones, but only for some of Pew's questions. In addition, other variables, such as smart phone and media use, were also related to differential views of the future of the Internet. The results are discussed in terms of how experts and nonexpert Americans have different perceptions of our future technological world and what that may portend for future use of the Internet and media, parenting, education and technology adoption.

Conditioning the Capital Asset Pricing Model to Incorporate Macro-Economic Based Variables

Author(s): Maria Casandra Rusti, Maria Jansen

Mentor(s): Sharad Keny

Institution: Whittier College, Whittier CA

Time variations in expected returns are related to the business cycle. Evidence shows that expected returns are higher in economic recessions, since investors are less

willing to hold risky assets, and lower in economic booms. This suggests that time variations in equity premiums should be accounted for by variables related to the business cycle. Being able to model equity premiums helps investors optimize their portfolios. Therefore, we develop a conditioning macroeconomic variable that captures time variation in risk premium across business cycles and we test its predictive power for future market returns. More specifically we look at the following macro-economic variables: dividend yield, term spread, default spread, and short-term interest rate. Our analysis uses Johansen's cointegration method to look at a stationary time series of the four macro variables as a new factor. We test the model's predictive power compared to the original CAPM as well as the widely used Fama and French three factor model in order to conclude whether it is a viable alternative or improvement over current practices. Our study indicates that the model outperforms the original CAPM and performs equally to the Fama and French factor model. The cointegrated term is not adding much more value to the model currently being used, although it is accounting for different influencing factors. Further study can look at combinations of the Fama and French factors with our cointegrated term and perhaps adding a momentum factor as well.

Miocene Basalts from Joshua Tree, California Show Fault Block Rotation

Author(s): Victoria S Rutledge

Mentor(s): Scott Bogue

Institution: Occidental College, Los Angeles CA

Paleomagnetic study of Miocene basalts collected from a locality 7km north of Desert Center, CA (33.7N, 244.6E) shows that rocks are rotated 46.6° in a clockwise direction, results inconsistent with previous kinematic models of the development of the San Andreas Fault. While the history of the southern segment of the fault from the Holocene to present shows good agreement and consistency between the observed and predicted offset along the fault, the history from the Miocene to the Pleistocene is poorly known, which inhibits further understanding of the early development of the Northern section of the fault system. This paleomagnetic study, which was proposed to be used with existing paleomagnetic evidence to reexamine extent and magnitude of the vertical axis block rotation in the fault system, conclusively showed through AF demagnetization that the blocks had indeed been rotated. Samples collected in 6 lava flows show a general direction of north and down after demagnetization, while lava flows towards the top of the section possess very strong, randomly directed magnetisms easily cleaned by low levels of alternate field demagnetization. I interpret these components as isothermal remanence magnetizations imparted by lightning strikes. Laboratory magnetization imparted by brief application of a direct field nearly saturate at a field strength of 200 mT, strongly suggesting that titanomagnetite is the primary magnetic mineral found in samples.

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Serendipitous Epidemiology: How Your Late Night Google Flu Symptom Searches Can Help the CDC Save Lives

Author(s): Joel P Ryan

Mentor(s): Kurt Meyer

Institution: Irvine Valley College, Irvine CA

The creation of Google Flu Trends- a search query based method of estimating the spread of seasonal influenza- has allowed influenza-like-illness (ILI) rates to be reported with unprecedented speed. However, the Google Flu Trends model lends itself to inaccuracy, thus raising the question of whether or not the Centers for Disease Control (CDC) should use this information in their fight against the spread of seasonal influenza. If used properly, the timely estimations made by Google Flu Trends have the potential to help prevent some of the up to 49,000 annual deaths from seasonal influenza. After examining empirical evidence provided by both Google and the CDC, it becomes clear that Google's estimation of ILI rates will never be as accurate as other more direct methods of estimating ILI rates. However, Google Flu Trends can be a tremendous asset to the CDC, despite inaccuracies caused by intense media coverage and the unpredictable nature of human behavior, as it provides results one to two weeks earlier than traditional surveillance systems. Therefore, data provided by Google Flu Trends should be used as the primary statistic on ILI rates, until the more accurate data becomes available. The success of Google Flu Trends may bring hope to other fields plagued by time delays in statistics. Unemployment rates, and consumer confidence estimations provided in real time could revolutionize fiscal decision-making. Google Flu Trends is now testing its ability to predict ILI rates in cities. If this method is refined, these search queries may predict everything hard water, to crime. As long as its inaccuracies are accounted for, Google Flu Trends will be a tool that revolutionizes the way the CDC predicts ILI rates, and it will be a precursor to tools that can change our world for the better.

All Roads Lead to Ireland: An Examination of the Clerical Revolution in Ireland

Author(s): Megan Ryan

Mentor(s): Sharyl Corrado

Institution: Pepperdine University, Malibu CA

In "All Roads Lead to Ireland: An Examination of the Clerical Revolution in Ireland" Megan Ryan analyzes the role the Irish Catholic clergy played in determining British politics in the 1820's, concentrating primarily on the unprecedented actions taken by the priests in order to support their political agendas. Previous scholarship considers the emancipation of the Irish Catholics a product of Daniel O'Connell's political career with the role of the priests noted as important—but not central—driving force. Ryan argues that the clergy, as evidenced by news-

paper articles, speeches, letters, and financial and political records from early nineteenth century Ireland, played an absolutely essential role in the political revolution that occurred in Great Britain in the 1820's. Furthermore, the political revolution was not possible without first having the added revolution within the clergy itself. Instances such as these are important to understand for current scholarship because of the fact that so much of Ireland's identity centers around religious associations, and it is largely due to these affiliations that tension between Ireland and England have lasted so prevalently throughout history, even until our present day.

Hydrostaticity of 4:1 Methanol:Ethanol at High Pressure and Low Temperatures

Author(s): Christopher R Salvo

Mentor(s): Andrew Cornelius

Institution: CSU, San Marcos, San Marcos CA

This study explores the hydrostatic limits of 4:1 Methanol:Ethanol pressure transmitting medium at temperatures down to 30 Kelvin. This mixture is a typical medium that is used to apply hydrostatic pressure on materials for high pressure physical experiments. However, it has not been studied below 70 Kelvin at high pressure. The experiment was performed by using a Merrill-Bassett diamond anvil cell (DAC) placed inside of a cryostat capable of reaching 30 Kelvin. For this experiment, pressures up to 12 GPa were reached and measured using the ruby R1 line. The R1 line was obtained using a 510 nm wavelength laser and spectrometer. The medium was found to be hydrostatic up to around 7 GPa at 260 Kelvin, and around 10 GPa it is more hydrostatic at 30 Kelvin than at 260 Kelvin. Typically, at lower temperatures, a liquid undergoes a phase transition to a solid, which is less hydrostatic. Therefore, our results of enhanced hydrostaticity at 30 Kelvin is rather surprising, and further investigations are required.

Women Under Soviet Rule

Author(s): Melissa D Samarin

Mentor(s): Michael J McBride

Institution: Whittier College, Whittier CA

The Soviet Union, particularly in the early years of its establishment, professed itself to be a supremely egalitarian society. This study counters this statement by examining the social realities of life for women living under the Stalinist years of the Soviet Union (namely the 1930s to the 1950s). The treatment of women is an excellent indicator of how egalitarian a society is, and is especially relevant in the case of the Soviet Union, since women constituted a higher percentage of the population during this time. This investigation focuses on urban, working, middle class, young women in the arenas of work, education, and the domestic realm. Drawing upon political and government

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documents, secondary historical texts, contemporary memoirs, literary responses, images, and data from this time period, the archetypal portrayal of the Soviet women is contrasted to the actual conditions they experienced. Despite the government's insistence and political claims otherwise, this research demonstrates that women were not treated equally and were in fact discriminated against in various ways under Stalin's rule.

Agents of Change or Upholder of Tradition: The 'Emancipation' of Central Asian Women

Author(s): Melissa D Samarin
Mentor(s): Leila Zakhirova
Institution: Whittier College, Whittier CA

Central Asia, as a predominantly Muslim area, was one of the first regions targeted by the Soviet Union in its policy towards women's emancipation in the 1920s. The Bolsheviks considered women prime agents to Russian-ize and Soviet-ize this southern region of the USSR, and so officials directed their campaign accordingly. However, this study demonstrates through statistical data, secondary historical texts, journal articles, and first-hand accounts that despite these Soviet efforts, Central Asian women were not the bringers of change, but rather the upholders of tradition. During the emancipation campaign, the Soviet government did not treat Central Asian women equally, and on many accounts actually oppressed them, which impeded much of the local impetus for conforming to these Soviet standards. Furthermore, because of the nature of traditional Central Asian culture (which includes more egalitarian practices, yet a set of delineated gender roles) women continued to maintain traditional values and sustain the Central Asian culture throughout the period of the Soviet Union. The repercussions of these women's efforts are being particularly manifested in the post-Soviet era, as the area is reverting back to more conventional gender roles and traditional practices are resurfacing.

Monkey See, Monkey Do: A Neurological Basis for Imitation and Its Importance in Language Learning

Author(s): Neha Samdaria
Mentor(s): Fiona Cowie
Institution: California Institute of Technology, Pasadena CA

The emergence of language was a defining moment in the evolution of modern humans. While most species of animals can communicate, humans have an intricate communication system that can describe anything from simple objects to visions. A prerequisite for the use of such a system is a capacity to learn efficiently from other language users. Over time, our brains have evolved mechanisms for imitation learning: the ability to transform the

act of watching someone achieve a goal via a sequence of steps into the act of achieving the goal ourselves, using the same sequence of steps. These mechanisms were likely involved in the very first stages of language evolution, when individuals began naming objects and learning those names from others. This study explores in particular the role of the mirror neuron system in imitation learning. It disputes Berkeley psychologist Gopnik's claim that it is a "myth" that mirror neurons are involved in imitation learning. More recent work suggests that mirror neurons are crucially implicated in that capacity, and hence in our ability to learn language. By extension, and contrary to what Gopnik implies, understanding the evolution of that system is critical to any account of the evolution of language.

Developing Confidence Among First-Generation College Students in the Graduate Program/Post-Graduate Career Process

Author(s): Tanya N Sanabria, Alysaunde M Murphy
Mentor(s): Mary Y Danico
Institution: California State Polytechnic University, Pomona, Pomona CA

In college, first generation students undertake many challenges and obstacles while navigating the system. Without prior knowledge, most of these students are unfamiliar with the requirements of graduate school programs or post-graduate career placements. This paper will argue that first-generation college students develop confidence in striving for their professional aspirations if exposed to resources on how to research under a faculty mentor, strengthen professional integrity and build the curriculum vitae. Our interest in building confidence stems from previous social cognitive theories that suggest that programs geared toward intellectual and confidence development raises students' self-efficacy through these experiences (Alfassi, 2003; Bandura, 1977, 1997). We focus on the impact of resources on how to obtain research assistantship and the guided mentorship between faculty mentor and mentee. We define a first-generation college student as a student currently attending a four year university or two year community college whose parents have not attended a post-secondary institution. Based on secondary data, the campus climate survey conducted on the California State Polytechnic University Pomona campus, we conduct an assessment of students' needs and experiences on campus. We discuss further implications of research in the impacts of faculty mentorship for first-generation college students.

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Aerial View

Author(s): Amanda M Sanchez

Mentor(s): Avery Falkner

Institution: Pepperdine University, Malibu CA

In this piece, I became compelled to explore the use of colors and shapes, which in turn suggest both an imaginative urban and natural terrain. The use of negative space balanced with dense areas of color add to the visual dialogue. By using watercolor, I was able to heighten the visual effects of fugitive light by the overlaying of transparent shapes. The use of both organic and geometric shapes allude to a feeling of human imposed structural order pitted against a natural organic environment.

The Influence of Flood Events on the Long-term Coexistence of Native Amphibians and Invasive Crayfish

Author(s): Arthur C Sanders, Eiichiro Uemura, Evan Mattiasen, Nicholas Huron, Craig Sutter

Mentor(s): Lee B Kats

Institution: Pepperdine University, Malibu CA

Invasive predators can have a severe and detrimental impact on an ecosystem. We have studied invasive predators in the streams of the Santa Monica Mountains of Southern California for over 15 years, and we have observed that some local populations of native amphibians have gone extinct as a result of competition or predation from these invasive species. One particular invasive predator, the crayfish *Procambarus clarkii*, preys on the eggs, larvae and adults of three stream-breeding-amphibians in the Santa Monica Mountain streams. These crayfish are tenacious when introduced to a stream, and as a result we have not seen a crayfish population be completely eradicated once introduced. Therefore, in most streams where crayfish are found, amphibian populations have disappeared. Nonetheless, we have long-term data indicating the persistence of amphibians in high gradient streams (steeply sloped streams with fast water flow). We have found that during El Niño events and years with high rainfall, crayfish are killed or washed downstream to areas where they are not usually found. However, in years of normal rainfall, the crayfish populations expand and amphibian reproduction is diminished. We have removed crayfish from streams during the low rainfall years, and have noted that when crayfish populations are downsized by our trapping and removal or high rainfall, the native amphibian populations increase because of successful breeding events. Our long-term study indicates that in high-gradient streams, removal and high rainfall can reduce invasive crayfish populations and preserve native amphibian populations.

Cryptic Species of *Polycera alabe* from the Northern Eastern Pacific Ocean

Author(s): Monica Andrea Santander, Elysse Gatdula

Mentor(s): Angel Valdes

Institution: California State Polytechnic University, Pomona, Pomona CA

Identifying species based upon morphological characteristics is advantageous as it is easily applicable and often consistent. However, this method sets limitations for identifying populations of distinct species that are morphologically similar or undistinguishable (cryptic species). Through molecular analysis, cryptic species can be recognized by the possession of genetic apomorphies (DNA substitutions that are unique to one species). *Polycera alabe*, Collier and Farmer, 1964, was previously known to have four different color variations, which appear to be conspecific based upon morphological traits. In this paper we have examined a nuclear marker, the histone H3 gene, to verify whether these four color variations are indeed members of the same species, and to compare *P. alabe* with *P. hedgpethi* and *P. atra*, two closely related species found in the northeastern Pacific. Specimens were obtained from museum collections and collected by the authors. Colgan's universal H3 primers were used to amplify the regions of interest for both *P. alabe* and the out-groups, *P. hedgpethi* and *P. atra*, through methods of PCR from extracted DNA. PCR products that yielded appropriate bands were purified and diluted. The diluted PCR products as well as a diluted sample of primer were sent out for sequencing. Sequences were edited and aligned for consensus. A phylogenetic tree was constructed using this data. Three of the color variations of *P. alabe* examined are genetically distinct based on the results from the histone H3 gene. This contrasts with the relative absence of genetic diversity observed in H3 gene sequences of *P. atra* and *P. hedgpethi*, which have similar broad, distribution ranges in California. These genetic differences imply that *P. alabe* is three and possibly four distinct species rather than color variations of the same species.

How a Friend or Family Member with Disabilities Can Affect Your Quality of Life

Author(s): Vanessa L. Sargent

Mentor(s): Virgil H. Adams

Institution: CSU, Channel Islands, Camarillo CA

In the past few decades, the public has acknowledged that the primary source of care for most individuals with mental illness is the family home. Research has shown that parents of children with developmental disabilities experience higher levels of stress from the sudden negative impact it has created in their lives. However, other research has shown that adults who've grown up with intellectually disabled siblings maintain high levels of positive involvement in their sibling's lives. The present

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research expands on this line of inquiry by examining if individuals who have a close friend or family member with either a mental or physical disability will have a decreased quality of life. A survey was developed and administered to a sample of community adults living in a large Southern California county ($n = 1005$, mean age = 37.88 years, age range = 18 – 91 years). The survey was administered during a three month period in the summer of 2010. It was hypothesized that the quality of life of individuals who have a close friend or family member with a physical or mental disability would decrease in comparison to those without such persons. Hierarchical regression results did not support the hypothesis. Even when the variance associated with the demographic variables was controlled, individuals who had family or friends with disabilities reported having increased well-being levels. The discussion focuses on a person's quality of life and how it is influenced by a friend or family member with a disability.

Robot Applied Plantarflexion Load Increases Ground Reaction Force Without Altering Step Trajectory: Implications for Body Weight Supported Treadmill Training

Author(s): Ryan Schmitt, D Soto, J Duhon,

Mentor(s): Jeff Nessler

Institution: CSU, San Marcos, San Marcos CA

Locomotor training is an integral component of rehabilitation following spinal cord injury, and research has shown that loading of the lower extremities during training is necessary to preserve muscle function. However, it is common practice to unload a portion of a patient's body weight during training to facilitate stepping, thereby reducing ground reaction forces and affecting muscular recovery. The purpose of this study was to investigate the efficacy of a robotic training algorithm for spinal cord injured rats that can simultaneously provide body weight support (BWS) in combination with downward force applied to the hindlimb to increase plantarflexion loading during the stance phase of gait. Twenty-four female, Sprague-Dawley rats received mid-thoracic spinal cord transections as neonates. Beginning at 21 days of age, all animals received 5 minutes of robotic training per day and were trained for five days per week for 4 weeks. On the 5th day of each week, stepping ability was evaluated as all animals stepped for 1 minute under each of the following 3 training conditions: 1) 90% BWS, 2) 50% BWS, and 3) 90% BWS with additional plantarflexion load. Sagittal plane step trajectories and GRFs were recorded by the robotic device for each condition. Results demonstrated that conditions 2 and 3 both yielded approximately 20% greater vertical GRF during stepping when compared to condition 1 ($p = 0.049$). In addition, step height was significantly reduced for condition 2 during the first week ($p = 0.05$), but returned to comparable levels by week 4. Total number of steps also appeared to be reduced on average for condition

2 (44.5 ± 30 vs 39.9 ± 27.92 steps/min), but this difference was not significant. These results suggest that the application of a plantarflexion load during stance, together with appropriate BWS, will elicit the best combination of GRF and step quality during locomotor training.

Evaluation of the Properties of Chitosan/Collagen Composite Scaffolds for the Treatment of Traumatic Brain Injury

Author(s): Kristen L Schunter, Halem Ham, Jon Witte

Mentor(s): Elizabeth Orwin

Institution: Harvey Mudd College, Claremont CA

Traumatic Brain Injury (TBI) is an acquired injury due to any sudden trauma to the brain either when the head violently strikes an object or when an object pierces the brain tissue. The extent of damage can vary from mild, resulting in loss of consciousness or confusion lasting under thirty minutes, to severe, which can result in irreversible memory loss, comatose states, and permanent loss of speech or motor function. Although there is potential for drugs to help regeneration and functional recovery, the simple application of this treatment does not address the loss of tissue sustained by the injury. However, a scaffold drug delivery system may be used to provide full recovery of the damaged tissue. Our group is working to develop a cross-linked collagen/chitosan composite scaffold that can be used to deliver mesenchymal stem cells, which could regenerate lost tissue and repair the damage caused by TBI. There are many considerations involved in creating a tissue-engineered construct for the treatment of TBI, including the viability of cells seeded on the scaffold, the potential for antibacterial activity to prevent infection, and the mechanical properties of the scaffold. To this end, we have performed three primary experiments. We explored the interaction between the scaffolds and human dermal fibroblasts, and found that the morphology and total number of cells changes significantly as a result of greater percentages of cross-linking. We also characterized the antibacterial properties of the scaffolds, observing that the pH of the solution drastically alters the bactericidal activity of chitosan alone, that none of our composites are effectively antibacterial, and that varying the percentage of cross-linking does not affect the bactericidal properties. Finally, we investigated the swelling and degradation of the scaffolds, finding that with respect to both factors our scaffolds are suitable for neural tissue engineering applications.

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Know Your Audience: Faith and the Patriotic Philosophy of Tertullian and Clement of Alexandria

Author(s): Anthony Scuibba

Mentor(s): Stewart Davenport

Institution: Pepperdine University, Malibu CA

This project seeks to evaluate the extent to which the Christian Church Fathers saw philosophy as a means to understanding faith. It focuses on Clement of Alexandria and Tertullian as late second century Mediterranean Christian contemporaries that exemplified the two opposing sides of this debate. Clement kept his constant use of philosophy consistent with his high appraisal of it, whereas Tertullian appears inconsistent – speaking out against philosophy even though he too used it in his writings. This paper argues that the great difference between their audiences accounts for the disparity in their approval of philosophy as a legitimate means to understanding faith: Clement's intellectually sophisticated and curious school at Alexandria; and Tertullian's close-knit and morally rigorist community at Carthage. Tertullian espoused an epistemological preference for inductive methods of understanding, which he believed bore witness to the historical birth, death, and resurrection of Jesus Christ, thereby freeing Christians from the dangerous and restrictive dialectical prison of deductive philosophy. Clement, by contrast, sought to educate orthodox Christians and refute heretical Gnostics by embodying the very essence and discipline of Christian philosophy – demonstrating that faith and reason mutually reinforce one another. This project analyzes these defining characteristics of both Church Fathers with respect to their audiences to support its thesis that their distinct audiences sufficiently account for their opposing attitudes towards philosophy. In so doing this paper supports much of the preceding scholarship on Clement, though it takes issue with most of the previous work done on Tertullian.

Flow into Happiness

Author(s): Crista Scott, Shadai Mora

Mentor(s): Christy Teranishi Martinez

Institution: CSU, Channel Islands, Camarillo CA

Happiness is a relatively stable state of positive well-being; however, findings suggest people may increase their level of happiness by pursuing meaningful activities (Lyubomirsky et al., 2005). Flow occurs when a person is completely immersed in an activity to the extent of losing awareness of time and everything except the activity itself (Csikszentmihalyi, 1990). The present study examines the relationship between flow and happiness. Csikszentmihalyi and colleagues identified nine dimensions of flow, including balance between perceived challenge and skills, clear goals, merging of action and awareness, concentration, control, less self-consciousness, altered sense of time, immediate feedback, and autotelic personality where fo-

cus is on an activity rather than how it affects one's ego (Nakamura & Csikszentmihalyi, 2002). We hypothesize that the nine dimensions of flow would be positively related to happiness. One hundred and forty-five participants (71 females, 74 males; $M = 30$ years old, $SD = 13.89$) completed a survey consisting of the Flow State Scale (Jackson & Marsh, 1996) and Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). Pearson's bivariate correlations indicated that happiness was positively related to balance between challenge and skills ($r(143) = 0.23, p < 0.01$), an autotelic personality ($r(143) = 0.23, p < 0.01$), and clear goals ($r(143) = 0.15, p < 0.10$). Multiple regression analysis indicated that balance between challenge and skills ($\text{Beta} = 0.20$), feedback ($\text{Beta} = -0.18$), and self-consciousness ($\text{Beta} = -0.18$) significantly predicted happiness ($F(9, 144) = 2.14, p < 0.05; R = 0.35; R^2 = 0.13$). In support of hypotheses, having greater balance between challenge and skills predicted greater happiness. Contrary to predictions, less immediate feedback and increased self-consciousness contributed to happiness. We will discuss how the various activity settings (e.g., sports, creative endeavors, etc.) where flow occurs may have an impact on level of happiness. Implications for these findings will be discussed.

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

Author(s): Victoria Senechal

Mentor(s): David Reznick

Institution: UC, Riverside, Riverside CA

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

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Role of the Nucleus Tractus Solitarii in Acupuncture-Related Modulation of Cardiopulmonary Reflex

Author(s): Angie Juwon Seo

Mentor(s): Stephanie Tjen-a-looi

Institution: Mount San Antonio College, Walnut CA

Electroacupuncture (EA) has been found to regulate blood pressure changes through the stimulation of somatic nerves at the Jianshi - Neiguan (P5 - P6) acupoints overlying the median nerve. Studies have found that EA can reduce blood pressure in hypertensive patients and studies suggest that it can be used as an alternative treatment for hypotensive patients but convincing evidence is lacking. The lowering of blood pressure is controlled by the parasympathetic autonomic nervous system. Parasympathetic outflow from the nucleus tractus solitarii (NTS) is influenced by baroreceptors and chemoreceptors in the heart and lungs through stimulation via the vagus nerve. Phenylbiguanide (PBG) excites cardiopulmonary chemo-receptors, which send afferent signals through the vagal parasympathetic pathway causing depressor and bradycardiac responses, also called the Bezold-Jarisch reflex. To show which region plays the specific role in the reflex, kainic acid, a neural depolarizer, was microinjected into different areas of the NTS. Through these studies, the role of NTS in EA modulation of PBG induced cardioinhibition was examined in a feline model. Direct stimulation of the cervical vagus nerve and extracellular recordings in the medial NTS were studied to see that there were electrophysiological changes in evoked responses by EA stimulation of the P5-P6 median nerve. It was found that EA at the P5-P6 acupoints modulated the Bezold-Jarisch reflex by attenuating in three animals the inhibitory cardiovascular responses in blood pressure (from -40 +/- 4 to -19 +/- 5 mmHg) and heart rate (from -58 +/- 6 to -20 +/- 6 beats/min) and the medial NTS ($n = 4$) plays an important role in the EA stimulation responses. These studies show that EA modulates hypotensive and negative chronotropic conditions and give insight to the EA-related neural pathways.

The Effects of Dietary Restraint on Neurocognition

Author(s): Stephanie Serna, Kathleen Pelham, Heather Todd, Vanessa Martinez

Mentor(s): Kimmy Kee

Institution: CSU, Channel Islands, Camarillo CA

Background: Previous studies on pathological eating patterns have typically assessed the cognitive consequences of dieting, yet fundamental questions about the cognitive effects on restrained eating behavior are not fully known. The current ongoing study compares the neurocognitive functions of inhibition, self-control, and emotional processing (i.e., emotional identification of valence; emo-

tional arousal) between 32 undergraduate students who engaged in restrained eating patterns and 46 students with non-restrained eating patterns. **Methods:** All participants completed the following test battery: the Revised Restraint Eating Scale (Herman & Polivy, 1975), Self-Control Scale (Tangney et al., 2004), and Williams' Inhibition Test (Williams, 2002). Emotional processing was assessed using 48 images (pleasant, neutral, and unpleasant) selected from the International Affective Picture System (Lang et al., 1998) and rated using the Self Assessment Manikin Scale (Lang & Bradley, 1994). **Results:** Interim analyses revealed a significant difference between restrained eaters versus non-restrained eaters for self-control, $t(76) = 1.93$, $p < 0.05$. Specifically, subjects in the restrained eating group demonstrated less self-control compared to their non-restrained eating counterparts. However, group differences did not achieve statistical significance for inhibition, emotion identification of valence, and emotional arousal. **Conclusion:** Preliminary findings from this study suggest that the neurocognitive function of self-control may serve as an important determinant of restraint eating behavior.

Merck & Co.: External Environment/Industry Analysis and Company Assessment

Author(s): Thomas A Setliff, Kendall Fisher, Derek Hacker, Gianfranco Panacci, Steven Sullivan, Amy Wunderlich, Kento Mizumaki, Brian Mulvihill, David Odorizzi

Mentor(s): Venkatachalam Seshan

Institution: Pepperdine University, Malibu CA

Merck & Co. with Net Sales among the global top ten pharmaceutical companies at \$27.4 Billion, up 15% from 2008. Its Net Income is \$13 Billion in 2009, up 64% from 2008. Merck has 4.8% of The United States Market Share and 3.39% of the Global Market Share, up 0.33% from 2008. The top competitors of Merck are Pfizer, Novartis, Sanofi-Aventis, GlaxoSmithKline, Johnson & Johnson and AstraZeneca. These top seven companies comprise 40% of global pharmaceutical sales. Merck's mission is to develop new pharmaceutical products, providing society with superior products and services that improve the quality of life. Merck increased R&D expenses by \$1 Billion in 2009. Recently, Merck and Schering-Plough Inc. merged. This merger creates a R&D pipeline with greater depth and breadth with many promising drug candidates. Merck has 19 Phase III medicines and 4 in final review. Two of Merck's blockbuster drugs, *Cozaar* and *Hyzaar* have expired United States patents as of April 2010. This will lead to lower revenues as Merck has no blockbuster drug debuting this year. The 2010 Healthcare Reform Bill will hurt Merck through drug discount programs and increased Medicare Part D discounts required by law. Merck has partnership and licensing agreements with many companies. The goal of this Undergraduate Research Project is to analyze Merck's Share of Market (SOM) in a manner that provides a framework for growth in market share via strategic imple-

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mentation. From the research completed in this project, Recommendations for Corporate Strategies will have been realized. Recommended strategies for Merck, include prioritization of R&D projects, continued development of promising candidates for Atherosclerosis, Thrombosis, Hepatitis C and Osteoporosis, a push for the \$3.5 Billion cost-savings plan to be completed by 2011, and successful exploitation of the recent merger with Schering-Plough to develop potential blockbuster drugs in the next two years.

Coupled Numerical/Experimental Investigation of Optical Stress Birefringence

Author(s): Travis Severt

Mentor(s): Michael C Shaw

Institution: California Lutheran University, Thousand Oaks CA

Optical stress birefringence offers a powerful window into the details of the spatially complex redistribution of stress that occurs around geometric irregularities within solids. This investigation compares both the numerical models and experimental results for stress redistributions of a model geometry. The investigation began by determining the stress birefringence coefficient and Young's modulus of a sample material through a series of calibration experiments using simple tensile specimens. A numerical linear elastic model was then developed, using ANSYS Multiphysics, to predict the two-dimensional stress fields, depending upon material composition and geometric structure, resulting from a given force applied to the object. Simultaneously, an experimental investigation was conducted to capture the stress contour patterns of the object using optical stress birefringence. Using the NIH ImageJ program, the resulting stress contours were analyzed for comparison with the numerical model. The results were interpreted to provide insight validity of both the numerical and experimental models.

Tiltmeter Interferometer Studies

Author(s): Morgan Shaner, Fabian Pena-Arellano, Emanuele Sobacchi

Mentor(s): Riccardo DeSalvo, Vladimir Dergachev

Institution: California Institute of Technology, Pasadena CA

The design and characterization of a Michelson interferometer for the readout of the tiltmeter is reported. The maximum angular displacement of the tiltmeter that the interferometer can tolerate is calculated. The noise produced by the transimpedance amplifier of the photodiode is calculated and compared with experimental measurements. The contributions of ground vibrations and laser intensity noise are experimentally identified. A feedback system for locking the interference pattern at a certain intensity was implemented.

Intracellular Correlates of High Frequency Oscillations in the Epileptic Brain

Author(s): Justin D Sharim

Mentor(s): Peyman Golshani

Institution: UC, Los Angeles, Los Angeles CA

Temporal lobe epilepsy is a neurodegenerative disorder characterized by recurrent unprovoked seizures. A single episode of status epilepticus rewires the brain, rendering it predisposed to having recurring seizures. Little is known about the mechanisms underlying this rewiring. In the non-epileptic brain, normal bursts of high frequency oscillations (HFOs) in the 140 – 200 Hz frequency band called ripples are believed to play a role in the consolidation of memory and in synaptic plasticity. In epileptic models however, much higher frequency oscillations of 200 – 600 Hz, called fast ripples, have been observed. The presence of these pathological HFOs is associated with the rewiring in the brain, and is a marker for where seizures originate. However, the cellular mechanisms underlying the genesis of these pathological oscillations are still unclear. We hypothesize that the pathological HFOs are caused by increased neuronal synchronization. We have recorded in vivo local field potentials simultaneously with whole-cell membrane potentials from CA1 pyramidal neurons in the hippocampus of control and epileptic mice (1-3 months after status epilepticus) under urethane anesthesia. Spectral analysis demonstrated that the anesthesia blocks the pathological HFOs. A proportion of epileptic mice however did show the presence of high amplitude spikes within ripples. We are currently conducting similar experiments in non-anesthetized mobile mice. Understanding the synaptic mechanisms underlying these rapid coherent rhythms will give insight into the pathogenesis of the epileptic state, and may give us insights into new forms of treatment.

The Aztlanian Lens: Return-to-Home Themes in Latino American Literature

Author(s): KT Shaver

Mentor(s): Susan Carlile

Institution: CSU, Long Beach, Long Beach CA

In studying the post Civil Rights canonized authors of Latino American literature, it appears that historical and geographical perspectives dominate and unify contemporary narratives just as do many traditionally canonized texts; however, the Mexican American novel asks us to consider an alternate trajectory with regard to geographical history in the US, one that is not dependent solely on a westward expansion. Gloria Anzaldúa's *Borderlands*, as a pre-text to understanding Aztlánian rhetoric and Mexican-American migratory patterns, serves as a lens to show how the return-to-home themes pervade many Latino American texts. These spherical migratory patterns that Anzaldúa maps (north to south and re-traces

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to a retro-migration into the American Southwest) allow us to understand the “return-to-home” themes in Sandra Cisneros’s fictional *The House on Mango Street*. Analyzing the construction of the text shows the migratory narrative that reinforces the Aztlanian lens. The story’s protagonist takes us through an eco-critical examination of how space and geography construct identity. Cisneros engages the voice of the narrator in a struggle to escape her barrio neighborhood, a perceived bordered space, by employing both a physical and emotional migration and ultimately returns her protagonist back home. In using an approach of new-historicism, deconstruction, and ecocriticism, this analysis focuses on how migratory and return themes in a novel taught in most junior and senior high schools link Chicano texts with an Aztlanian ideology.

The Role of Inhibitor of Differentiation-2 (Id2) in Lung Fibrosis

Author(s): Diane H Shin, Benjamin Lopez

Mentor(s): Vedang Londhe

Institution: UC, Los Angeles, Los Angeles CA

Id2 is a helix-loop-helix protein that inhibits dimerization and binding of related HLH proteins to promoter regions of DNA during organogenesis. Id2 thus controls DNA transcription and is normally expressed in tips of branching embryonic epithelium during lung development. Our previous data has shown that epithelial overexpression of Id2 yields a morphologically normal lung in both embryonic and adult mice. Whether Id2 plays a role in regulating lung injury such as bleomycin-induced pulmonary fibrosis remains unknown. We hypothesize that Id2 protects against bleomycin-induced pulmonary fibrosis. We generated transgenic mice by inserting human Id2 cDNA under control of a SpC promoter (SPC-Id2) to investigate the role of Id2 overexpression during bleomycin-induced pulmonary fibrosis. Newborn SPC-Id2 mice and control wild-type littermates were challenged with daily bleomycin (1 mg/kg) intraperitoneally for 16 days. Adult SPC-Id2 and control mice were similarly challenged with a single intratracheal bleomycin injection (1 mg/kg) and sacrificed after 16 days. Mouse weights were recorded prior to sacrificing and lung tissue was processed for bronchoalveolar lavage cell counts, mRNA, protein, and histological analysis. Bleomycin treatment did not induce inflammatory or histological changes in SPC-Id2 or control newborn pups. In contrast, adult SPC-Id2 mice showed significant reduction of bleomycin-induced inflammation and lung fibrosis when compared to wild-type controls as demonstrated by histology and quantitative Ashcroft scores. Bleomycin-treated SPC-Id2 mice also maintained better weight gain compared to controls. Our results demonstrate that Id2 reduces inflammation and fibrosis in lungs of bleomycin-treated adult mice. These findings suggest that Id2 may play a protective role in bleomycin-induced lung fibrosis, although the specific mechanisms have yet to be determined.

Dipole Trapping and Evaporatively Cooling to Achieve Bose-Einstein Condensation

Author(s): Joel A Shuman, Eric Dodds, Zack Lasner

Mentor(s): Dwight Whitaker

Institution: Pomona College, Claremont CA

To create a Bose-Einstein Condensate (BEC), we cool Rubidium-87 atoms to nanoKelvin temperatures. Atoms are confined using near-resonant lasers and magnets in a magneto-optical trap (MOT), then loaded into a dipole trap where evaporative cooling can take place. Loading atoms into the dipole trap involves hitting a ~4mm diameter cloud of atoms with a ~30 micron, ~50 Watt, invisible CO₂ laser in a vacuum; if the atoms are sufficiently cool and dense, they will be trapped in the electric field of this far-off-resonant light. The intensity of the laser light is subject to fluctuations on the order of 10% of the total power of the laser. We have been unable to load the dipole trap from the MOT, and so a servo system will be installed to stabilize the laser power by feeding back the signal from a liquid nitrogen cooled detector to an acousto-optic modulator (AOM). The AOM, which controls the total power of the laser, can be adjusted at frequencies higher than the power fluctuations themselves, enabling it to provide real time power stabilization. In addition, a translational optical mount controls the size of the minimum beam waist and hence the dipole trap size. By adjusting the position of this mount, we can control the depth of the trap and allow the most energetic atoms to ‘evaporate’ from the trap, further cooling the atoms.

Wittig Reagents from Amino Acid Derivatives: Preparation of Chiral Auxiliaries

Author(s): Hannah Sievers

Mentor(s): David Marten

Institution: Westmont College, Santa Barbara CA

Chiral auxiliaries are useful tools for synthesizing important organic compounds in highly stereoselective reactions. The presence of a remote, chemically active group in the chiral auxiliary (a free alcohol or amine), can have a large effect on the stereoselectivity observed in a particular reaction. The objective in this project was to prepare a chiral auxiliary, derived from an α -amino acid, that was part of a stabilized Wittig reagent. The new Wittig reagent would then be treated with an aldehyde to form an α, β -unsaturated ester with the chiral auxiliary in the alkyl group of the ester [R*-O₂CCH=CHAR]. The double bonds could then be transformed in stereoselective ways to prepare useful organic compounds, and the auxiliary could be recovered and re-used. This lab has previously shown that cyclic carbonates, prepared from chiral diols, could be used to make chiral auxiliaries with hydroxyl groups. We wanted to expand this method to include cyclic carbamates prepared from an α -amino acid. When the cyclic carbamate of (+)-phenylglycinol was reacted with methyl-

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lenetriphenylphosphorane, the intermediate stabilized Wittig reagent was indeed synthesized and the desired carbon-carbon double bond was formed from this Wittig reagent upon reaction with *p*-tolualdehyde. Although the carbamate could have opened to produce an ester or an amide, the ester was the main product in this particular example. The chiral auxiliary produced in this reaction has a remote amine that could be used to induce chirality during a reaction involving the alkene. We will present our results from the cyclic carbamate reactions and describe how these products will be used in the future to produce chiral organic compounds.

Status of Satisfaction

Author(s): Samantha Silver

Mentor(s): Virgil Adams

Institution: CSU, Channel Islands, Camarillo CA

It is not surprising that research indicates social support and care giving are essential not only to personal health and well-being, but also to the development and maintenance of healthy and satisfying intimate relationships. Other research also indicates that infidelity is now the most frequently cited cause for divorce. The present research examines the relationship between marital status and global well-being. More specifically, it was hypothesized that marital status would be a significant predictor of global well-being. A second question assessed if satisfaction with the amount of romance received is related to well-being. The sample ($n = 955$) consisted of adults from a large Southern California county (Mean age = 42.28, age range 18 – 90). Hierarchical regression results indicated that marital status did not significantly account for variance in well-being. However, satisfaction with their marital status and the amount of romance received were significant predictors of well-being. It should be noted that these predictors emerged after the variance associated with demographic variables had been removed. The discussion focuses on how the relationship between the amount of romance received and global well-being may influence infidelity rates.

Isolation and Characterization of Novel Bioplastic-Producing Bacteria

Author(s): Paramjit K Singh

Mentor(s): Nitika Parmar

Institution: CSU, Channel Islands, Camarillo CA

Bioplastics are defined as plastics made from renewable resources such as plant starch and microbial species. This research project involves application of microbial techniques in examining the production of bioplastics by novel microbial species. Bioplastics are made from the compound polyhydroxyalkanoate (PHA). In some microbial species, accumulation of PHA occurs during

presence of excess carbon and nitrogen sources. Poly 3-hydroxy butyric acid (PHB) is the most common microbial PHA. PHB produced in response to stressful conditions, serves as an energy storage molecule to be utilized when common energy sources are absent. From a biotechnological point of view, the ability of the bioplastics to be biodegradable makes them a desirable substitute for petrochemical-based plastic, an environmental pollutant. By increasing the production of bioplastics, both carbon dioxide emissions and consumption of fossil fuels can be reduced. Bacteria were collected from a variety of environments and tested for polyhydroxybutyrate synthesis. Known bioplastic producing strains, *Pseudomonas*, *Ralstonia*, and *Bacillus* were utilized in determining the optimal conditions for plastic production. Bacterial strains were assayed using standard PHB extraction procedures in a variety of media containing different carbon sources and substrates. Growth curves were also analyzed concurrently. Microscopic staining of all strains was done to determine accumulation of PHB. Upon analyses of 16 different microbial species in both rich (LB) and synthetic (minimal) media at different growth temperatures, two novel bioplastic producing species of bacteria were isolated. Extensive study using the carbon sources glucose and glycerol as well as four different substrates heptanoate, caproate, malate and propionate indicated diversity in the utilization of nutrients for plastic production. Strains showed differential preference for carbon sources, however, heptanoate was the preferred substrate for maximum PHB production. This study demonstrates the potential of isolating efficient bioplastic producers by screening diverse microbial communities using a simple assay.

The Relationship between Chronic Pelvic Pain and Endometriosis

Author(s): Christia Angela M Sison, Izabella

Khachikyan, Ninet Sinaii, Mariah Welch

Mentor(s): Pamela Stratton

Institution: Mount Saint Mary's College, Los Angeles CA

Chronic Pelvic Pain (CPP) and endometriosis are often related in reproductive age women, but are not exclusive to one another. We studied three different groups of women: women with CPP and endometriosis (endo), women with CPP without endo, and healthy volunteers with no history of pain or endo symptoms to see whether women with endo experienced central nervous system sensitization, myofascial dysfunction, and diminished quality of life. Each subject underwent a comprehensive neuromusculoskeletal assessment by a physiatrist who assessed allodynia, hyperalgesia, and pain pressure threshold (PPT) from T9-S2. Muscle assessments tested for myofascial trigger points (MTrPs) in seven paired muscles. Sensitization and myofascial dysfunction was defined as occurring in more than half the sites tested. Quality of life (QOL) was assessed using the Duke QOL questionnaire. Trend analyses were performed by the Abelson-Tukey lin-

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ear contrast ANOVA test. Women were first categorized as women with CPP and endo, women with CPP but no endo, and healthy volunteers. To see whether central sensitization was associated with endo, those with any history of endo were combined. Compared to healthy subjects, those with CPP had a significantly higher rate of sensitization; those with history of endo were most likely to be sensitized compared to the others. All women with endo had myofascial dysfunction. Healthy subjects had a significantly better QOL compared to CPP patients. Women with endo had better self-esteem, social, mental and general health than those with CPP only. Women with CPP, regardless of endo, have similar pain and disability scores. CPP is associated with sensitization and myofascial dysfunction, which is greatest in women with any history of endo. Physical assessment of sensitization and myofascial dysfunction is an important aspect of assessing women with chronic pelvic pain and endometriosis.

Identifying the Aggregative Properties of Pd₂DBA₃

Author(s): Austin R Smith
Mentor(s): Stefan Franzen
Institution: North Carolina State University, Raleigh NC

The phenomenon of aggregation in chemistry is known to be caused by the interaction of insoluble compounds with one another. My project has involved the study of the phenomenon of aggregation by the inorganic complex tris(dibenzylideneacetone)dipalladium(0) (Pd₂DBA₃). Pd₂DBA₃ is a widely used catalyst of organic reactions. This project has branched from a study done to understand claims of mediation by ribonucleic acid (RNA). The goal of this project is to determine the characteristics of aggregates formed when Pd₂DBA₃ is added to 50% tetrahydrofuran (THF) and water. To understand this phenomenon, two important tests were used in this study. These included DLS (Dynamic Light Scattering) which measures the size of particles in a solution, and UV Vis; which is a technique used to verify absorption levels of a solution. There is immediate precipitation in these mixtures. Once the precipitate is removed by centrifugation, aggregates can be observed by DLS. After one week there is a color change, which is nearly reversible if THF is added to the solution. Remarkably, the solution returns to the normal purplish color of the Pd₂DBA₃ in THF. There are apparently further aggregation states of the material. These spontaneously formed aggregates cast further doubt on the role played by RNA in RNA-mediated processes reported using this reagent.

African Influence in the Music of Mexico's Costa Chica Region

Author(s): Brian K Smith
Mentor(s): Ray Briggs
Institution: CSU, Long Beach, Long Beach CA

While European and Amerindian contributions to folk music in Mexico have been thoroughly investigated and acknowledged, the African influence on folk traditions has not been as widely publicized. There is ample evidence that African influence has contributed to folklore music in Mexico and especially in heavy black populated *pueblos* within the states of the Costa Chica region: Guerrero and Oaxaca. Substantiation of elements of music that suggests African origins is most salient in the Costa Chica region. Instruments such as the *marimbola*, *quijada*, and *tambor de fricción* (friction drum) specifically point toward African influence in music of Costa Chica due to their African origins. The main objective of this paper is to trace the African roots of Mexican folk music of the Costa Chica region, thereby affirming the covert existence of African influences in the music that have been overlooked by compare and contrast as well as analyzing the song *Hurra cachuca y los enanos* from the Instituto Nacional de Anthropología e Historia's compact disc titled "Soy el negro de la costa" - Costa Chica.

Effect of Unsaturated DOPC Lipid on the Phase Behavior of the Monofluorinated Phospholipid F-DPPC

Author(s): Connor J. Smith, Eric A. Smith
Mentor(s): Phoebe K. Dea
Institution: Occidental College, Los Angeles CA

The monofluorinated phospholipid 1-palmitoyl-2-[16-fluoropalmitoyl]sn-glycero-3-phosphocholine (F-DPPC) is a unique bilayer which spontaneously interdigitates in aqueous solution. In order to test the effects of unsaturated lipids on the phase behavior of F-DPPC, 1,2-dioleoyl-sn-glycero-3-phosphocholine (DOPC), a lipid with two *cis* double bonds, was introduced. Fluorescence spectroscopy and differential scanning calorimetry (DSC) were used to investigate the properties of F-DPPC/DOPC lipid mixtures. Two fluorescent probes, 1,6-diphenyl-1,3,5-hexatriene (DPH) and the DPH-labeled analogue of DPPC, 2-(3-(diphenylhexatrienyl) propanoyl)-1-hexadecanoyl-sn-glycero-3-phosphocholine (β -DPH HPC) were used in fluorescence intensity and polarization measurements. We found that there was an increase in fluorescence intensity with more DOPC, indicating that DOPC hinders the formation of the interdigitated gel phase. Our fluorescence polarization results also show that DOPC increases the fluidity of F-DPPC membranes below the main transition temperature (T_m). DSC data revealed a decrease in T_m , along with a decrease in the main transition enthalpy, and a significant increase in T_m hysteresis. Therefore, the pres-

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ence of the two *cis* double bonds in the hydrocarbon tail of DOPC clearly disrupts the lipid packing of F-DPPC bilayers, which makes the interdigitated phase less favorable and the liquid crystalline phase more favorable.

The Effects of Animal and Human Distress on Empathy: A Stroop Interference Study

Author(s): Danielle R Smith, Allison O'Leary, Jennifer McDonald, Lauren Hamac

Mentor(s): Kimmy Kee

Institution: CSU, Channel Islands, Camarillo CA

Although previous research has demonstrated that the capacity to empathize with animals in distress is a strong predictor of pro-social behaviors, little is currently known about the differences between empathic concerns towards animals versus humans. The current ongoing study examines the effects of animals and humans in distress on Stroop interference in individuals with higher versus lower levels of empathy. To our knowledge, this is the first research to utilize the Stroop interference procedure to assess empathic concern in these areas. For the interim analyses, data is currently available from 36 undergraduate students with higher levels of empathy and 33 students with lower levels. Participants' responses (errors) and latency were assessed using a Stroop Interference Task, which involved identifying the background color (red, green, yellow, or blue) of a series of five types of images: animal distress, human distress, animal neutral, human neutral, and pure color. Empathy was assessed using the Emotional Empathetic Tendency Scale. A series of t-tests revealed that the higher empathy group tended to make fewer errors compared to the lower empathy sample for human distress ($t(67) = -1.45, p = 0.076$), human neutral ($t(67) = 1.517, p = 0.067$), and animal neutral ($t(67) = -1.577, p = 0.059$) conditions. The two groups also differed significantly in latency for the human neutral condition, $t(67) = -1.645, p = 0.05$ and differed at a trend level in latency for the human distress condition, $t(67) = -1.343, p = 0.092$, with participants in the higher empathy group exhibiting a faster reaction time compared to those in the lower empathy group. Preliminary findings from this study may potentially increase our understanding of the role of human and animal distress on our cognition and empathic concern in everyday life.

First EPR Results on New Organic Ferroelectric

Author(s): Earl D Smith

Mentor(s): Timothy Usher

Institution: CSU, San Bernardino, San Bernardino CA

The study of ferroelectric materials is a field that is constantly expanding; one of the newest discoveries is that of an organic ferroelectric called croconic acid. Organic ferroelectrics are rare. Ferroelectrics are typically inorganic

ceramics. Thus, croconic acid is a sort of 'gateway' into further real world applications, such as energy harvesting. What it means to be ferroelectric, is when a material spontaneously polarizes under an electric field. This polarization can be reversed when an electric field is applied to it. Furthermore, it remembers the electric field applied, creating a memory effect, allowing it to be used to store information as well. The main focus of our research was the question: Does Croconic Acid give an Electron Paramagnetic Resonance (EPR) signal? To have an EPR signal means that there is an unpaired electron. The EPR spectrometer shines microwave energy onto the sample inside of a magnetic field, and measures the absorption. This information gives us further insight into the ferroelectric properties of the material. In order to get EPR data on the Croconic acid, we placed the sample into a clean quartz tube, which was then placed into the Bruker EMX x-band EPR spectrometer. We also exposed a separate sample to x-rays and then took an epr spectrum. The results of both tests showed that there was in fact an unpaired electron within the substance. However, the results of the x-rayed croconic acid show that the radiation did in fact change the unpaired electron, and/or possibly created a new unpaired electron. The initial g-value was recorded to be: 2.00235, while the x-rayed sample showed an additional g-value of 2.00474. In summation, our results proved our hypothesis, showing that croconic acid does in fact have an unpaired electron contained within it. This allows us to look further into croconic acid's ferroelectric properties.

Is Hip-Hop a[n] [in]Formal Education? A Brief Examination Through the Lyrical Genius of KRS-One

Author(s): Natalie G Smythe

Mentor(s): Paul Kjellberg

Institution: Whittier College, Whittier CA

Hip-hop music is frequently considered as anti-intellectual or anti-educational. Hip-hop music allows individual expression, where one intellectualizes over many social and individual concerns. Such expression is often considered as the act of "droppin' science" within the hip-hop community, due to the fact that often the experiences shared are not solely personal, but also educational. Hip-hop can perform an educational function, specifically the Deweyan concept of knowledge as a "mode of participation" (Dewey, Democracy and Education) where the individual is "an intimate participant in the activities of the world to which it belongs". KRS-One is likely to support the same notion, as he is quoted defining "rap [as] something you do, [and] hip-hop [as] something you live". The purpose of this study is to demonstrate that hip-hop provides a space where the individual can become such a Deweyan participant, thus affirming hip-hop as a cultural space where intellectual knowledge is engaged, and listeners are engaged as serious intellectuals. The presence of knowledge, intellectualism, and socio-political critique is identified

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in hip-hop through a close reading of the lyrical content of "Blackman in Effect". This paper is a piece of a larger research project that is investigating the educational and academic relevance of hip-hop music and culture, and will therefore only examine one song for this particular presentation. "Black Man In Effect" by KRS-One is presented first because it directly emphasizes the importance of engagement with history and factual truth—in short, of book learning—in the formation of identity. Not all popular art forms nor does all hip-hop perform this function. The project focuses on showing that even though it operates outside of a traditional educational model, by design hip-hop is able to perform an educational function, and is therefore unique as a popular art form in doing so.

Biologically-Inspired Synthesis of Size and Morphology Controlled Titanium Dioxide Nanostructures for Photovoltaic and Photocatalytic Applications

Author(s): Frank Soberanis

Mentor(s): David Kisailus

Institution: UC, Riverside, Riverside CA

Biological systems offer examples of efficient strategies for the controlled synthesis of nanostructures to achieve desired properties. TiO₂ is an inexpensive semiconducting material with widespread applications in self-cleaning coatings, photocatalysts, sunscreen, and food coloring. In this work, we will be optimizing TiO₂ nanowires for application in photovoltaics. TiO₂ semiconductor nanostructures can be made more efficient and useful by increasing the surface area to volume ratio. This ratio can be improved through fabrication of branched nanowires. Solvothermal synthesis of TiO₂ nanostructures directed by functional organic materials such as thiourea allows greater control over size and morphology. Addition of thiourea to the precursors leads to the formation of highly branched structures and decreased roughness of nanowires. SEM images show nanowires 100-300 nm in diameter composed of smaller nanowires bundles. The inner single-crystal nanowires are 10-20 nm in diameter, as shown by HRTEM cross-sectional micrograph. TEM analysis of branched structures identifies (101) as the twin structure with another possible (301) twin structure. The surface area to volume ratio will be observed using BET analysis and photocatalytic properties will be measured.

World Enough and Time: Narrative Theory in *All The King's Men*

Author(s): Elisha R Soch

Mentor(s): Julianne Smith

Institution: Pepperdine University, Malibu CA

Robert Penn Warren's *All the King's Men* ponders history, morality, and theology as its narrator, Jack Burden, devel-

ops confidence and a full view of self that appreciates every occurrence as significant to both history and identity. This paper compares narrative theory to Jack Burden's philosophy as presented in *All the King's Men*, asserting that the novel's discourse works to support the narratological idea, first espoused by Walter Fisher and further endorsed by current theorists such as Scott Stroud, that humans understand the world through narratives. It focuses particularly on how the structuring of the text influences the reader's emotional and intellectual reaction to the novel's plot, arguing that Warren's belief that literature should actively engage readers in the pursuit of knowledge is a standard successfully met in his own work. The paper shows how, in both his work as a novelist and his work as a critic, Warren worked to unite the critically rational approach of philosophy with the contextual poignance of history and literature. The success of this approach is evident in *All the King's Men*, which forces readers to actively engage in questions of ethics and truth, and suggests reason to further explore the benefits of collaboration between the fields of philosophy and literature.

The Concept of Utopia and Roberto Bolaño's Short Fiction

Author(s): Melanie Sollitt

Mentor(s): Lila Carlsen

Institution: Pepperdine University, Malibu CA

This paper will analyze a selection of the short fiction of Chilean writer Roberto Bolaño (1953-2003) through the lens of utopian theory. This author's work has attained significant critical attention in recent years, yet has not been analyzed in light of utopian thought. In fact, many critics regard this author's work as a dismissal of any redeeming social discourse. Considering recent theories by Lyman Tower Sargent, I understand the utopian impulse as the desire for a better way of being. Contemporary Latin American fiction, and Bolaño's work included, tends not to envision an ideal society in an imaginary and isolated place, as the genre supposes. More often, the concept of utopia in these works critiques the actual, rather than offer a blueprint of a regimented society. Bolaño uses the concept of literature and writers' circles as a point of departure to address some of Latin America's most important social issues in a utopian sense. This presentation will focus on the short stories "Sensini" and "Enrique Martín" in the volume *Llamadas telefónicas* (1997).

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Experimental Investigation of the Thermal Resistance of Silicon - Diamond Composite Wafers

Author(s): Martin L Somesla

Mentor(s): Alexander A Balandin, Vivek Goyal, Des Teweldebrhan

Institution: UC, Riverside, Riverside CA

Recently there was notable increase in interest to composite silicon – synthetic diamond (Si-Di) substrates as alternatives to conventional silicon wafers. It is driven by several factors. First, continuing downscaling of Si complementary metal-oxide semiconductor (CMOS) technology demands more efficient heat removal to handle the increasing thermal design power and rising temperature of hot spots. The high temperature in electronic circuits leads to lower computer speed and degradation of the performance and reliability. Second, there was a renewed interest to silicon – diamond substrates owing to fast progress in the chemical vapor deposition of synthetic diamond at relatively low temperatures compatible with conventional Si technology. We investigated the thermal conductivity of Si-Di wafers using two experimental techniques: the transient plane source (TPS) method and “laser flash” technique. In TPS method, an electrically insulated flat nickel sensor is placed between two pieces of a sample and plays a role of the heater and thermometer simultaneously. During the measurement, a current pulse is passed through the sensor, which generates heat, while recording temperature rise as a function of time. In the “laser flash” method the heating is provided by the optical light flash. The use of two experimental techniques allowed us to reduce the systematic error, which is usually high in the thermal conductivity measurements. We found that the composite Si-Di substrates have lower effective thermal conductivity than Si wafers at room temperature. At the same time their thermal conductivity is higher than that of Si wafers at elevated temperatures. The crossover point is reached around ~360 K. The increased thermal conductivity of composite Si-Di wafers at temperatures, typical for operation of electronic chips, may lead to better thermal management of advanced electronic chips. We also analyze the thermal transport and thermal boundary resistance in Si-Di wafers over a wide temperature range.

Significance of Ca^{2+} Mass Transfer on Endothelial Flow-dependent AMPK Signaling Pathway

Author(s): Martha E Sosa, Prashanthi Vandrange

Mentor(s): Victor G.J. Rodgers

Institution: UC, Riverside, Riverside CA

Endothelial signaling pathways regulate vascular homeostasis. One of the main pathways is the flow dependent adenosine monophosphate-activated protein kinase (AMPK) signaling pathway activated by upstream calmodulin kinase kinase (CaMKK). Activated CaMKK causes the phosphorylation of AMPK and the downstream phos-

phorylation of endothelial nitric oxide synthase (eNOS). The end product of this pathway is the vasodilator, nitric oxide (NO), an important molecule that facilitates vasodilation and promotes vascular health. The regulation of these signaling pathways has been credited to mechanical transducers, which are known to convert mechanical forces to chemical signaling pathways as opposed to mass transfer, which is the transport of chemical species into the endothelium. However, the mechanism governing these signaling pathways is not clearly known. We hypothesize that mass transfer of calcium ions (Ca^{2+}) into the endothelium is significant in AMPK signaling pathways. To validate our hypothesis, we perform *in-vitro* experiments using a parallel plate flow chamber setup. Mass transfer experiments are performed using an aqueous culture media having measured concentrations of Ca^{2+} delivered through the inlet. Endothelial cells are seeded on 25 mm x 75 mm glass slides and are exposed to a physiologically constant shear stress of 12 dynes/cm². The effect of Ca^{2+} concentration on eNOS phosphorylation as a downstream product of AMPK signaling pathway is analyzed using Western Blot technique and the results elucidated the importance of Ca^{2+} mass transport in triggering AMPK signaling pathway.

Preserving Lower Limb Muscle Function Following Spinal Cord Injury: a Comparison of Three Robotic Training Algorithms

Author(s): Dalziel R Soto, P Doyle, J Duhon, E Nakamura, R Schmitt

Mentor(s): Jeff Nessler

Institution: CSU, San Marcos, San Marcos CA

Robotic devices are often used as part of an overall rehabilitation program to facilitate locomotor recovery following spinal cord injury. While many investigators have focused on optimizing training techniques to improve neurological function, few studies have examined effects of automated training on muscle physiology. The purpose of this study was to compare several measures of muscle function in three groups of rats subjected to three different training algorithms following SCI. Twenty-four female, Sprague-Dawley rats received mid-thoracic spinal cord transections as neonates. Animals were assigned to one of three training conditions: 1) standard robotic training, 2) robotic training with increased plantarflexion load applied during stance, and 3) robotic training with increased plantarflexion load and tail nerve electrical stimulation (TANES). All animals received five minutes of continuous training per day at 90% body weight support, and were trained for five days per week for four weeks while the robotic device recorded step trajectories and ground reaction forces. Following the fourth week of training, all animals were euthanized and their hindlimb muscles dissected. A 2 way ANOVA with repeated measures indicated that the number of steps, the magnitude of the ground reaction force, and the ground reaction force projection

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angle increased significantly with time across all animals ($p < 0.001$). Conditions 2 and 3 resulted in a significantly greater increase in number of steps and ground reaction force magnitude when compared to condition 1 ($p = 0.026$ & 0.001 , respectively). Comparison of *en vitro* muscle mass revealed no difference between rats trained by each condition. These results suggest that plantarflexion loading during stance has a beneficial effect on the outcome of automated training in rats following SCI, but TANES does little to improve muscle function. Additional work is needed to understand the role that TANES and robotic loading might play in the optimization of robotic gait training.

A Study of Pt-Sn Nanoparticles by Scanning Tunneling Microscopy (STM), Ultraviolet visible (UV-vis) and Absorption and Cyclic Voltammetry (CV) Scans

Author(s): Kliah N Soto, Christian D Hernandez

Mentor(s): Adrian Hightower

Institution: Occidental College, Los Angeles CA

Continued research on fuel cells is significant on a global scale due to their potential to help relieve the world's increasing energy need. Furthermore, Ethanol fuel cells benefits are greater since ethanol can be derived from renewable biomass. Both nanoparticle composition and synthesis have been studied with aims to improve the reaction efficiency in ethanol fuel cells. Platinum-Tin nanoparticles were synthesized by the reduction of metal salts using a reverse micellar process. The synthesis by Sine et al. has been improved by increasing the reducing agent reaction time of nanoparticle synthesis in order to get improved size distribution of nanoparticles. The degree of metal salt reduction quantitatively determined UV-vis absorption analysis. Waiting a period of approximately 70 minutes or more after adding the reducing agent NaBH_4 to a 0.0222M metal chloride solution allows the metal in the nanoparticle solution to reach an absorbance of zero. This results in a greater amount of nanoparticles that are formed, along with a better distribution of the nanoparticles in solution. The electro-oxidation of ethanol in H_2SO_4 on nanoparticles $\text{Pt}, \text{Pt}_7\text{Sn}, \text{Pt}_6\text{Sn}, \text{Pt}_5\text{Sn}$ was explored through cyclic voltammetry (CV). Active surface area of the nanoparticles were experimentally calculated through CV on H_2SO_4 and used to compare the reactions taken place in different compositions of nanoparticles. Three different ethanol concentrations were experimented with, finding that the oxidation of ethanol varied as a function of the concentration. A composition of Pt_6Sn was found to be optimal for the 0.2M solution of ethanol in 0.2M H_2SO_4 . The reactions also varied as a function of the Pt-Sn ratio. Smaller amounts of Sn improved the efficiency of the oxidation.

Progress Towards the Synthesis of Nootkastatin 1: Alkylation, Dercarboxymethylation and Cuprate Jubilation

Author(s): Alexandra Souverneva

Mentor(s): Brian Stoltz, Kristy Tran

Institution: California Institute of Technology, Pasadena CA

Nootkastatin 1 is a leukemia cell line inhibitor found in the yellow cedar tree, *Chamaecyparis nootkensis*. Progress towards the total synthesis is discussed. The first two steps in the synthesis were optimized on a model system to give a 77.0% overall yield using an alkylation-saponification-decarboxylation protocol. The cyclohexenone successfully underwent a cuprate addition and the desired silyl enol ether was isolated, but due to decomposition mostly the ketone was recovered. Products of each step were purified via flash chromatography and characterized with ^1H NMR, ^{13}C NMR, IR and HRMS. Work to selectively reduce and methylate the benzylic ketone is underway. Then a simple Wittig reaction and Friedel Crafts cyclization will be done to complete the model.

Characterization of a Multiple Drug Resistant (MDR) Strain of *Pseudomonas spp.* and Identification of Potential Efflux Pump Inhibitors (EPI)

Author(s): Aaron D Springer

Mentor(s): Wei-Jen Lin

Institution: California State Polytechnic University, Pomona, Pomona CA

Excessive use of antibiotics has applied evolutionary stress to the bacterial population, generating genes responsible for antibiotic resistance through random mutation and natural selection. Acquisition and accumulation of genes via horizontal gene transfer has led to resistance to multiple antibiotics, known as multi drug resistance (MDR). Recently, a MDR strain of *Pseudomonas* sp. strain D9 was isolated which exhibits resistance to a core group of antimicrobial agents. Preliminary sequence analysis indicates that this strain may harbor a variant of *Salmonella* genomic island 1 (SGI1). In addition, D9 was observed to inhibit MDR strains of *E. coli* known to harbor antibiotic efflux pumps. The purpose of this study was confirm the presence and location of SGI1 within the cell, characterize D9's antibiotic resistance through antibiotic minimum inhibitory concentration (MIC) testing, and to investigate the nature of inhibition that D9 exhibits upon other MDR strains of *E. coli*. Using plasmid extraction kits and gel electrophoresis, no plasmid harboring SGI1 was found within the cell. *E. coli* transformation confirmed the absence of a plasmid harboring SGI1. MIC concentrations have been found for 13 antibiotics from a variety of antibiotic groups. Efflux pump class specific inhibition of efflux harboring *E. coli* by D9 was confirmed and common chelating agents were ruled out as causative agents. Further studies are

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needed to confirm the presence of SGI1 within the genome of D9, to test the MIC concentrations found against a standard organism to confirm the antibiotic concentrations used were accurate and to determine the nature of inhibition of MDR *E. coli* by D9.

Examining Student Framing of Culture and Diversity at Seaver College

Author(s): Alexia Stamas, Grant Waggoner, Matthew Baker

Mentor(s): Juanie N Walker

Institution: Pepperdine University, Malibu CA

The purpose of this study was to investigate the meaning of diversity in regards to ethnicity, race, gender, and faith among students at Pepperdine University's undergraduate Seaver College. These first three aspects of diversity were identified by Pepperdine diversity administrators as central to most definitions of diversity and the fourth as an area of particular concern among students in the recent university campus climate study. The study examined how Seaver students define diversity and what components are particularly significant to them. Methodology similar to Caulfield's (2008) master thesis on tradition and diversity at Texas A&M University was used to guide the study. A purposive sample of approximately 20 undergraduate Seaver students across various student groups was sought through advertising among general campus channels and the use of snowball sampling from interested volunteers within these channels. Four focus groups of approximately five students each were used to examine how participants define diversity in their own terms. Thematic analyses were used to identify relevant metaphors, worldviews, and definitions of diversity, and recommendations are made regarding ways the university could frame and reframe diversity.

Solar Wind Interaction with the Magnetosphere: PMAF Events and Their Link to Magnetic Reconnection on the Dayside

Author(s): Heather Stancl, Alessandro Monteros, Alex Hakso, Clayson Spackman, Jacob Domeyer, Seelypon Phanthip, Blake Travis, Terah Condrey, Malia Pantastico, Raymond McIntyre, Qiming Zhong, F Sigerness, D A Lorentzen

Mentor(s): Gerard J Fasel

Institution: Pepperdine University, Malibu CA

Poleward moving auroral forms (PMAFs) have been identified in past studies as Ionospheric signatures of magnetic reconnection on the dayside. Magnetic reconnection occurs on the dayside when the interplanetary magnetic field (IMF) B_z component is southward. During these periods of magnetic reconnection the auroral oval shifts equatorward and PMAFs begin to move poleward. Not all PMAFs

have the same brightening history. PMAF1 events fade with time and PMAF2 events rebrighten as they move poleward. A third class of PMAFs (PMAF3 events) has been found to stall as they drift poleward. PMAF3 events occur during times when the auroral oval is expanded and begins to contract poleward. This poleward shift of the auroral oval occurs when the IMF B_z component turns from a southward to northward orientation. This study looks at 20 years of meridian scanning photometer (MSP) and all-sky camera (ASC) data from the Kjell Henriksen Observatory in Longyearbyen, Norway. The occurrence of these PAMFs events is documented and their connection to a theoretical model of magnetic reconnection is presented.

Chip Scale Titanium – Glass Anodic Bonding for Microfluidic Applications

Author(s): Daniel Stark

Mentor(s): Masaru Rao

Institution: UC, Riverside, Riverside CA

While anodic bonding of silicon and glass is well-established for use in fabrication of Microelectromechanical Systems (MEMS), there have been limited attempts to apply such techniques to the bonding of titanium and glass. This paper reports the development of such processes as a means of extending our recently developed techniques that will for the first time allow fabrication of titanium-based MEMS. We anticipate that these bonding techniques will eventually provide opportunity for realization of robust and reliable microfluidic devices capable of extremely high pressures and optical interrogation. Such advances will find potential for use in diverse applications ranging from high-performance liquid chromatography to pressure sensors for harsh environments. In order to minimize potential for generation of residual stresses that can adversely affect bond integrity and substrate planarity, we have chose to pursue use of NBK7 glass to minimize thermal expansion mismatch with titanium. Although our preliminary studies have demonstrated successful anodic bonding of titanium and NBK7, bond strengths have been unsatisfactory thus far. This, therefore, provides motivation for our ongoing process optimization efforts. Details regarding these efforts, as well our bond characterization studies will be presented. Anodic bonding of silicon and glass substrates is used widely in the fabrication of Microelectro-mechanical Systems (MEMS) pressure sensors and as a means of device packaging for many other applications. It finds favor in such applications because it provides strong mechanical bonding and hermetic sealing at temperatures well below other bonding techniques, as well as reduced sensitivity to surface roughness and particulate contamination.

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A Closer Art: Abstraction in Perfumery and Scent Composition

Author(s): Jacqueline Steele

Mentor(s): Damian Stocking

Institution: Occidental College, Los Angeles CA

Perfumery has a long history in human culture. Long existent as a form of imitating or capturing nature, perfume, due to recent advances in chemistry and scent technologies, has assumed a new role in modernity. Today, perfumery is a clearly *artistic* practice, the products of which are sophisticated, conceptual, and, more than not, involved in deliberate abstraction. I aimed to further research the current artistic trends in perfumery today, and their possible indicative significance as to why humans use perfumes in modern society; how humans interpret scents in the world and experience sensual phenomena in general; and the nature of the abstract scent. Much of my research meant to question both the nature of abstraction as a human communicative and artistic phenomenon, as well as to interrogate the particular medium of this art—odor—which is a sense usually thought to exist secondarily (as a mode of indication of more concrete objects, or as an arbiter of emotion) rather than containing its own positive aesthetic qualities. However, scent does have aesthetics, and perfumery is the study of these aesthetics, the producer of olfactory forms. I discovered that many perfumes today are essentially phenomenological meditations, with compositions that aim to expose qualitative truths about sensorial experience, and which communicate both emotionally and intellectually. I carried out this research in the field in Paris and Grasse, France during June and July, 2010. Among my methods were: interviews with perfumers; smelling and learning the different types of scent materials in order to understand the limits and possibilities of scent composition; research in two unique perfume libraries; visits to the single perfume archive in the world, as well as attending lectures there; interviews with educators on scent; visits to several museums and familiarizing myself with their content and curative strategy; and extensive online research.

Analysis of β -Amyloid Peptide Fragments Involved in Alzheimer's Disease via Capillary Electrophoresis (CE) and High Pressure Liquid Chromatography-Mass Spectrometry (HPLC-MS)

Author(s): Matt J Steele

Mentor(s): David P Schrum

Institution: University of Redlands, Redlands CA

Alzheimer's disease is a progressive form of dementia that affects approximately 22 million people worldwide. Amyloid plaques and deposits in the brain have been linked as a principal component detected in Alzheimer's patients. These Amyloid plaques are composed of 40-42 amino

acid peptides, and as the disease progresses, these peptides tend to aggregate and retain in the affected patient's brains. β -Amyloid ($A\beta$) is stemmed from a larger protein called Amyloid Precursor Protein (APP), which extends from the inside to the outside of brain cells by passing through a fatty membrane around the cell. When APP is cut by proteases (β secretase), $A\beta$ is formed. The prime feature of these peptides is their ability to produce negative charges at certain pH values, which allows analysis by Capillary Electrophoresis (CE) and High Pressure Liquid Chromatography-Mass Spectrometry (HPLC-MS). The focal outcome in the analysis of these peptides by use of HPLC-MS can have the potential to establish *in vitro* and *in vivo* detection limits, as well as identity establishment via HPLC-MS. This could ultimately yield a clinical method for analyzing samples in the early detection of Alzheimer's. Another outcome by analyzing Amyloid plaques is the contribution in determining binding constants and understanding the formation of oligomers, all by changing the chemical environment from which the plaque are analyzed. An analysis of $A\beta$ through CE showed a reproducible way to identify $A\beta$ 1-40 individually and in a peptide mixture. Analysis of 1-40 $A\beta$ by HPLC MS yielded a mass spectrum with peaks at m/z 1082.6 and 823.2 which are characteristic amino acid sequences with verification through previous studies. Analysis through HPLC-MS and CE showed that the identity of $A\beta$ can be established with reproducible results and that a limit of detection can be established using HPLC-MS.

Mechanics of Prey Capture in Frogs with Ballistic vs. Non-Ballistic Tongue Projection

Author(s): Stephanie A Stoeppeler, Aik R Heng

Mentor(s): A Kristopher Lappin

Institution: California State Polytechnic University, Pomona, Pomona CA

Terrestrial frogs capture prey using tongue projection, which can be based on either a ballistic or non-ballistic mechanism. In ballistic forms (e.g., *Bufo* [toads]), tongue projection is extremely rapid, and the tongue can double in length. Previous work indicates that this mechanism depends on the storage and subsequent recovery of elastic strain energy in the jaw-opening muscles (depressor mandibulae [DM]) as they are activated prior to the mouth opening. Energy recovered from the muscles then powers mouth opening, and momentum from the lower jaw is transferred to the tongue to project it. In contrast, tongue projection in non-ballistic forms (e.g., *Ceratophrys* [horned frogs]) is comparatively slow, the tongue does not elongate, and the DM are not active prior to the onset of prey capture, indicating that energy storage and recovery by these muscles does not power tongue projection. In ballistic projectors, the energy storage phase requires a means to resist mouth opening prior to prey capture when the DM generate force and store energy. A potential mechanism is based on specialized jaw morphology that

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provides an interface for wet adhesion that produces a resisting force to mouth opening. To test the hypothesis that this mechanism is necessary for ballistic projection, but not for non-ballistic projection, we experimentally interfered with wet adhesion between the upper and lower jaws. We implanted wire segments into the maxillary grooves of *Bufo* and *Ceratophrys* specimens and used high-speed imaging to record feeding trials. Feeding performance was not affected in non-ballistic *Ceratophrys*, in contrast to a strong negative effect on ballistic *Bufo*. These results support a growing body of evidence that prey capture in ballistic tongue projectors requires precise synchronization of jaw and tongue neuromechanics. Non-ballistic tongue projectors, however, do not require this for prey capture, which may provide a means for greater evolutionary plasticity.

Surface Plasmon Resonance in Optical Fibers

Author(s): Gregory H Stough

Mentor(s): Ertan Salik

Institution: California State Polytechnic University, Pomona, Pomona CA

We investigated the application of silver deposition on single mode optical fibers with the goal of designing a biosensor that utilizes surface plasmon resonance. Surface plasmon waves form when electromagnetic waves combine with electron density waves traveling on the surface of a metal. Silver has been deposited on fiber ends via the Tollens reaction. The fiber end needed to be polished at a specific angle to ensure that only a narrow range of wavelengths traveling through the fiber would excite the surface plasmons on the silver film. In other words, surface plasmon resonance can only be observed for a small range of wavelengths at a given angle of incidence, which manifests itself as a drop in transmitted power for those wavelengths. We launch light from a broadband light source into the fiber, and monitor the transmitted power with an optical spectrum analyzer. The wavelength at which the minimum transmission occurs at a given dielectric-metal interface, or the resonance wavelength, strongly depends upon the refractive index on the surface of the metal. Therefore, this device enables one to monitor refractive index modifications as a result of chemical or biological changes on the metal surface through shifting of the resonance wavelength.

Role of Glucocorticoid Receptor Activation in Maintenance of Pregnancy and Parturition

Author(s): Katie N Stutz

Mentor(s): Steven M Yellon

Institution: University of Redlands, Redlands CA

Progesterone is a steroid hormone that maintains pregnancy and an unripe cervix (Sem Reprod Med 3:139, 2007).

Progesterone withdrawal leads to inflammatory processes associated with cervical ripening and parturition (Biol Reprod 81:1, 2009). Such actions of progesterone are thought to be exclusively mediated by binding to nuclear progesterone receptors (PR), though progesterone also binds to glucocorticoid receptors (GR). The objective of this study was to determine whether PR and/or GR regulate neutrophil immigration as part of the inflammatory mechanism that mediates preterm cervical remodeling. Time-dated pregnant CD-1 mice were ovariectomized (Ovx) on D16 postbreeding and treated with a pure GR agonist (dexamethasone, Dex; 0.5 mg/kg/day i.m.) or a progestagen that binds to both PR and GR (medroxyprogesterone acetate, MPA; 10 mg/kg/day i.m.). Sham-operated and Ovx mice given vehicle served as controls. Mice were killed before or after birth. The cervix was sectioned, stained, and neutrophils enumerated by image analysis. Mice treated with Dex delivered 24 h postovariectomy (D17), as in Ovx controls. Mice given MPA delivered at normal term, as in Sham controls. The neutrophils census in the cervix increased in Sham mice by day of birth (D19), decreased in Dex-treated mice before and after preterm birth, but was unaffected in mice after Ovx or MPA treatment. These results do not support the hypothesis that neutrophil recruitment is associated with cervical remodeling at term. Additionally, although neutrophils may affect processes in the cervix immediately leading up to birth or postpartum, these results do not support the hypothesis that the PR and/or GR regulate neutrophil immigration in the process of preterm remodeling of the cervix or parturition. Thus, glucocorticoids are unlikely to be a useful treatment to block preterm cervical ripening or prevent preterm birth. Supported by HD054931.

Role of Ubiquitination in Hepcidin-Mediated Internalization of Ferroportin

Author(s): Priscilla N Sugianto

Mentor(s): Tomas Ganz

Institution: UC, Los Angeles, Los Angeles CA

Anemia of inflammation (AI) is one of the most common immunopathological disorders that affect patients with acute and chronic infections or inflammatory diseases. Inflammation causes increased production of hepcidin, which binds to the only cellular iron exporter ferroportin and induces its internalization and degradation, thus blocking iron efflux from cells into plasma. This then restricts iron flow to the developing red cells in bone marrow, limits hemoglobin synthesis and results in anemia of inflammation. Preliminary studies have shown that ferroportin is ubiquitinated prior to its internalization, but it is still unknown where ferroportin is ubiquitinated and whether this modification is necessary or sufficient for ferroportin internalization. The goal of this study was to characterize the sites of hepcidin-induced ferroportin ubiquitination and the effect of ubiquitination on ferroportin internalization. A number of ferroportin mutants

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were constructed by site directed mutagenesis of HEK293 cells and analyzed for hepcidin-induced internalization (by fluorescence microscopy) and for ubiquitination (by immunoblotting). Upon hepcidin treatment, ferroportin with substitution in lysine 240 and 258 was not internalized and one with substitution in lysine 240 was not ubiquitinated. Lastly, we detected that pathogenic ferroportin mutants, which were resistant to hepcidin and were not internalized, did get ubiquitinated. Our result suggests that lysines 240 and 258 are the two important sites for ferroportin ubiquitination and that ubiquitination is necessary, but not sufficient for its hepcidin-mediated internalization. Better understanding of the structural basis and the role of the hepcidin-mediated ferroportin ubiquitination and internalization should facilitate the rational design for the treatments of AI.

Programmable RNA Nanoparticles

Author(s): Zoe N Swank

Mentor(s): Wade Grabow

Institution: UC, Santa Barbara, Santa Barbara CA

The modularity and singular complementary nature of RNA allows us to control the arrangement of molecules on a nano-scale level through varying self-assembly techniques. Based on naturally occurring RNA motifs, nanostructures of arbitrary size and shape can be constructed by designing programmable RNA molecules that fold into a desired geometry. Due to their structure, RNA nano-cubes can readily attach to a quantified dosage of therapeutic drugs or si-RNA, delivering the therapeutic to a target tissue and then degrade naturally. We have designed a cube shaped RNA nano-particle, based on a computer model that combines the crystal structures of known RNA motifs together on a Swiss Protein Data Base Viewer. We experimented with the assembly process of certain portions of the cubic shape, in particular the corner piece. Examining such RNA solution variables as metal ion concentration and temperature, we manipulated the assembly protocol to favor the folding process of certain molecules, and tested the resulting constructs via gel-electrophoresis. Through these studies we have examined the different folding morphologies by varying the sequences of the RNA strands and the conditions under which they are assembled, which will serve as the building block for future nano-particle assembly. To confirm the creation of the cubes we will obtain 3D images using cryo-electron microscopy, which uses an electron beam to illuminate the RNA at cryogenic temperatures. The results of this study will contribute to the broader goal of creating RNA cube scaffolding for si-RNA and drug delivery.

Caddy Smelled Like Trees: An Analysis of T.S. Eliot's "Objective Correlative" in Faulkner's *The Sound and the Fury*

Author(s): Jesse B Swift

Mentor(s): Shawn A Christian

Institution: Wheaton College, Norton MA

Candace Compson, labeled by Faulkner as his favorite character in *The Sound and the Fury*, plays an interesting role in the novel. Despite her absence as narrator, most scholars recognize Caddy's role as the central character, crediting her as the facilitator of the novel. In addition to affirming Caddy's role as the central character in the novel, this paper argues that she also serves as a medium through which Faulkner can transmit emotions to the reader. In 1919, T.S. Eliot suggested that "the only way of expressing emotion in the form of art is by finding an 'objective correlative'; in other words, a set of objects, a situation, a chain of events which shall be the formula of that particular emotion." According to Eliot emotion can be conveyed only through objects that represent or embody the emotion the writer attempts to insert in the work. This paper applies and expands Eliot's notion of an "objective correlative" to *The Sound and the Fury* and looks at how Faulkner invests both objects and characters alike with specific emotions, thus turning them into "objective correlatives." This paper particularly examines this process in Benjy Compson's narrative, looking at certain objects that Benjy turns associates with an emotion, such as the old family pasture or his favorite slipper. The most important of these objects is Caddy Compson herself, who becomes the premier example of an "objective correlative" in the novel. Using Faulkner's novel with Eliot's concept provides a new understanding of Caddy within *The Sound and the Fury*, as well as an investigation of the application and expansion of Eliot's notions of the "objective correlative" and how it operates in literature, especially with regards to the modernist movement and its attempt to understand how to portray and express emotions or truths in writings and art.

Identification of Binding Site Residues of a Serine Protease Autotransporter

Author(s): Fayha Tariq, Huma Malik, Peter Oelschlaeger

Mentor(s): Christos Stathopoulos

Institution: California State Polytechnic University, Pomona, Pomona CA

Serine Protease Autotransporters of *Enterobacteriaceae* (SPATE) are multidomain proteins found in pathogenic enteric bacteria. They are characterized by a conserved serine protease function. These proteins are comparatively large (>100 kDa) and are comprised of a signal sequence, a passenger domain, and a translocater domain. The passenger domain is responsible for the protein's virulence activity. Temperature sensitive hemagglutinin (Tsh) is

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used as a model SPATE in our studies. In the present study we aim to define the substrate binding site of Tsh. Homology modeling was done using Tsh and alpha-chymotrypsin along with sequence alignment between Tsh and Hap, another autotransporter to identify the following residues as potential residues of the Tsh substrate groove: G254, L279, T280, A281, and N290. Based on our hypothesis, mutations introduced at these five residues are expected to deform the substrate groove and thereby inhibit the correct positioning of the substrate at the active site. This would result in decreased proteolytic function. To test this hypothesis, we introduced single point mutations at these five residues using PCR based site directed mutagenesis. SDS-PAGE and western blotting were then used to analyze the secretion pattern of the mutants. A functional analysis was performed using a Tsh-specific oligopeptide assay and a mucin assay. The secretion analysis showed that the mutations did not impact the proper secretion of the mutants. The results of the cleavage assays showed a significant reduction in the proteolytic function of the mutants. These results show that the five residues that we have identified are crucial for the proteolytic activity of Tsh, which suggests a role of these residues in forming the Tsh substrate binding site.

The Forgotten Anarchism of Chinese Literary Giant Ba Jin

Author(s): Darren M Taylor
Mentor(s): George DaRoza
Institution: Whittier College, Whittier CA

What is at stake in the issue of remembering Ba Jin's Anarchism, is the authenticity of Chinese history. The pre-revolutionary and Communist eras are now being re-written according to the capitalist present. Drawing on histories of Chinese Anarchism, the works of Ba Jin, and various untranslated writings on Ba Jin, as well as my seven years living in China and working as a translator, this presentation will elucidate Anarchist themes in Ba Jin's life and work. This presentation will begin with an introduction of the author and his times. Then, the international Anarchist movement of this era will be described, showing parallels to Ba Jin's life and contact between him and Anarchists abroad. The third section will show examples from Ba Jin's fiction and polemical writing that illustrate his Anarchist themes. Lastly, I will comment of the legacy of Ba Jin in current historical narratives concerning China. *Background:* Ba Jin's stories, novels and articles began to incite and inspire Chinese society during the 1930's. His own inspiration came largely from Anarchist sources, such as Piotr Kropotkin and Emma Goldman. Despite his Anarchist beliefs, Ba Jin has now been adopted by the intelligentsia as a national literary treasure. His novels are read by the majority of Chinese students, his death was officially mourned, and his status as a patriotic revolutionary has been cemented. But the Anarchist spirit that permeates his life and writing has yet to be fully appreciated.

Galectin-1 Exposure during the Monocyte-Derived Dendritic Cell Differentiation Results in Dendritic Cells with Tolerogenic Potential

Author(s): William C Temple, Margaret H Chang
Mentor(s): Benhur Lee
Institution: UC, Los Angeles, Los Angeles CA

Dendritic cells (DCs) are sentinels of the immune system, acting as potent antigen presenting cells which regulate immune responses to both exogenous and endogenous signals. Galectin-1 is a galactoside-binding lectin with pleiotropic immunomodulatory functions. We have previously shown that galectin-1 is an endogenous activator of immature human monocyte-derived DCs (MDDCs), triggering their maturation and migration. In addition, galectin-1 is present in peripheral tissues at high concentrations, and thus may affect monocyte to DC differentiation. Here, we show that galectin-1-exposed DCs during the differentiation process result in DCs with a tolerogenic phenotype. Immature DCs differentiated in the presence of galectin-1 specifically display a down-regulation of CD83, CD86, and TLR2. This phenomenon is galectin-1 dose-dependent and temporally regulated; reliant upon how long galectin-1 is in the presence of differentiating monocytes. In addition, galectin-1-exposed DCs also upregulate secretion of the anti-inflammatory cytokine IL-10 and decrease levels of proinflammatory IL-12. These MDDCs also retained the ability to uptake antigen and mature in response to classical immunogenic stimuli like lipopolysaccharide (LPS) and polyI:C, however they retained low expression levels of costimulatory molecules and continued to secrete IL-10 but not IL-12. In addition, galectin-1-exposed DCs display an upregulation of PDL-1 and downregulation of MHCII, TLR2, and DC-SIGN relative to chemically-induced and untreated DCs. These findings show that monocytes exposed to galectin-1 during the differentiation process possess a cell surface phenotype and functionality consistent with tolerogenic DCs. Thus, galectin-1 has various effects on DC function depending on the differentiation and activation status of the cell.

Ecole et épanouissement Personnel / From School to Self Realization: *Les Choristes* and *Dead Poets Society*

Author(s): Shilpa Thakar
Mentor(s): Marie Magdeleine Chirol
Institution: Whittier College, Whittier CA

The mirroring themes in Christophe Bartier's *Les Choristes* (2004) and Peter Vier's *Dead Poets Society* (1989) provide a good thematic juxtaposition through their portrayal of both French and American cinema. They are two cinematic approaches at portraying the ideas of juvenile rebellion and self-realization in young men with the influence of two dynamic, yet poised, educating leaders. First

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I will present the dynamic of the schools represented in each film by comparing their means of educating their students namely through the social context underlined in each film's respective institute. The basis will be the difference in the education systems stemming from the underprivileged institute for delinquent boys, Le Fond de L'Etang, and Welton Academy, a wealthy yet strictly conformed school for the upper class. Next I will incorporate the two educators, Clement Mathieu and John Keating, and present how they vary in their means of reaching their students and prove to be influential leaders. Lastly I will show how their influence on the boys provided for a successful result in their individual self-realizations through their respective educational routes. The education standpoints presented in both films provide these young boys with leaders that help them pave paths to success that are structured differently from those that would inhibit the realization of their apparent talents. My presentation will be in French.

Art, Sport and an American Identity: An Examination of the Art of Charles Eakins and Mary Cassatt

Author(s): Ian Theel

Mentor(s): Paula Radisich

Institution: Whittier College, Whittier CA

Linda Nochlin in her article the "Issues of Gender in Cassatt and Eakins" contends that of the two contemporary American artists, Mary Cassatt was more radical and politically active overall. My question is whether this is a valid assertion given a thorough examination of the subject, processes and materialism in Thomas Eakins' painting "The Wrestlers" and Mary Cassatt's so called work "Mother Bathing Sleepy Child". For my evidence I examined the two works in person as well as several accompanying photographs and paintings for Eakins work. I have also viewed a digital scan of a preliminary sketch by Mary Cassatt for "Mother Bathing Sleepy Child," and have read a series of correspondence between Cassatt and her immediate family relating to her art production and sale. Through an examination of these works I conclude that Linda Nochlin's assertion is incorrect insofar as these two paintings. Thomas Eakin's awareness and attempt to capture the idea of an American identity and its democratic facets make him more radical and socially aware. Meanwhile Mary Cassatt is more concerned with bourgeois and capitalist ideas pertaining to the Impressionist movement in Europe. This research is important because it discusses how artist's choices in their art either propagates or neglects a particular national identity, and how those choices relate to issues of class and society.

Evidence for Post-Pleistocene Range Expansion in the Western Fence Lizard (*Sceloporus occidentalis*) in Central and Eastern Nevada

Author(s): Milinda A Thompson

Mentor(s): James Archie

Institution: CSU, Long Beach, Long Beach CA

Western Fence Lizards (*Sceloporus occidentalis*; WFL) are distributed throughout Nevada in isolated and semi-isolated mountain ranges at intermediate elevations. Dramatic geological events and climate changes occurred in this region during and following the Pleistocene that would have resulted in extensive expansion and contraction of suitable habitat. We analyzed variation in both mitochondrial and microsatellite DNA to determine the effects of these changes on populations of WFL. Phylogenetic analysis of mtDNA variation identified four major clades of WFL in the Great Basin of Nevada: eastern, central, western, and southern. We present an analysis of the distribution and overlap of the eastern and central clades. Low-levels of variability in mtDNA sequences in both clades suggest a post-Pleistocene range expansion. Based on the level of mtDNA differentiation within clades, we predicted: i) significant nuclear gene differentiation between the clades and ii) a loss of allelic diversity progressing south to north, reflecting post-Pleistocene range expansion. Clade membership was determined, using clade specific RFLP sequences, while patterns of nuclear gene differentiation were determined using primers specific for five microsatellite loci. Overlap of mtDNA clades was minimal; occurring in a single population (WOW). Contrary to our hypothesis, we found a lack of genetic differentiation in microsatellite loci between mtDNA clades consistent with high levels of gene flow between clades. However, we found significant genetic variation within the central, but not the eastern clade, as follows: 1) isolation by distance (IBD) and 2) loss of allele diversity from southern to northern populations. These patterns support the hypothesis of northward range expansion in only the central clade that are consistent with expectations from post-Pleistocene climate changes.

Role of the Parabrachial Nucleus in the Pons in Regulation of Cardiac Sympathoexcitatory Reflexes Evoked by Bradykinin

Author(s): Zaw Thura

Mentor(s): Liang Wu Fu

Institution: Mount San Antonio College, Walnut CA

Studies have shown that myocardial ischemia activates cardiac sympathetic afferents leading to sympathoexcitatory reflex responses, including an increase in blood pressure and renal sympathetic nerve activity. There are many integration centers in the brain such as the Nucleus Tractus Solitarii (NTS), rostral ventrolateral medulla (rVLM), and the Parabrachial Nucleus (PBN), which are

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responsible for these reflexes. The purpose of this study was to identify the role of the PBN in regulation of sympathoexcitatory reflexes evoked by bradykinin (BK). Concentrations of BK in coronary circulation are increased during myocardial ischemia. In anesthetized cats, 0.1-3 µg/ml of BK was applied to the epicardium of the heart to evoke the reflex responses. Next, 50 nl of non-specific glutamate receptor antagonist Kynurenic acid (Kyn) was microinjected into the PBN followed by three repeated BK applications. Arterial pressure and renal nerve activity were monitored and recorded during the experiment. We observed that epicardial BK evoked sympathoexcitatory reflexes. BK-evoked reflex responses were attenuated by 48% in mean blood pressure and 56% in renal nerve activity 25 min after microinjection of Kyn into the PBN. We concluded that the BK-evoked sympathoexcitatory reflexes are regulated by the PBN neurons through the glutamate receptor mechanism.

Closing the Cove: Promoting an Awareness of the Largest Dolphin Slaughter in the World

Author(s): Cassidy B Tillemans
Mentor(s): Kurt Meyer
Institution: Irvine Valley College, Irvine CA

Despite the growing concern and establishment for animal welfare and animal rights on a worldwide scale, the largest dolphin slaughter still occurs every year in the city of Taiji, Japan, killing nearly 1,800 Pacific Bottlenose Dolphins. The fishermen use inhumane techniques such as scaring the mammals into a corner with underwater noises emitted from their ships, and stabbing them with hooks and spears until they slowly bleed to death in a small cove. There are nearly another 400 dolphins that are not killed, and are consequently placed in relatively small tanks to be sold to aquariums and amusement parks around the world. Some fishermen claim that they will continue the slaughter to protect a centuries-old practice, while others explain how they are just part of another multimillion dollar trade industry around the world. Dolphins captured and sold for entertainment purposes are worth, on average, \$154,000, which is very motivating for business men to continue the hunts. The danger is presented to the public when dolphin meat, heavily contaminated with mercury, methylmercury, DDT and Cadmium, is placed in the markets, schools, and restaurants to be consumed without any warning labels or signs. This essay is not only concerned with the reasons that fuel this tradition to continue each year, but also to inform the citizens of the world how the consumption of dolphin meat is threatening human health and safety. What would be affective is to present this issue more publicly in all countries associated with the trade to reduce the demand for dolphins as entertainment. This, in fact, would promote an awareness to the Japanese public, and government that this slaughter is threatening public safety, as well as staining their reputation as a united nations member.

Investigation of Protein-Protein Interactions in the Tetrapyrrole Pathway

Author(s): Jessica Toledo, Esthella Flores
Mentor(s): Luiza A Nogaj
Institution: Mount St. Mary's College, Los Angeles CA

The mechanisms of substrate channeling and protein-protein interactions are well documented in all cells but are not well established in the tetrapyrrole pathway. This pathway leads to the production of hemes and chlorophylls and most of its intermediates are toxic and unstable to the cell. Therefore, it is likely that all of those intermediates are channeled through the pathway without being released into the cellular environment. For this reason we hypothesize that all the enzymes in this pathway interact with one another and channel the intermediates between their active sites. To test this hypothesis we overexpressed and purified two of the enzymes in the pathway, glutamyl-tRNA reductase (GTR) and glutamate-1-semialdehyde aminotransferase (GSAT). Using native gels we show that both of these enzymes interact with one another. In addition, our work focuses on cloning two other enzymes in the tetrapyrrole pathway, glutamyl-tRNA synthetase (GTS) and porphobilinogen synthase (PBGS). Those enzymes will be necessary to continue our studies to show the protein-protein interactions and substrate channeling in the tetrapyrrole pathway.

The Possible Role of CCR7/CCL21 Chemo-kine Receptor Ligand System in Lymphatic Metastasis

Author(s): Linda L Tran
Mentor(s): Lily Wu
Institution: UC, Los Angeles, Los Angeles CA

To investigate the process of cancer metastasis in living subjects, it is necessary to consider the molecular signals that could be guiding the tumor cell to disseminate from primary tumor to another organ location in the body. Although the lymphatic and blood vasculature systems are two main routes of tumor cell metastasis, we focused on investigating the lymphatic path as it occurs early in tumor development and in close proximity to the primary tumor site. Prior studies suggest metastatic tumor cells mimic the signaling pathways employed by dendritic cells to traffic along lymphatic vessels to draining lymph nodes. Chemokine receptor CCR7, expressed on the cell surface of T cells and dendritic cells, allows these cells to migrate along a concentration gradient of its ligand CCL21 and homes to lymphatic vessels in the lymph nodes. High level of CCR7 expression has been documented in head and neck and breast cancer, implicating this signaling pathway could be subverted by tumor cells to guide their metastasis to lymph nodes. To study the functional role of the CCR7/CCL21 receptor ligand system in prostate cancer metastasis, migration assays with the murine tumor cell line

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Myc-CaP were performed. This line has been genetically modified to overexpress CCR7 and was set in transwell culturing system to migrate towards CCL21. Preliminary results suggest that the presence of CCL21 leads to an increase in Myc-CaP-CCR7 migration.

Theoretical Structure of PPDK Regulatory Protein – Insights Into Catalysis

Author(s): Ngan Tran, Shirley K Burin
Mentor(s): Christopher M Smith
Institution: CSU, San Marcos, San Marcos CA

In C4 plants (e.g., most agronomically important plants; corn, sorghum, sugarcane), C4 photosynthesis is characterized by carbon “sequestration” in mesophyll cells, then the shuttling of these carbon units to bundle sheath cells where the increase in carbon unit concentration increases the efficiency of carbon fixation by Ribulose 1,5-Bisphosphate Carboxylase (the primary carbon fixing enzyme in the inefficient C3 photosynthesis cycle). Pyruvate, Orthophosphate Dikinase (PPDK) catalyzes the conversion of pyruvate into phosphoenolpyruvate, the initial CO_2 receptor or substrate in the carbon “sequestration” process. The activity of PPDK is regulated by a bifunctional Regulatory Protein (PPDK-RP), which mediates both light-dependent dephosphorylation and subsequent activation, and dark-dependent phosphorylation and subsequent inactivation of PPDK. Using bioinformatics and recombinant DNA technologies, the cDNA sequence for this regulatory protein has been determined from an expression clone. There are currently no known efforts underway to determine the 3D structure for the expressed, recombinant form of this protein using traditional X-Ray crystallographic techniques. In this project we utilized data on the biochemical properties of this protein, bioinformatics analyses of the primary peptide sequence, and homology modeling to determine a theoretical tertiary structure for PPDK-RP. We have determined that PPDK-RP has functional motifs and secondary structural elements consistent with the kinase family of enzymes. Several preliminary PPDK-RP 3D structures have been computationally generated using iterative threading assembly refinement, structure guided-sequence profile homology modeling, and PS² homology modeling. These structures were subjected to structural alignment comparative analyses to develop a single, highly refined structure (putative PPDK-RP structure). This putative tertiary structure will serve as the basis for the design and generation of genetically-engineered mutant PPDK-RP proteins to experimentally examine primary and tertiary structural elements involved in the binding of ligands (PPDK substrate, inhibitors, etc.), and better understand the mechanism(s) of PPDK-RP bi-functional catalysis.

The Effect of Changing Tank Conditions on Bromeliad Water Uptake

Author(s): Rebecca Tribelhorn
Mentor(s): Gretchen North
Institution: Occidental College, Los Angeles CA

Bromeliads, particularly those with a water-holding tank formed by leaves, act as amplifiers of biodiversity in tropical forests. The tanks play host to a wide variety of life forms, and provide bromeliads with their water and mineral nutrients. Bacteria, insects, amphibians, and other plants thrive in the conditions created by the tank. Field observations of bromeliads in previous years have shown marked changes in the pH of tank water, a condition that appears to be related to changes in the composition of the bacterial community. Because the pH of the tank water could also interact with the amount and type of detritus present in the tank, preliminary investigations were conducted on the Costa Rican species *Aechmea nudicaulis* that measured changes in pH under three conditions: with the addition of leaf matter, with the addition of streptomycin (knocking out bacteria in the tank), and control (no additions to tank water). Additionally, because pH is known to affect the rate of water uptake due to a potential inhibition of aquaporins (protein water channels), a separate experiment with the horticultural species *Aechmea fasciata* investigated rates of water uptake from tanks with artificially manipulated pH. Statistical analysis using one-way repeated measures ANOVA showed no significant difference in tank pH between detritus- and streptomycin treated bromeliads, but a significant difference ($P < 0.001$) was found in rates of water absorption in plants that had differing acidity levels. Extreme acidity (pH 3.0 or lower) reduced rates of plant water uptake. However, water uptake was not reduced at pH 4.0 (a typical pH of bromeliad tank water in the field and in the greenhouse). In other plants, water absorption and aquaporin activity can be sharply reduced at a pH of 4.0, suggesting that further studies on aquaporin expression in tank bromeliads are warranted.

Labyrinth, Labourinth, Labor intus: Inner Work and Female Subjectivity in Lady Mary Wroth's Pamphilia to Amphilanthus

Author(s): Mary H Truglia
Mentor(s): Wendy A Furman-Adams
Institution: Whittier College, Whittier CA

Within Pamphilia to Amphilanthus, the labyrinth can be seen as representative of internal and private space, both constructed and confusing. In a time where a woman was seen to be good if she remained “chaste, silent, and obedient,” the labyrinth serves as an excellent metaphor for the internal struggle that “inner work” can cause. Adhering to the Petrarchan symbolic, Pamphilia simultaneously has to articulate her desire and be the sexualized object. Sub-

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jectivity in this sequence is all about perception: woman as subject, viewing and being viewed, seeing and seeming, eyes and “I’s”, internal and external, and most significantly, public versus private perceptions and personas. Labyrinthine themes run throughout the sequence, evoking the connection between the labyrinth and tragically frustrated love. Pamphilia wanders through a maze of repeated efforts to pay homage to Cupid, but emerges with a renewed feeling of entrapment in an understanding of the relation of love and the self. Wroth’s strategies involve inverting modes of cultural regulation in order to construct and legitimate certain conceptual, psychological and physical spaces for her narrative. The labyrinthine theme serves to remind the reader of the struggle with female subjectivity as it is displayed through the depiction of the pain of having to self-represent and the self-representation of pain. Wroth is not engaged in a complete repudiation of Petrarchan discourse, but rather chooses to reinvent Petrarchanism by removing transgressive elements to construct a space for Pamphilia’s psyche. A woman creating a poetic labyrinth in a Petrarchan sonnet sequence speaks from the very center of contradiction, transforming public self-analysis into a spiritually respectable private search for self-knowledge. Wroth’s labyrinthine style dramatizes this search, engaging her reader in the very process she represents. The sequence illustrates Wroth’s rejection of the body-as-sign and instead proposes a space where Pamphilia’s “inner work” might signify.

Main-Belt Asteroid Solar Phase Behavior and the Discovery of Unexpected Trends with Heliocentric Distance

Author(s): Thien-Tin Truong, Michael Hicks

Mentor(s): Michael Hicks

Institution: CSU, Los Angeles, Los Angeles CA

The 4th Release of the Sloan Digital Sky Survey Moving Object Catalog (SDSS-MOC) contains 471569 moving object detections from 519 observing runs obtained from 2000 up to March 2007. Of these, 220101 observations were linked with 104449 known small bodies, with 2108 asteroids sampled at least 10 times. It is our goal to mine this database in order to extract solar phase curve information for a large number of main-belt asteroids of different dynamical and taxonomic classes. We found that a simple linear phase curve fit allowed us to reject data contaminated by intrinsic rotational lightcurves and other effects. As expected, a running mean of solar phase coefficient is strongly correlated with orbital elements, with the inner main-belt dominated by bright S-type asteroids and transitioning to darker C and D-type asteroids with steeper solar phase slopes. In order to calculate V-band magnitude in terms of absolute magnitude, H, and slope parameter, G, we used the H, G Magnitude Equation (Bowell et al. 1989) We fit the empirical H-G model to our 2108 multi-sampled asteroids and correlated these parameters with spectral type derived from the SDSS colors and position

within the asteroid belt. Our data allowed us to constrain solar phase reddening for a variety of taxonomic classes. There were unexpected linear trends for phase slopes with semi-major axis a for each major taxonomic family which could not be correlated with size or albedo within the spectral class. In future work, we will investigate whether that this is a real change in the surface scattering function independent of size and surface composition as a function of mean heliocentric distance.

Biologically Inspired Synthesis of Nanostructural Titanium Dioxide for Photocatalytic and Photovoltaic Applications

Author(s): Luke H Turalitsch, Ian Miller, Nichola Kinsinger, Dongsheng Li

Mentor(s): David Kisailus

Institution: UC, Riverside, Riverside CA

TiO₂ materials have gained much interest in photovoltaic and photocatalytic applications, specifically, the different nano-structures of TiO₂. Unfortunately, many synthesis routes to TiO₂ require high temperatures and or extreme pH conditions, yielding TiO₂ with poor size and phase control. However mineralizing biological systems demonstrate how nature can produce elegant structures at room temperature through controlled organic-mineral interactions. These organics exist as either soluble forms or as insoluble scaffolds that are often used to control size, shape, and orientation of mineral. We are using biologically-inspired scaffolds (synthetic polymers) to template the nucleation and growth of inorganic materials such as TiO₂. These ligands (modeled after specific mineral functionalities identified in biomimetic systems) interact with minerals during nucleation and growth. These ligands help to control the size, shape, and phase of these materials and ultimately, their properties. TiO₂, as a photocatalytic material, shows great potential for being able to completely mineralize over 800 compounds non-selectively. We have investigated its photocatalytic activity via degradation of Methylene blue, a commercially available dye. By characterizing TiO₂ synthesized under a variety of parameters such as polymer concentration which affects crystallite size due to reduced diffusivity, we are able to optimization the photocatalytic activity of the TiO₂. By modifying the structure of TiO₂ (i.e. nano-wires, nano-films, and nano-ribbons), a higher efficiency can be obtained for solar cells, thus increasing marketability. However, since the synthesis of TiO₂ materials involves extreme conditions, the TiO₂ cannot be synthesized directly onto the substrate. Using this bio-inspired synthesis the TiO₂ can be grown directly on the substrate, which will reduce processing costs. Changes to concentration of precursor, temperature, and pH, all have dramatic effects on the structures of TiO₂ produced on the substrate.

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Effects of UV Light on Local Stream Frogs' Behaviors

Author(s): Eiichiro Uemura, Daniel Lim

Mentor(s): Lee Kats

Institution: Pepperdine University, Malibu CA

Amphibian declines have been well documented throughout the world. Several studies have examined whether UV radiation from the sun is a possible contributing cause to declining populations. In Southern California, two closely related species of treefrogs, *Pseudacris hypochondriaca* and *Pseudacris cadaverina*, coexist in many perennial streams. *P. hypochondriaca* is primarily nocturnal while *P. cadaverina* is known to bask in direct sunlight. The purpose of the study is to determine how the two different species of frogs will react under different types of light emitted by a portable flashlight. The light was emitting either UV radiation or visible light, or was turned off as it was slowly brought toward the frog. When the frog jumped from its resting position, the light was held stationary and the distance from the light to the original frog perch was recorded. Our results suggest that both species are more sensitive to the UV light than to the light that was turned off or the visible light. Frogs jumped much sooner when presented with UV even when the light was farther away. There appeared to be no differences in the sensitivity of the two species to the UV light. Our results suggest that both species of treefrogs are sensitive to UV. This sensitivity may be due in part to the large levels of UV that reach streams after wildfires. Wildfires are a natural part of these ecosystems and the removal of tree canopy by wildfire may create periodic strong selection on riparian animals to avoid increased levels of UV radiation.

Does Vulnerability to Cavitation Influence the Distribution of Species along an Elevation Gradient in Gulf Coast Wetlands

Author(s): Peaches Ulrich, Shelley Heller, Jes Matias

Mentor(s): Cheryl Swift

Institution: Whittier College, Whittier CA

We examined vulnerability to cavitation in, *Myrica cerifolia* and *Baccharis halimifolia* along a transect from freshwater marsh to mesic forest at the Weeks Bay reserve in Alabama. The transect spans five distinct communities as elevation increases--freshwater marsh, sparse ecotone, dense ecotone, seep forest and mesic forest. The transition from marsh to forest is divided into a sparse ecotone where canopy cover and shrub density are low and a dense ecotone where canopy cover and shrub density are higher. The objective of the experiment was to determine the role vulnerability to cavitation plays in explaining differences in distribution of these species. *Myrica cerifolia* occurs along the entire length of the transect; however, *B. halimifolia* is restricted to the ecotone between the marsh and the forest. The air-injection method was used to determine

vulnerability to cavitation. Stems from five different individuals from each zone were placed in a pressure chamber where air was forced into the xylem at intervals of five to ten bars until loss of conductivity approached or was at 100%. Percent loss of conductivity was plotted against xylem pressure, and values for P_{50} , which indicate a 50% loss of hydraulic conductivity, were then calculated. *Baccharis halimifolia* had higher P_{50} values than *M. cerifolia* in zones where the species co-occurred, and P_{50} decreased from the dense ecotone to the seep forest for *M. cerifolia*. More negative values of P_{50} in zones of lower water availability (increasing elevation) suggests water availability may play a role in the distribution patterns of these species; Both water saturated soils and drier soils decrease water availability; water saturated soils inhibit root function as a result of low O_2 levels, and drier soils have less available water. This may explain the restriction of *B. halimifolia* to the sparse and dense ecotone zones.

Freshwater Incursions as a Switch Mechanism between Alternative Foundation Species: The Physical Context of Adaptive Trade-Offs

Author(s): Lea Urpa

Mentor(s): Carlos Robles

Institution: CSU, Los Angeles, Los Angeles CA

The interaction between the ochre sea star (*P. ochraceus*) and *Mytilus spp.* mussels has been studied for several decades. Experiments on this predator-prey system have led to the creation of several now-central theories in the field of ecology. The effect of climate change on this system, specifically increased rainfall, is therefore of particular importance. The reported salinity tolerances of *Pisaster sp.* and *Mytilus spp.* in the Barkley Sound indicate an apparent adaptive trade-off between salinity tolerance and predation tolerance. In this case, freshwater incursions may then serve as a switch mechanism between *M. californianus* and *M. trossulus* as the dominant mussel species. The role of this project is to determine the duration and intensity of freshwater incursions in the Barkley Sound so their effects on species abundance and distribution can be determined. We installed salinity sensors at 7 sites throughout the Barkley Sound, British Columbia, and continuously recorded changes in salinities from the dry to wet seasons. The varying depths of the freshwater layers were assessed at irregular intervals using a hand-held sensor. Preliminary results show the linkage between heavy rainfall events and sustained lowered salinities, and indicate a difference in water movement between sites placed on islands and sites on the mainland. Additionally, it was observed that the lower salinity tolerances of *P. ochraceus* and the larvae of *M. californianus*, were episodically exceeded, indicating that salinity appears to be a crucial, yet little recognized factor in the ecology of this model system. Once the effect of these incursions on the system has been established and the distribution and abundances of *Mytilus* mussels in the area have been confirmed, climate change predictions can be applied to the system.

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Psychosocial Functioning and Recidivism in At-Risk Youth

Author(s): Maria Vaca, Matthew Lysak, Melinda

Miranda, Dorothy Scuteri

Mentor(s): Kimmy Kee

Institution: CSU, Channel Islands, Camarillo CA

Background: While success rates for youth in mental health service programs have been extensively studied, the occurrence of recidivism in this population has not been fully explored. The current ongoing study examines the longitudinal associations between specific aspects of psychosocial adjustment and recidivism in at-risk youths with emotional and behavioral problems. **Methods:** Data are currently available on a sample of 130 youths, who were at risk for out-of-home placement at intake in a community-based services program. Participants' psychosocial adjustment was measured upon admission and again at discharge using the Ohio Scales, which were completed by three different informants: caregivers, youths, and agency workers. The Ohio Scales are comprised of subtests that assess four components of psychosocial outcome, including the severity of symptoms/problem, hopefulness, functioning, and satisfaction with services. For the current study, the three dimensions most relevant to outcome (i.e., symptoms/problem severity, hopefulness, and functioning) were used. Recidivism was assessed by the total number of times the participants subsequently re-entered the treatment program or were placed into an alternative treatment program after discharge from initial program. **Results:** Interim analyses revealed significant cross-temporal relationships between baseline functioning rated by caregivers with recidivism ($r = -0.19, p = 0.033$) and baseline functioning rated by youths with recidivism ($r = -0.17, p = 0.048$). Also, the association between hopefulness rated by caregivers at intake and recidivism was at a trend level ($r = -0.15, p = 0.092$). However, at discharge, only symptoms/problem severity and functioning rated by agency workers correlated with recidivism ($r = 0.26, p = 0.003; r = -0.19, p = 0.029$ respectively). **Conclusion:** Preliminary findings from the current study provide new insights into the potential role of psychosocial adjustment as a predictor of recidivism in at-risk youths and may further help guide the development of mental health treatment programs.

Prevention of Oxidative DNA Protein Cross-linking by Resveratrol

Author(s): Zoila Valdez, Bianca S Wilson,

Mentor(s): Eric D A Stemp

Institution: Mount Saint Mary's College, Los Angeles CA

Oxidative damage induces a plethora of diseases and the one-electron oxidation of guanine has been shown to induce DNA-protein cross-linking. Here, pure resveratrol and a resveratrol supplement were tested for the ability to inhibit such damage. Guanines in pUC19 DNA were

oxidized by the flash-quench technique, and cross-linking with histone was detected by the gel shift assay. pUC19 DNA subjected to photochemical oxidation provided a considerable amount of cross-linked material visible within the wells, an effect reversed by resveratrol. This inhibition is maintained out to concentrations of resveratrol as low as $10\mu M$ and control experiments indicate that it is not due to trivial effects such as interference with the flash quench oxidation process or absorption of the laser light used to initiate oxidation. From analogous experiments on tyrosine-containing tripeptides, the most likely explanation for these results would be reduction of the guanine radical by the phenol ring.

The Modeling of Small Molecules and DNA Intermediates

Author(s): Gabriel Vahi-Ferguson, Marc Rideout

Mentor(s): Peter Salamon

Institution: San Diego State University, San Diego CA

The Segall lab has previously identified peptides that have antibacterial activity at least in part because they interfere with DNA repair processes. The most potent peptide, WRWYCR, has been shown to bind to the central DNA repair intermediate, the Holliday Junction (HJ), with high affinity and stability and this contributes to bacterial cell death. Here we present preliminary characterization of small molecule analogs of the peptides that are more potent antibacterial compounds than the peptides. These small molecules also interact with HJs and inhibit DNA repair enzymes, which may in part explain their activity. Different analogs bind to HJs with either lower or higher affinity. Quantifying these differences in binding to the HJ target will help explain the differences in the activities of the peptide and the small molecule, and will help us design compounds with higher affinity for their specific target. A solution-based fluorescence assay is used to measure binding between the peptide and small molecule to the HJ. The data measures the concentration of small molecule in solution, the amount of HJ, and the fluorescence emitted by HJ containing a fluorophore at the presumed binding site of the inhibitory molecules. To model the interaction, we are considering a set of possible mechanisms that may describe the interactions between the small molecules and their targets. Each mechanism gives us a set of equilibrium constants, and the goodness of fit between modeled and actual data will suggest which is the most likely mechanism of binding, and suggest experiments to confirm or rule out the predicted mechanisms. The mechanisms explored allow the possibility of interactions of a HJ with a dimer of small molecule, and the potential dimerization of the small molecule either in solution or when in contact with the DNA substrate.

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Voyeurism

Author(s): Raul G Valdez

Mentor(s): Jack Reilly

Institution: CSU, Channel Islands, Camarillo CA

I treat my paintings like mirrors as they reflect my personal experience in voyeuristic and homosexual American culture. We as Americans are immersed in the lives that are not our own: we are more interested in the model, actress, or reality TV show. We are looking into the lives of others and living by proxy. My models as such are homosexual and male; they are placed in erotic and semi-nude poses that mimic those of magazine advertisements and snapshots of celebrities. These voyeuristic influences provoke the viewer to objectify the subject and in the paintings the model remains faceless; only the iconic sexual pose and apparel remain. The viewer is provided with little information, limited to that of the sexual pose and fabric, creating a feeling of voyeuristic sensuality. My work serves the viewer that which he or she desires most; a glimpse into an intimate moment that they secretly desire. They give the American population what they crave, and allow them to give in to a guilty pleasure without legal or moral consequences.

Utilizing a Geographic Information System to Digitally Archive California Condor Nesting Data

Author(s): Kimberly J Valverde

Mentor(s): Chris Cogan

Institution: CSU, Channel Islands, Camarillo CA

Prior to becoming federally protected by the Endangered Species Act of 1967, research efforts were initiated to understand the influencing factors affecting the rapid decline in the California condor (*Gymnogyps californianus*) population. Due to the efforts of those concerned about preserving biodiversity, valuable data has been collected on the natural history of California condors along with mortality threats including shooting and lead poisoning, low reproduction success and management of critical habitat. Today recovery efforts led by California Condor Recovery Program of the United States Fish & Wildlife continue to increase the population and California condors have begun re-inhabiting areas within their former range. Threats will continue to influence the survival of the California condor, however with the combination of gaining knowledge resulting from current advanced studies along with historical data referencing, proper assessment can be made to determine probable livelihood responses of California condors in their historic range. The purpose of this research was to digitally archive historical nesting data of the California condor using a geographic information system (GIS) database. GIS technology has become an important tool in the recovery of California condors as it allows researchers to visualize the spatial distribution relationship condors have with their habitat resources.

Consumer Barriers to the Acceptance of Apparel Mass Customization

Author(s): Mai Vang

Mentor(s): Muditha Senanayake

Institution: California State Polytechnic University, Pomona, Pomona CA

Mass Customization (MC) is a production strategy that allows for customization of mass produced products. MC enhances manufacturers' and retailers' operations with the ability to tailor their products to consumer preferences and increase customer satisfaction. This is proven by the considerable research that has been done to show that MC can benefit companies to increase profits and gain market share. However, MC's adoption in the apparel industry seems considerably slow in comparison to other industries like the automobile and electronic industries. The purpose of this study was to investigate consumer barriers that prevent consumers from making MC apparel purchases. Past research on MC have analyzed the degree of customization, types of customization, location and popular mass customized apparel, but no research has been done on consumer barriers to apparel MC. Since there is diminutive research on consumer barriers in relation to apparel MC, it makes this study both relevant and timely. The objectives of the study were to: (a) investigate consumer barriers to the acceptance of apparel MC, (b) rank the barriers, (c) find additional barriers, and (d) examine correlations between the validated barriers and consumer demographics. To meet these objectives, literature review was used to hypothesize ten consumer barriers and the barriers were tested in the form of an online survey. There were 136 subjects; students, staff and faculty at Cal Poly Pomona participated in the study and the snowball sampling technique was used to recruit participants. Results from the study found that Fit, Feel, Price and Brand were significant barriers that prevented consumers from making MC apparel purchases. An understanding of the consumer barriers to apparel MC will give retailers and manufacturers who are interested in this business model an idea of which area(s) to enhance or improve to remedy the consumer barriers that were found.

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Latinos in Hispanic Serving Institutions: Student Success and Engagement

Author(s): Christian Vasquez

Mentor(s): Gilbert Vasquez

Institution: California State Polytechnic University, Pomona, Pomona CA

The U.S. Department of Education has defined Hispanic Serving Institutions (HSIs) as accredited and degree-granting public or private nonprofit institutions of higher education with twenty-five percent or more total undergraduate Hispanic full-time equivalent (FTE) student enrollment. This study seeks to understand how HSIs in California and Texas advance Latinos in higher education. My main research question is: *How do Latinos in Higher education benefit from HSIs?* The theories of student engagement and ethnic identity development guides this study. Secondary data analysis is used in the investigation by way of using individual institutional data. One of the themes the literature highlights is to create strong institutional funding bases in order to ensure the future growth and development of HSIs. There are mixed results in the findings, although some Latinos benefit from HSIs, it is clear that many do not.

Achieving Homogeneous and Isotropic Turbulence from an Active Grid

Author(s): Mayra Vega

Mentor(s): Evan Variano

Institution: UC, San Diego, La Jolla CA

Turbulence remains an active field of study in fluid dynamics, due to its chaotic and random behaviors. Wind tunnels have traditionally been used to study turbulence in the laboratory, and recently researchers have begun to implement active grids (Makita, 1991) in their wind tunnel studies. Active grids enhance turbulent shear production and higher Reynolds number flows in traditional wind tunnels. (Makita 1991) This is crucial in simulating the large scale turbulence experienced in the natural environment. Previous active grid designs implemented actuated rods and flaps to generate turbulence, but we propose a new active grid design, the Random Fan Array (RFA), that utilizes individually controlled fans. We predict that the RFA's larger degree of freedom will result in the creation of a high Reynolds number flow that will be statistically more homogeneous and isotropic than previous active grids, while also generating its own flow. By developing a device capable of generating isotropic and homogeneous turbulence, along with enhanced turbulent shear production, it will enable scientists to better understand and predict how turbulence affects various systems.

Structural Insights into the Lipid-bound Conformation of Human Apolipoprotein E CT

Author(s): Raul Vera, Arti Patel

Mentor(s): Vasanthy Narayanaswami

Institution: CSU, Long Beach, Long Beach CA

The C-terminal domain (CT) of apolipoprotein E (apoE) involved in the cholesterol homeostasis of plasma and the brain, functions in high affinity lipoprotein binding and protein self-association. In our study, we employ site-specific fluorescence labeling to gain insights into the conformation of lipid-bound apoE CT at physiological concentrations (5-10 µg/ml). Pyrene, a spatially sensitive fluorophore, reports on proximity between desired sites by displaying a signature excimer band. Pyrene maleimide was covalently attached to single cysteine-containing recombinant apoE CT at position 223 to probe the first predicted helical segment, and at 255 and 277 to probe the terminal helical segment. Our studies indicate that parallel inter-molecular helix-helix contacts exist throughout the entire CT in the lipid-free state. Upon lipid binding, helix-helix interactions in pyrene labeled apoE CT are replaced by helix-lipid interactions yielding discoidal high density lipoprotein (HDL) particles. In HDL-bound state, a significant decrease in excimer emission intensity was observed for all labeled positions. Fluorescence emission quenching by potassium iodide indicates that the accessibility of the probes in lipid-bound apoE CT was restricted. Quenching studies using 5-and 16-doxyl stearic acid provided information on the depth of penetration of the labels at different positions with regard to the lipid bilayer. In addition, by using a cysteine specific crosslinker, bis-(maleimido)hexane, additional information on the distance and orientation of apoE CT molecules with respect to each other in the lipid-bound state was obtained. This study presents new information about the conformation of lipid associated apoE CT. Future studies will examine the conformation of full length apoE in lipid-associated state using a similar approach.

Simulation of Interplanetary Travel

Author(s): Duy Vo, Jason Higuchi

Mentor(s): Milan Mijic

Institution: CSU, Los Angeles, Los Angeles CA

In this study, computer programs were developed to determine the success of user operated interplanetary travel through the output of orbital data and visual illustration. The simulated tasks include trajectory from Earth to Mars and the interception of a Near Earth Asteroid. The programming environment utilizes C++ and a 3D game engine, Panda 3D. The physics involving planetary travel was developed as a set of algorithms and realized first in C++. The program reads as input the current orbital state of the spacecraft along with state of other celestial objects influencing the orbit. The final output was visualized by Panda 3D. The program informs the user whether the in-

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putted data led to a successful or an unsuccessful launch to Mars or intercept of the asteroid after which the user is allowed to proceed with new and corrected attempt. In the event of an unsuccessful input of data, the program displays the distances the spacecraft missed its target along the axes of a three-dimensional coordinate system. The program also reminds the user of the previously inputted values and prompts for input of new values. The entire process was displayed by the 3D game engine where an unsuccessful launch was indicated for example by the spacecraft missing Mars' sphere of influence. A successful launch allowed users to advance to more difficult situations as part of game play that enables user to learn and experiment with laws of orbital mechanics.

Optimized Expression, Isolation, and Purification of Rat ApolipoproteinE

Author(s): Tien T Vu, Tuyen N Tran, Muhammad Rafay
Mentor(s): Vasanthy Narayanaswami
Institution: CSU, Long Beach, Long Beach CA

The objective of our study is to examine the effect of oxidative modification on the structure and function of apolipoprotein E (apoE). ApoE is an exchangeable apolipoprotein that plays a crucial role in cholesterol transport in the blood and central nervous system. Considered an anti-atherogenic protein, apoE lowers plasma lipid levels by acting as a ligand for low-density lipoprotein receptors. Our long-term goal is to understand the effect of environmental tobacco smoke exposure on plasma apoE and whether exposure predisposes people to developing heart disease. We are specifically interested in the effect of acrolein and 4-hydroxynonenal, which are aldehydes present in tobacco smoke. To achieve this goal, we designed a protocol to obtain recombinant rat apoE *in vitro*. Previous attempts to purify rat apoE resulted in poor protein yields and extensive protein degradation. To improve yields and obtain high-purity proteins, codon usage was optimized for expression of rat apoE in *Escherichia coli*. ApoE was over expressed, isolated, and purified by nickel affinity column chromatography. Protein yield was ~ 50 mg/L culture medium. Sodium dodecyl sulfate polyacrylamide gel electrophoresis indicated the presence of a single major band corresponding to about 34 kDa, with a few minor bands of lower molecular masses. Western Blot analysis using an anti-apoE polyclonal antibody showed that the major band was apoE. Minor bands were not detected even when 10 µg of total protein was loaded on the gel, indicating that they were not degradation products of apoE. HPLC analysis confirmed the purity of the preparation. Our next step would be to cleave the affinity tag, taking advantage of the TEV protease cleavage site that was engineered between the apoE and hexa-Histidine sequence.

Investigation of a Novel Mouse Model of Autistic-Like Behavior

Author(s): Hady Wahby
Mentor(s): Bryce C Ryan
Institution: University of Redlands, Redlands CA

Autism has three core symptoms: restricted, repetitive behaviors, deficits in communication, and abnormal social interactions. The causes of autism are unknown, and no established animal model currently exists. Past research indicates that the inbred C58/J mouse strain has elevated repetitive behaviors and deficits in social behavior, making this an animal of interest in the research of autism and its underlying causes. This study expands on earlier work and investigates the effects of environmental enrichment during development on the emergence of abnormal behaviors in the C58/J mouse. Breeding pairs of mice were placed in enriched or non-enriched caging and the behavior of their pups was measured throughout the lactational period. Adult C58/J mice showed elevated repetitive behaviors throughout life regardless of the level of enrichment in which they were raised.

Synthesis and Characterization of Pyridine and Pyrrole Containing Macromolecules.

Author(s): Michael S Walley
Mentor(s): Andreas Gebauer
Institution: CSU, Bakersfield, Bakersfield CA

The current question driving this research into the synthesis of pyridine and pyrrole containing macromolecules is the binding ability of the cavity in the center of such structures. These kinds of macromolecules have applications in both the medical and environmental fields. This research progresses towards the assembly of the macrocycle in a one-pot synthesis from 2,6-pyridinedimethanol and pyrrole in a similar fashion to how calyx[4]pyrroles are prepared. This presentation will describe our efforts in identifying the ideal reaction conditions (i.e., solvent, temperature, reactant ratio) that leads to the highest yield of calix[2]pyrrole[2]pyridine. Furthermore, data confirming the preparation of the calix[2]pyrrole[2]pyridine will be presented. Once the synthesis of the calix[2]pyrrole[2]pyridine is completed the characterization and testing of the binding abilities will be carried out. The image for the described reaction would not paste into this window.

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Experimentation of Cylindrical Cross Flow Fan Wing Technology

Author(s): Mark Walters, Matthew Sipek

Mentor(s): Steven Dobbs

Institution: California State Polytechnic University, Pomona, Pomona CA

Team Aerios of the Aerospace Department at the California State Polytechnic University of Pomona presents a senior project involving the experimentation and demonstration of cylindrical cross flow fan wing technology. The ideas for the basis of the project were inspired by the work of Patrick Peebles who has developed a working *Fan Wing* prototype in the U.K. The team originally set out to develop a remote controlled (RC) prototype with an integrated autopilot system that would be capable of controlling the aircraft during flight. Before designing the prototype the group the team conducted a number of tests to prove such a propulsive system would work as well as try to optimize the configuration to maximize its performance. The first test was a feasibility test conducted to qualitatively assess the cross flow fan's ability to produce lift. The second test involved constructing a wind tunnel model to quantitatively assess how lift and drag is affected by airfoil shape when operating with a free stream velocity. The final test involved the construction of a static test stand to measure thrust and lift produced by the cross flow fan wing as well as optimizing the front cowling height to maximize these static forces. The initial feasibility test proved that static lift could be produced with a cylindrical cross flow fan wing. The wind tunnel test helped the team determine that cross flow fan wing performance is not affected by airfoil shape nearly as much as fan speed and cowling height. The group also found that the center of lift acts through the center of the fan. The static stand also provided the team with the optimum cowling height for their cross flow fan wing configuration which was 0.15 inches above the fan's horizontal center line.

Quantitative Study of Nasal Tip Stiffness: *In Vivo* Mechanical Testing Using a Custom Built Apparatus

Author(s): Edward Wang, Spencer Tung

Mentor(s): Elizabeth Orwin

Institution: Harvey Mudd College, Claremont CA

Reconstructive surgery often decreases nasal tip stiffness. Without a quantitative measure of the nasal tip's original stiffness, it is difficult for the surgeon to return the nasal tip to its pre-surgical stiffness. The purpose of this study is to determine a method that will obtain a quantitative measurement of the nasal tip's stiffness. A custom-built machine was used to perform cyclic compression tests on the nasal tip. The machine operated under four parameters: the initial displacement of the nasal tip, the amplitude of the cyclic compressions, the angle of attack,

and the frequency of oscillation. Values for each parameter were determined to standardize the testing protocol. Nasal tip cartilage is a viscoelastic material. When viscoelastic materials are subjected to cyclic force-displacement loads, known as hysteresis, the viscous components dissipate some of the energy. The area within the loading and unloading cycle is the energy dissipated. Assuming that softer nasal tips are composed of more viscous materials, softer nasal tips would thus have larger areas. The slope of the loading curve can also tell us about the stiffness of the material through finding the equivalent spring constant using Hooke's Law. A larger slope would indicate a stiffer material. Thus, a stiff nasal tip would exhibit a large slope and small area. The results from *in vivo* human testing did not completely support the hypotheses. Nasal tip stiffness showed no correlation with the hysteresis area, though the slope analysis showed a positive correlation with stiffness. However, the hypothesis of stiffness correlating to area was supported when polyurethane models of the nose were tested using the same machine. These results indicate that material difference is not the only factor affecting stiffness. Potentially, internal connectivity and cartilage form factors can be analyzed to account for these discrepancies.

Direct Conversion of Fibroblasts to Retinal Pigment Epithelium Cells

Author(s): Kevin Yuqi Wang

Mentor(s): Guoping Fan

Institution: UC, Los Angeles, Los Angeles CA

The retinal pigment epithelium (RPE) is a monolayer of cells that serve a myriad of functions in maintaining visual function and photoreceptor survival. As such, degeneration of the RPE can lead to death of photoreceptors in the macula, a region that is most pivotal for central, high acuity vision. This degeneration is the cause of the disease age-related macular degeneration, one of the leading causes of blindness in the developed world. However, there is neither a cure nor a method to prevent it. Studies demonstrated that autologous transplantation of the RPE in animal models and clinical trials in humans with macular degeneration partially restores visual function. Furthermore, because pluripotent stem cells can potentially differentiate into nearly any cell type, derivation to RPE cells sufficient for therapy is most ideal. Methods for spontaneous and directed differentiation of human embryonic stem cells and induced pluripotent stem cells to RPE cells have been produced and characterized. Attempts at converting fibroblasts to neuronal-like cells, dermal fibroblasts to cardiomyocyte-like cells, and exocrine cells to insulin cells using retroviral or lentiviral transduction have also been achieved. This study attempts to directly convert mammalian fibroblasts to RPE-like cells using a pool of 16 candidate transcription factors. Currently, 12 of the 16 cDNA of candidate transcription factors have been cloned into a lentiviral construct under the control of a tetracycline-induced operator. 10 of the 16

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cDNA plasmids have been successfully transfected into 293T cells for lentiviral construction. Preliminary results from qRT-PCR reveal that when candidate genes NeuroD, Ascl1, Mitf, and Pax6 are individually introduced into 293T cells, these cells express these genes at significantly higher levels than without doxycycline. Ultimately, once all 16 candidate genes are packaged into a lentiviral system, assessment of the conversion process will be performed using qRT-PCR and immunostaining.

Assessment of Glypican-3 as a Precancerous Marker in Different Types of Cirrhotic Livers: An Immunohistochemical and Molecular Study

Author(s): Sean K Wang

Mentor(s): Peiguo Chu

Institution: South Pasadena High School, South Pasadena CA

Hepatocellular carcinoma (HCC) often leads to patient death within 6 months, making early detection essential for optimal treatment and survival. Liver cirrhosis is caused by various etiologies and is the major risk factor for HCC. Though controversial, liver cell dysplasia in cirrhotic livers is thought to be the precursor lesion to HCC. Recent studies have shown that glypican-3 (GPC3), an oncofetal protein, is overexpressed in HCC but silenced in normal liver, thus serving as a useful biomarker for HCC detection. The aim of this study was to investigate if GPC3 could also be used to detect precursor lesions in cirrhotic livers. By immunohistochemical analysis on 167 cirrhotic livers, we found that GPC3 was more frequently expressed in cirrhotic livers with HCC (64%) than those without (37%; $P = 0.0009$). Most (84%) GPC3-positive cases without HCC were associated with hepatitis B and/or C viral infection, but little difference was observed between viral (69%) and non-viral (50%) cases with HCC. The findings that cirrhosis of viral origin is more frequently associated with GPC3 expression than non-viral cirrhosis agrees with the fact that hepatitis viruses are more potent oncogenic factors than non-viral etiologies. Surprisingly, GPC3-positive hepatocytes in cirrhotic livers were normal-appearing while morphologically dysplastic hepatocytes were typically GPC3-negative. By quantitative real-time PCR analysis of 6 selected genes associated with hepatocarcinogenesis, two genes were found to be differentially regulated between GPC3-positive and GPC3-negative cirrhotic livers, suggesting the existence of molecular differences between these two types of morphologically indistinguishable cirrhosis. Our data suggest that GPC3 may be a precancerous marker for cirrhotic livers with malignant potential, regardless of histological dysplasia, and therefore may serve as a promising tool in early HCC detection. It may allow for precancerous lesions in cirrhotic livers to be identified well before the cancerous transformation can be visibly recognized.

Candy Currency

Author(s): Catherine Warburton

Mentor(s): Jack Reilly

Institution: CSU, Channel Islands, Camarillo CA

It has become a well known fact that abundant sugar is an unhealthy addition to most American diets. According to www.health.families.com, the average American consumes 22 teaspoons of sugar a day. People are enticed into gorging on addicting sugary sweets by slick packaging, colorful graphics, and familiar branding. Candy is a comfort food that appeals to our most basic, emotional needs. It is also used as currency in childhood. Complete a task, be rewarded with candy. This piece is the first in a series that will illustrate how mass-produced confections are seen through the eyes of a child. "Candy Currency" captures the cunningly seductive nature of brightly colored packaging. It was inspired by my euphoric childish glee upon viewing a Halloween bucket brimming with goodies. One type of sweet was traded for another, often being offered to our parents in exchange for favors. Nowadays, candy is no longer a treat, but something had daily. It is my intention to explore all facets of candy consumption. I will address both the sentimental, as well as the detrimental. My goal is to have candy consumers knowledgeable about the many ways in which children view candy, but with an aesthetic spin.

A Comparative Analysis of High Impact Local Nonprofit Organizations

Author(s): Ashley N Watson, Christopher R Mendez

Mentor(s): Regan Schaffer

Institution: Pepperdine University, Malibu CA

In the United States 1.5 million nonprofit organizations now account for more than \$1 trillion in revenues annually of the nation's economy. During the past fifteen years, nonprofits grew faster than the overall economy. In order for nonprofits to maintain their effectiveness amidst rapid growth and competition they must learn new ways of managing. The purpose of this study is to explore key management practices developed by nonprofit organizations located in Ventura and Los Angeles counties. The study utilizes the framework outlined in a research study conducted by Heather Grant McCloud and reported in her book *Forces for Good: Six Practices of High Impact Nonprofit Organizations*. Through this research, we were able to take the best practices of large, national, high-impact nonprofit organizations and conduct a comparative analysis with 60 local nonprofits. We applied qualitative research methods and an appreciative inquiry approach through the use of online surveys, informational interviews and content analysis to identify themes focusing on three main practice areas: How to make markets work, inspire evangelists for your cause and master the art of adaptation. Results show that reciprocal relationships and matching missions are important in making for-profit and nonprofit partner-

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ships work. In addition, strategic planning and assessment are essential to adapt to change. Finally, organizations function better by having individuals who are passionate for their cause as spokespersons in the community. Our findings were consistent with the national study and provided vivid examples of each practice at work.

Thermal Instability of Oxidative DNA-Protein Crosslinks

Author(s): Tameka T Watson, Ludmila Youchkovets

Mentor(s): Eric D A Stemp

Institution: Mount St. Mary's College, Los Angeles, Los Angeles CA

Oxidative damage has many detrimental effects on DNA and one type is the DNA-protein crosslink. Our aim is to determine the thermal stability of oxidative DNA-protein crosslinks between calf thymus DNA and histone. We hypothesize that high temperatures will allow for the DNA-protein crosslinks to be cleaved, and that NaCNBH₃ will increase their resistance to temperature; since formation of an imine between guanine and lysine is a possible path towards DNA-protein crosslinking, reduction of an imine should create a more stable amine linkage. Through the flash quench method Ru(phen)₂dppz³⁺[phen=phenant hroline, dppz=dipyridophenazine] was created to oxidize guanine. The guanine radical then reacted at room temperature with histone to form DNA-protein crosslinks. The samples were then incubated at temperatures of 0 °C, 25 °C, 37 °C, and 100 °C for one hour. The chloroform extraction assay was utilized to quantify DNA-Protein crosslinks. In this assay sodium chloride and Sodium Dodecyl Sulfate (SDS) are used to break non-covalent interactions. Chloroform is used to extract the proteinaceous material, and UV-spectroscopy is then used to quantify the amount of free DNA. The amount of crosslinking varied inversely with temperature, with values of $\Delta H^\circ = -21.4 \text{ kJ/mol}$ and $\Delta S^\circ = -66.9 \text{ J/mol}\cdot\text{K}$ obtained from the temperature dependence. After incubation at 0 °C, crosslinking was still observed, however there was less crosslinking observed after incubation at high temperatures. Treatment with NaCNBH₃ did not improve the stability of the DNA-protein crosslinks, possibly because the hydride could cause a sharp increase in pH, and treatment with alkali is known to cleave damaged bases in DNA.

Computer Simulation of Crista Structure in Mitochondria

Author(s): John L Waynelovich

Mentor(s): Peter Salamon

Institution: San Diego State University, San Diego CA

Recently, electron tomograms have shown that mitochondria contain individual cristae that are made up of a flat,

lamellar, central structure surrounded by multiple tubular components. These tubular components join the lamella to the inner boundary membrane. The fluid-like nature of phospholipid bi-layer lends itself to analysis using a thermodynamical approach. Utilizing the observed morphology as a guide, equations for a geometrically idealized crista were developed. It was then inferred that free energy was minimized in this configuration. This approach allowed the prediction of thermodynamic properties such as surface tension and pressure difference across the membrane. While this model has been very useful, it does not consider the entropic contribution to the free energy of the system. Our current effort is the development of a computer simulation of an individual crista using a Monte Carlo method. We allow the crista to assume configurations based on random fluctuations in the structure. The energy associated with that configuration is calculated and the transition is either accepted or rejected based on the Boltzmann distribution. This achieves two goals. The first is that it allows us to calculate the phase space associated with the entropic contribution using a numerical method rather than an analytical one. The second is that it allows us to view the model as a dynamical system rather than a static one. Stable and unstable manifolds become obvious as the system is allowed to evolve towards a lower energy state. The observation of an unstable manifold has allowed us to predict that the diameter of the tubular structure does not fluctuate freely. The recent observation of OPA1, a helical, dynamin-like protein, along the tubular structures would seem to support this finding.

A Microstructural Analysis of Fully Mineralized Ultra-hard Radular Teeth

Author(s): Brian J Weden, Qianqian Wang

Mentor(s): David Kisailus

Institution: UC, Riverside, Riverside CA

An understanding of how to synthesize new materials exhibiting ultra-hard and high-impact resistant properties may be achieved through in depth microstructural analysis of unique biomaterials. A prime example of one of these unique biomaterials is the radular teeth, belonging to *Cryptochiton sterilli* mollusk. The radular undergo a biomineralization process starting as unmineralized organic membranes and ending as fully mineralized teeth with an outer magnetite (Fe_3O_4) region and an iron phosphate core. Previous analysis of the radular teeth have revealed magnetite nanorods surrounded by an organic matrix identified as alpha chitin. To provide a complete microstructural characterization of the radular teeth, several microscopy techniques will be used such as Fracture Analysis, coupled with SEM, TEM, and FTIR Mapping. After a full analysis and characterization of the radular tooth's unique microstructure, we can determine how its properties are direct result of that microstructure.

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Effects of Whale-Watching on Gray Whale (*Eschrichtius robustus*) Behavior

Author(s): Chandler E Weeks

Mentor(s): Lei Lani Stelle

Institution: University of Redlands, Redlands CA

Every year a large portion of the gray whale (*Eschrichtius robustus*) population migrates from the Bering and Chuckchi Seas to the lagoons of Baja, Mexico. The whales spend summers in the north feeding and winters in the south for mating and giving birth. Humans and gray whales cross paths often during the migration because the gray whales usually swim within a few miles of shore, passing busy ports along the way. Previous studies have shown statistical differences in swimming velocities for both the southbound and northbound migration when comparing behavior with and without whale-watching boats. For seven weeks in British Columbia, Canada, data was collected on gray whale behavior to determine if whalewatching boats were a disturbance. The best way to track gray whale behavior from the surface is by recording ventilations. This is a simple and noninvasive method of tracking behavioral changes. The data was collected two ways: (a) using a surveyor's instrument called a theodolite and (b) recording observations from a boat. The advantage of the theodolite is that positional data, swim speeds and swimming direction of the whales can be recorded. Preliminary analysis suggests behavioral changes included change in swim direction and longer dive periods, especially when approached at fast speeds. Ventilation data will also be analyzed to compare breathing rate of whales with and without whale-watching boats.

Modeling and Testing a Multiple-Agent Robotic Approach to Exploration

Author(s): Nicholas S Westberg

Mentor(s): Paul K Dixon

Institution: CSU, San Bernardino, San Bernardino CA

We describe programming and developing a robotic navigation test bed using a Lego Mindstorms 2.0 robotics kit and a LabVIEW equipped computer. The kit provides the parts to build a mobile robot equipped with simple motors and sensors. The implemented code allows a computer running LabVIEW to send navigational instructions to the robot and track its movements, graphically displaying various movement and sensor data to the user. We developed this project to explore the depth of research opportunity represented in the Mindstorms product, without major technical modifications or additions to the processor, motors or sensors. We describe the milestones for the project and present each section of programming code and the functionality it provides. We discuss the challenges and issues inherent to the system and the work required to solve or mitigate those challenges. We present a plan for a functional navigation test bed capable

of implementing multiple navigational algorithms and designed to allow other programmers to expand the functionality in many directions. The Mindstorms product is suitable for research at the undergraduate level, allowing rapid implementation of ideas while presenting design challenges common to the industry such as communication protocols, the mechanical limitations of sensors, motors and parts, as well as weight, power and battery life concerns.

The Effects of Delta-9-Tetrahydrocannabinol on the Phagocytosis of *Candida albicans* by J774 Murine Macrophage Cells

Author(s): Stephanie M Wetzel

Mentor(s): Nancy E Buckley

Institution: California State Polytechnic University, Pomona, Pomona CA

Marijuana and its psychoactive compound Δ-9-tetrahydrocannabinoid (THC) are used for therapeutic purposes as an analgesic and appetite stimulator in immune compromised individuals. The fungal species, *Candida albicans* (*C. albicans*), is part of the humans natural bioflora. However, *C. albicans* can become a hostile pathogen when the host has a compromised immune system. Macrophage cells are one of the primary response immune cells to fight off the uncontrolled yeast growth. Cytokine production and phagocytosis are the primary functions of macrophages. Previous research by others has demonstrated that THC, at micromolar (non-physiological) concentrations, inhibits phagocytosis of bacteria, parasites, and yeast by macrophages. The present study aims at investigating the effect of physiological concentrations of THC on macrophage cytokine production and phagocytosis. To carry out these investigations, the mouse macrophage cell line J774A.1 will be challenged with heat killed *C. albicans* in the presence or in the absence of THC (10, 50, 500 or 1000 nM). Secretion of tumor necrosis- α (TNF- α), interleukin-1 (IL-1) and IL-6 will be determined by enzyme linked immune absorbent assay (ELISA). The extent of phagocytosis will be assessed microscopically by counting 100 macrophages per viewing field and finding the percent of macrophages that have engulfed at least one yeast particle. Thus far, we have determined the optimum conditions for heat killing and dying of the yeast. We have also established, the optimum J774A.1 cell density to use for our ELISA and phagocytosis assays. Our findings will increase our understanding of the effect of THC on the innate immune resistance to yeast infections.

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Nursing the Sprouts of the Grassroots Movement: How We Might More Effectively Solve the Sex Trafficking Problem.

Author(s): Caitlin W Whelan
Mentor(s): Kurt Meyer
Institution: Irvine Valley College, Irvine CA

The multi-faceted problem of human trafficking, one that enslaves the lives of 27 million people in the modern world, undeniably deserves, and requires a complex solution. This study explores how grassroots and non-profit organizations efficiently tackle the problem of sexual slavery and sex trafficking by restoring victims physically, emotionally, and by giving them greater economic autonomy. This focus on elevating the oppressed group is exemplified by highlighting the efforts of certain grassroots and non-profit organizations such as International Princess Project, Apne Aap, and Somaly Mam Foundation, and by illustrating the perspectives of rescued victims. It also judges that these organizations are woefully underfunded, yet with more rigorous funding, can immensely reduce sexual slavery. Despite limited resources, these organizations provide security and shelter, community, counseling, jobs and purpose, and medical care to victims and restore many of their basic necessities for survival. Furthermore, these grassroots groups focus on rebuilding the victim's personal control over her life through the use of economically sustainable projects and education. These sustaining initiatives rescue the oppressed and change their status from disposable commodities into dignified and self-supporting individuals, who are valuable in the eyes of their peers, relatives, and government. As a result, this research suggests that by restoring the self-worth of the trafficked, as well as increasing their worth to the world economy and governments around the globe, non-profit organizations are increasingly powerful. However, in order to perpetuate their efforts, these organizations should undoubtedly receive greater funds from individuals and governments alike, giving them the power to expand resources and restore the basic, yet comprehensive needs of individuals rescued from sexual slavery. A continuation of legal changes and force, coupled with increased efforts to expand grassroots organizations is the most powerful and sustainable method in combating the epidemic of sex-trafficking and sexual slavery.

Victory in Subjection: The Formation of Subjectivity in Plato's *Symposium*

Author(s): Sidney K Whitten
Mentor(s): Damian A Stocking
Institution: Occidental College, Los Angeles CA

At a critical moment in Plato's *Symposium*, the otherwise sober discussion is disturbed by the drunken intrusion of the statesmen-playboy, Alcibiades. An image of masculine strength and beauty, victory ivy and violets streaming

from his handsome head, Alcibiades' vociferous interruption of the meeting is all the more remarkable for occurring right after the seemingly climactic speech of Socrates, a speech which should have brought the dialogue to its natural conclusion. Many critics, most prominently Martha Nussbaum, have argued that the scene is Plato's attempt to problematize his own doctrine of the Forms, especially as applied to love. I would like to argue, however, following Michele Foucault's *Hermeneutics of the Subject*, that the whole episode is not meant to undermine but to reveal the real work of the Forms in the creation of a new form of subjectivity, one appropriate to a stabilized, post-agonistic, civic society. Formerly, the paradigm of accomplished masculine subjectivity was one that promised mastery over others through the active power of one's body. The object of Alcibiades speech, however, is to show that mastery does not belong to the traditional figure of heroism (such as Alcibiades himself), but rather, paradoxically, to the one who subjects himself to the most passively un-heroic experience possible: love. As the Alcibiades episode shows, by surrendering wholly to love one attains a divine mastery and autonomy beyond anything the archaic hero could ever hope to achieve. This is because a pure subjection to love, according to Plato, aligns one's soul with the Forms, which are the themselves the mastering principles (*archai*) of all existence. As Lacan shows in his *Seminar VIII*, Alcibiades is merely posing as a lover, whereas the true lover and victor of the dialogue, the one who takes the victory wreaths from Alcibiades' head, is Socrates himself.

Viscoelastic Properties of Normal and Cancerous Human Bronchial Cell Plasma Membranes

Author(s): Hailey Wilder, Nima Khatibzadeh, Sharad Gupta
Mentor(s): Bahman Anvari
Institution: UC, Riverside, Riverside CA

Transmembrane phospholipids are an integral part of the cell plasma membrane and contribute to the mechanical properties of the cell. In normal cells, anionic phospholipids are largely absent on the surface of plasma membrane, but may be expressed due to abnormal physiological conditions such as cell apoptosis, injury or malignant transformations. In this study the viscoelastic properties of normal and cancerous human bronchial cell plasma membranes are presented. A laser trap in conjunction with optical detection methods were used to measure mechanical properties of the plasma membranes by pulling a membrane nano-tube (tether) from normal and cancerous human bronchial cells. Using the temporal tether force profiles, the tether formation force, the effective tether viscosity, and the tether equilibrium force are used to analyze the differences in the membrane mechanical properties between normal and cancerous cells. Differences may be attributed to the over-expression of the anionic lipid, phosphatidylserine.

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Crime in Victorian England: Class, Gender and Crime in *Frankenstein* and *Jane Eyre*

Author(s): Aubrey D Williams

Mentor(s): Julie Smith

Institution: Pepperdine University, Malibu CA

My paper examines the relationship between crime, class and gender in the nineteenth century using the novels *Frankenstein* by Mary Shelley and *Jane Eyre* by Charlotte Bronte. During the Victorian period, class often dictated the way a person was perceived. While crimes were indeed committed by those of the lower class, the blame for many crimes tended to fall upon their heads solely as a result of the caste system. Both Victor Frankenstein and Edward Rochester are men of the upper class, and as such are able to get away with crimes that would otherwise leave them in prison or at the gallows. The fact that they are men also puts them at greater advantage. Even when Frankenstein is imprisoned as a suspect in the murder of his friend, he seems to be let off quite easily. When Bertha is found to be locked in the attic by the erstwhile bigamist Mr. Rochester, none bat an eye. On the other hand, characters from the lower classes, such as Grace Poole and Justine Moritz, are blamed for crimes they did not commit. Both are servants--and, moreover, women. Justine is quickly convicted and executed for her suspected crimes, even when Frankenstein proclaims her innocence. Grace is suspected for all the crimes in *Jane Eyre*. Members of the lower class in this era, particularly servants, were often held responsible for crimes that members of the upper class were able to get away with. I examine the discourse of class, gender and crime using contemporaneous accounts of nineteenth-century criminality and modern day historical scholarship on the nineteenth century.

Monitoring the Photochemistry of a Mixed Arene Iron Complex with Absorbance Spectroscopy and Cyclic Voltammetry

Author(s): David J Williams

Mentor(s): Joseph Fritsch, David B Green

Institution: Pepperdine University, Malibu CA

Thermally forbidden but photochemically allowed reactions are an interesting set of reactions in chemistry. One such reaction is the photolysis of cyclopentadienyl toluene iron(II) hexafluorophosphate ($[CpFeTol][PF_6]$) in acetonitrile. The electronic excited state of $[CpFeTol][PF_6]$ readily loses toluene and then the cyclopentadienyl group. The iron center is coordinated by fluxional acetonitrile molecules. Addition of phenanthroline traps iron in the stable tris-phenanthroline iron (II) ($(phen)_3Fe^{2+}$) complex which can be observed with absorbance spectroscopy or cyclic voltammetry. The kinetics of photolysis by an ultraviolet pen lamp and sunlight were followed with these techniques and were well-fit to first-order kinetic analyses.

Induction of Autophagic Immunological Processes by LC3b Detection

Author(s): Bianca S Wilson

Mentor(s): Stephen A Spector

Institution: Mount Saint Mary's College, Los Angeles CA

Autophagy, a specialized lysosomal degradation pathway, is a self-digestion process essential for maintaining cellular homeostasis, cell survival and for degrading intracellular pathogens as well as self protein and organelles. Autophagy is generally induced by conditions of nutrient deprivation and associated with cell differentiation, neurodegenerative diseases, viral infection and cancer. Light chain 3 (LC3) was identified as a subunit of microtubule-associated proteins 1A and 1B, and undergo post-translational modification during autophagy. Although there are three isomers identified, LC3b is known for a maker of induction of autophagy. Following synthesis, LC3b is cleaved at the carboxy terminus and becomes the cytosolic LC3b-I form. During autophagy, LC3b-I (16kDa) is lipidated by ubiquitin-like system and converted into LC3b-II (14kDa) that are bound to the membrane of autophagosomes. The detection of the conversion has been known to be indicative in induction of autophagy. The conversion of LC3b-I to LC3b-II can be determined by a western blot and the results is expected to be shown in two bands that are closely separated based on their different molecular weight. Here, we demonstrate that LC3b conversion indicating the induction of autophagy can be successfully detected by western blot.

Adsorption Equilibrium and Dynamics of CO_2 Adsorption on MgO Aerogels and Alumina

Author(s): Joshua Savas Wilson, Kenneth Kelley

Mentor(s): Mingheng Li

Institution: California State Polytechnic University, Pomona, Pomona CA

The purpose of this project is to advance the fundamental understanding of CO_2 adsorption by MgO aerogels and to utilize this knowledge in order to investigate its application in a novel adsorption enhanced steam reforming (AER) process for efficient hydrogen generation. A thermogravimetric analyzer (TGA) has been employed to determine the capacity as well as the kinetics of CO_2 adsorption on MgO aerogels compared to alumina. Preliminary experimentation showed that MgO aerogels would be a better choice than alumina for low temperature AER. Also, a single tube packed-bed reactor is currently being constructed for further adsorption testing that will simulate more realistic reforming conditions. Future testing will be done to compare MgO aerogels with other adsorbents such as commercial MgO, Cu/ZnO/Al₂O₃, and Pt/ZnO/Al₂O₃. Finally, doped MgO aerogels will be made, tested and compared with the other adsorbents.

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Characterization of the Nodulating Bacterium *Bradyrhizobium canariense* and Its Association with *Lupinus perennis*

Author(s): Chung Ki Wong

Mentor(s): Michelle Lum

Institution: Loyola Marymount University,
Los Angeles CA

The symbiosis that occurs between legumes and bacteria of the Rhizobiaceae is one of the best-studied interactions between plants and microbes. Bacteria fix atmospheric nitrogen for the plant in a structure on the root called a nodule, and in exchange, the plant provides the bacteria with carbohydrates. During the development of the nitrogen-fixing symbiosis, in some legume species, bacteria enter by crack-entry between epidermal cells instead of entering the root hair through infection threads. The bacterial mechanisms of crack-entry are not well understood. *Lupinus* species have been reported to have a crack-entry mode of bacterial entrance. In order to characterize the rhizobial association that occurs with lupine better, we have begun looking at the nodulating symbiosis that occurs with *Lupinus perennis*. We isolated bacteria from *L. perennis* nodules, confirmed that they formed nodules, and identified them as *Bradyrhizobium canariense* by sequencing the 16S rDNA gene. We characterized the antibiotic resistance profile of our isolate and determined it is tetracycline resistant but kanamycin sensitive. We have worked out electroporation and biparental mating strategies for introducing kanamycin resistant plasmids into the bacterium, so that we can insert a green fluorescent protein (GFP) gene to visualize whether the bacteria enter through infection threads or by crack-entry. We have also begun generating transposon-tagged *B. canariense* mutants and will be screening them for defects in the symbiosis in order to better understand the bacterial mechanisms involved in nodulation.

Semantic Third Person and the Pre-Verbal Particle *i*

Author(s): Brent Woo

Mentor(s): Russell Schuh

Institution: UC, Los Angeles, Los Angeles CA

A typically intractable problem for speakers of a language to resolve is enumerating the meanings and formalizing the uses of apparently pleonastic grammatical particles. The tiny particle *i* (ipa: /i/) in Tok Pisin is one of these particles. Appearing in sentences of all tenses, aspects, and in other contexts, it seemed to have a random distribution. After some investigation into the pronominal system of Tok Pisin it became evident that *i* marks what I call the “semantic third person”. The appearance of *i* in various contexts is reminiscent of do-support in English, a process which creates something that has no meaning by itself but is grammatically mandatory. Previous work on Tok Pisin,

which is limited to a small corpus of very generalized or broad surveys of the language, dismiss *i* as a “predicate marker” (Krifka 2005, Wohlgemuth 1999) with no other function than to separate the subject from the predicate in some cases. This analysis seems flimsy and begs the question: in what cases does it appear? Robert Eklund puts forth an interesting proposition in his description of the language: “Tok Pisin makes use of a predicate marker *i*, which precedes the predicate in cases where the subject contains some kind of third-person element.” (Eklund 2010) but neglects to elaborate. Further investigation produced the following conclusions. The particle *i* is used to mark the presence of speaker recognition of the so-called semantic third person—a third person element that may or may not coalesce into a single entity with the first person element. Speakers can choose whether or not to use *i*, and in choosing not to, they reinforce the idea that the subject of the given sentence is a conceptually single entity.

What's in the Tank? A Study of Tank Bromeliad Microbe Interactions

Author(s): Walter T Woodside

Mentor(s): Shana K Goffredi

Institution: Occidental College, Los Angeles CA

Tank forming bromeliads collect water and fallen debris at the base of their tight leaf rosettes. Within these tanks a plethora of aerobic and anaerobic bacterial species flourish in a stratified micro-habitat. It is assumed that the bacteria experience a stable and unique habitat within the rainforest (ex. low oxygen and acidic), while the plant host receives nutrients, including nitrogen, from the microbial residents. To investigate bacterial colonization and influence on *Werauhia gladioliflora*, a tank-forming bromeliad species from a lowland tropical rainforest in northern Costa Rica, several plants were sterilized using ozone, antibiotics and bleach, and the bacterial recolonization of their tanks monitored using cultivation and molecular techniques. We hypothesized that bacterial diversity and abundance would decrease following sterilization and that early bacterial recolonizers might be those capable of forming spores. As expected members of the spore-forming *Bacillus* genus were seen to be the first recolonizers, with increasing diversity over time. To investigate the influence of bacteria on tank pH conditions, sterilized bromeliads were subjected to artificial manipulations in pH (increases or decreases using dilute NaOH or HCl, respectively) and monitored for subsequent restoration of the natural pH. Previous investigations have shown that the abundance of four bacterial subgroups, including Acidobacteria, Alphaproteobacteria, Betaproteobacteria, and Firmicutes correlate to the natural acid-base conditions within the tank. To investigate this in an experimental fashion, the tank pH of unsterilized bromeliads was artificially manipulated and responses by the bacterial community were observed. Long-term (62 day) pH manipulation of the tank water of *Aechmea maria-reginae* in situ, from the natural

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pH of 6.5 to the final target pH of 4.5, resulted in increased abundance of Acidobacteria and Alphaproteobacteria and decreases of Betaproteobacteria and Firmicutes, supporting the finding that pH is a strong predictor of bacterial community composition within tropical bromeliad tanks.

Efficient Screening of Cellulases for Thermo-stable Sequence Blocks by Structure Guided Recombination

Author(s): Catherine Bingchan Xie

Mentor(s): Frances Arnold

Institution: California Institute of Technology,
Pasadena CA

The goal of this project is to use recombination as a tool to produce more stable and highly expressed cellulases. The current biorefining process is too inefficient, expensive and time consuming due to the limitations in the breakdown of cellulose into fermentable sugars by cellulases. Since enzyme reaction rates increase with temperature following Arrhenius behavior, one way to improve cellulose conversion is to develop cellulases that will be stable and active at higher temperatures. Previously, by structure-guided recombination, a family of 32 monomers was constructed and characterized by swapping 8 sequences blocks, one by one, from 5 homologous fungal cellobiohydrolase class I (CBH I) enzymes to efficiently identify stabilizing amino acid sequence blocks. However, substitutions at block 7, the largest block, resulted in total loss of expression, and so there is currently little information on nearly one third of protein. For this work, we hypothesized that even though block 7 has a highly destabilizing effect, some parts of the block may have neutral or positive contributions to expression and stability. Thus, block 7 was broken down into 6 subblocks equally distributing the residues that differ between them using new block breakpoints. The subblocks from 4 parents were moved, one at a time, into the most highly-expressed and stable parent and their effects on stability were measured by their relative residual activity on cellulosic substrates after incubation at an elevated temperature. The results show that even though the entire block abolishes expression, some subblocks are neutral or beneficial to expression and/or stability. By looking at the effects of the same subblocks from different parents, we were able to identify locations important for expression. Due to the additive nature of the blocks, beneficial subblocks can be moved into other CBH Is to increase their stability and expression.

Nationalism and the Internal Enemy in Raffi's *The Fool*

Author(s): Anahid Yahjian

Mentor(s): Warren Montag

Institution: Occidental College, Los Angeles CA

In 1881, Persian-Armenian author Raffi published *The Fool*, a historical novelization of a journalistic venture to chronicle the last Russo-Turkish war. Originally written in the eastern dialect of Armenian, *The Fool* uses this historical moment--in which the Christian Armenian minority of the Ottoman empire was forced to choose between a loyalty to the Ottomans or Russians for the sake of survival--to construct an argument for the necessity of an independent Armenian nation. Raffi introduces the modern nationalist concept into the Armenian consciousness by juxtaposing the subservient mentalities of the traditional Ottoman Armenians to that of "The Fool," an educated young man from Constantinople who predicts the extermination of the Armenian people by its six-century-old Ottoman government. Raffi's work went on to inspire the Armenian revolutionary movement, which contributed greatly to the establishment of the first Armenian republic in 1918. Since its publication, however, *The Fool* has been regarded mainly as a revolutionary text and therefore scarcely approached critically. My research this summer has focused on a close reading of German theorist Carl Schmitt's "The Concept of the Political" and its postulations about friend, enemy and--most dangerous of all--the internal enemy, all of which both complicate and are complicated by *The Fool*.

Sub-Pixel Resolving Optofluidic Microscope for On-chip Cell Imaging

Author(s): Samuel Yang

Mentor(s): Changhuei Yang

Institution: California Institute of Technology,
Pasadena CA

Miniaturizing conventional modes of microscopy to produce compact, low-cost microscopy systems for biological research, point-of-care analysis, and field diagnostics is a difficult task, since precision lenses and optical components are difficult to scale inexpensively. One method to circumvent these costs is to explore lensless microscopy techniques. However, whereas traditional microscopes are limited by the quality of the optics and lenses, up until the diffraction limit (~ 0.2 micron), lensless microscopy techniques are often limited by the CMOS sensor's pixel size (~ 3-5 microns). To surpass the resolution limitation of the sensor's pixel size, we applied a pixel super-resolution algorithm with an optofluidic sample delivery and scanning mechanism to develop a lensless, on-chip, sub-pixel resolving optofluidic microscope (SROFM). Unlike conventional microscopes, the SROFM delivers specimens directly across a CMOS sensor using a microfluidic flow to

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allow a sequence of low-resolution projection images to be captured and reconstructed into a single high resolution image using a pixel super-resolution algorithm, allowing features beyond the Nyquist rate of the low resolution images to be resolved. This pixel super-resolution approach takes advantage of over-sampling in the time domain (capturing a sequence of images rather than a single image) to compensate for under-sampling in the spatial domain. The optofluidic microscope, measuring only 1.5cm by 1.5cm in size, achieves a resolution of 0.75 microns without the use of any lenses or other optical elements and can be easily fabricated, consisting of only a polydimethylsiloxane (PDMS) microfluidic channel mounted to a CMOS sensor. Microspheres, protist *Euglena gracilis*, and *Entamoeba invadens* cysts have been imaged successfully with sub-cellular resolution using our SROFM device. The novel and powerful combination of both the pixel super-resolution and optofluidic microscopy techniques within our SROFM make it a simple, cost-effective, high throughput and highly compact imaging solution for biomedical and bioscience needs.

Effect of Anti-IL-6 RNAi on Dendritic Cell Mediated T Cell Development

Author(s): Hiroshi Yano

Mentor(s): William Langridge

Institution: University of Redlands, Redlands CA

Recent studies suggest a new subset of T helper cells (Th17) that produce the pro-inflammatory cytokine IL-17 may play a dominant role in Type 1 Diabetes (T1D) progression. Both T1D patients and non-obese diabetic (NOD) mice generate expanded populations of inflammatory Th17 cells. It was shown that Th17 cells and regulatory T cells (Treg) have parallel differentiation mechanisms initiated by the same inflammatory cytokine stimulus, transforming growth factor beta (TGF- β). This inflammatory cytokine is capable of inducing transcriptional activator molecules ROR γ t and FOXP3 to initiate Th17 and Treg differentiation respectively. The crossroads between Th17 and Treg differentiation is the cytokine IL-6 secreted by dendritic cells (DCs). When IL-6 is present, it induces STAT3, which inhibits FOXP3 expression, and in turn, ROR- γ t expression increases significantly. Once ROR- γ t is highly expressed, formation of IL-23 receptor is induced via IL-21/STAT3 signaling pathway, and DC-synthesized IL-23 further stabilizes Th17 differentiation. Thus, blockage of IL-6 may shift T cell development from Th17 to Treg like a see-saw. Though it has been demonstrated in the murine system *in vivo*, it has not yet been fully analyzed in human cells. To confirm the effect of the IL-6 blockage in human Th17/Treg development, human dendritic cells derived from umbilical cord blood monocytes are transfected via liposomal transfection with an siRNA cocktail designed to inhibit IL-6 mRNA. The reduction of IL-6 expression will be measured by RT-PCR and ELISA following LPS-activation of DCs. Further,

transfected DCs are co-incubated with naïve Th0 cells also isolated from umbilical cord blood. If our hypothesis is correct, Th17 cell proliferation should decrease and the population of Tregs should increase. Although all experiments have not been completed, the generation of DCs from umbilical cord blood monocytes has been successfully demonstrated, and confirmed by microscopic analysis of DC cell morphology.

Low Energy Electron Impact Ionization of the Noble Gases (Ne, Ar, Kr, Xe)

Author(s): Brent R Yates

Mentor(s): Murtadha A Khakoo

Institution: CSU, Fullerton, Fullerton CA

Doubly-differential cross-sections of electron impact ionization of the noble gases Ne, Ar, Kr, Xe are presented from 1eV above the ionization threshold to the threshold for double ionization, i.e. restricting the measurements to the e-e range. The aim of these investigations is to probe the influence of polarization and spin-orbit (relativistic) effects due to interaction between the ionized (continuum) electrons with the ${}^2P_{3/2,1/2}$ ionized noble gas core in the post-collision process. These results are useful to the electron collision (theory) community as well as to the plasma modeling/ processing industry (Fusion, microchip, materials processing, medical plasmas).

Regulation of SREBP-1 Transcription by iPLA₂ β

Author(s): Iliana Ycute

Mentor(s): Suzanne Barbour

Institution: CSU, Dominguez Hills, Carson CA

Lipid disorders are associated with a variety of diseases, such as obesity, diabetes, atherosclerosis, and the metabolic syndrome. Systemic lipid metabolism is under the control of Sterol Regulatory Element Binding Proteins (SREBP), a family of transcription factors that regulate expression of lipogenic genes in the liver. Other investigators have demonstrated that expression and function of SREBP-1 is suppressed by polyunsaturated fatty acids (PUFA), bioactive lipids that are released by group VIA phospholipase A₂ β (iPLA₂ β). This research was performed to determine if iPLA₂ β provides an endogenous source of PUFA that can control SREBP1 and the lipid metabolism. CHO-7 cells were transfected with transcriptional reporter plasmids containing the SREBP-1a and SREBP-1c promoters. Cells were treated with bromoenol lactone (BEL) to suppress iPLA₂ β activity or transfected to over-express iPLA₂ β . Preliminary experiments indicated reduced transcription from the SREBP-1c promoter in cells that over express iPLA₂ β and increased transcription in BEL-treated cells. These studies support our hypothesis that iPLA₂ β produces PUFA that regulates transcription (expression) of SREBP-1c. However, we don't know the

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mechanism yet, which work on this continues to be done. This is important because perhaps in the future iPLA₂β can be manipulated to treat Lipid Disorders.

The Effects of Stress on Humor and Hope

Author(s): Mekdes E Yilma

Mentor(s): Virgil H Adams III

Institution: CSU, Channel Islands, Camarillo CA

Human beings have developed many different ways to cope with the inevitable stressors of everyday life (Hänggi, 2008). Some confide in close family or friends for emotional support (Aldwin et al. 1980), while others turn to faith in a higher power to get them through (Aldwin et al. 1980). Humor, another commonly used strategy for coping with stress, is thought to "serves as a means of cognitively reframing situations" (Martin, 1996) resulting in alleviation of tension and anxiety (Kuiper and Martin, 1998; Lefcourt et al. 1995; Moran, 1996; Moran and Massan, 1999; Yovetich et al. 1990). The present study sought to examine effects of stress on an individual's tendency to use humor as a coping mechanism and their perceived hopefulness. A survey was administered to a sample of 464 community dwelling adults. It was hypothesized that those individuals that tended to use humor as a coping mechanism would have lower stress levels and higher perceived hopefulness. Hierarchical regression disconfirmed the hypothesis in that as stress levels increased, so did the tendency to use humor to cope. At the same time, the results showed a decrease in perceived hopefulness. The discussion focuses on possible ramifications of a decrease in hopefulness as a result of using humor for coping.

Speeding up the Gaussian Mask Algorithm

Author(s): Nahom Yirga

Mentor(s): Alex Small

Institution: California State Polytechnic University, Pomona, Pomona CA

We investigated possible ways to speed up the Gaussian Mask Algorithm. The Gaussian Mask Algorithm is commonly used to locate the actual position of a fluorophore after it has been imaged by a CCD array. It is fast, but it still involves the evaluation of a transcendental position at each pixel each iteration. To further simplify this algorithm we expanded the PSF in a Taylor series about the center of the pixel array. This increases the speed of the algorithm significantly, as a simple polynomial is evaluated at each pixel. Though the accuracy of the approximation starts to fail as we move further and further from the center of the pixel, the decrease in accuracy can be made insignificant by increasing the order of the Taylor series (provided that the initial guess is accurate within a distance of about 1 pixel). When we compared different order expansions to the original algorithm, the standard devia-

tion and molecular position were nearly identical for the two methods until the distance from the center of the pixel array is significantly larger than 1 pixel. To show that the information used by the Taylor expansion is identical to the information used by the original algorithm, we used a set of orthonormal basis images to decompose each image. A new (truncated) image was constructed from the decomposition (leaving out noise-prone high spatial frequencies) and analyzed by the original algorithm. Thus, the three methods were compared; the first consisted of values from the original Gaussian Mask and the image, the second involved the Gaussian Mask and the reduced image constructed from an nth order basis set and the third consisted of the Taylor approximated Gaussian Mask and the image, we found that the three were consistent for displacements up to 1 pixel.

Acting for Reagan: Performance Choice Reflects Politics in 80s Television

Author(s): Olivia D York

Mentor(s): Katie Mills

Institution: Occidental College, Los Angeles CA

By using the popular soap, *Dallas* (1978-1991), specifically the season which aired during the 80s era, I will discuss social conditioning and its effects on actor performance. Using the political reign of the Reagan administration, I argue that although the traditionally melodramatic operatic acting may be a style developed by acting technique, it may also be an actor's direct choice in order to reflect the society's current political mindset. His/her choices are made from more than the narrative, but also from the surrounding politically and aesthetically influenced elements of the mise-en-scene that are guiding their behavioral choices on screen. Television acting has progressed through the years, which is why we have many different styles including operatic, sitcom, and high realism. The common thread between these progressing styles is that they become more about revealing *information* rather than revealing *emotion*. I'll argue how this is a sign of changing American behavioral choices in relation to America's current mindset. Using *Dallas* as my primary case study will enable me to give an overview of the effects of Reaganomics on television portrayal of the wealthy family. The "...domestic melodrama...represent the decade's central ideology in the way it condenses the corporation and the family—the mainstay institutions of Reaganism..." is a quote that Jane Feuer uses to describe the relation of Reaganism and excess to the serial melodrama in her book, *Seeing Through the Eighties*. I am applying Feuer's theories to my research on performance choices during the 80s. I conclude by discussing how even though acting, especially the critiqued style of melodramas, is rarely discussed out of an acting technique context, the choices actors make reflect past and current emotional states of America during critical changes in economic and patriotic moral.

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Flash-Quench-Induced Monitoring Oxidative Damage to Guanine via HPLC: Dependence on Quencher

Author(s): Ludmila Youchkovets

Mentor(s): Eric Stemp

Institution: Mount St. Mary's College, Los Angeles, Los Angeles CA

7,8-dihydro-8-oxoguanine (8-oxo-G) is important because it contributes to aging, cancer, and various types of diseases. Here oxidative damage to guanine was monitored by HPLC. The oligonucleotide strand, 5'-ATATGATATG-GATATGATAT-3' and its complement were made and purified. The duplex DNA was subjected to flash-quench treatment using Ru(phen)₂dppz²⁺ as the photosensitive intercalator and using Ru(NH₃)₆³⁺ or Co(NH₃)₅Cl²⁺ as the quencher. The DNA was digested with nuclease P₁ and alkaline phosphatase to the nucleotide level and the mixture was then analyzed by reversed-phase HPLC. The nucleotides were observed by UV absorbance. With Ru(NH₃)₆³⁺ as the quencher, 8-oxo-G eluted as a small peak at 9.2 minutes. With Co(NH₃)₅Cl²⁺ as the quencher, no peak for 8-oxo-G was observed. This result may be attributed to the different lifetimes of the guanine radical with the different quenchers. With Ru(NH₃)₆³⁺ as the quencher, the reduction of guanine radical by reduced quencher is rapid, occurring within 100 microseconds. This shorter lifetime for guanine radical may increase the probability of reaction of the guanine radical out of its cationic form, which is thought to be precursor for 8-oxo-G.

Differences in Leaf Mechanical Properties among Species of Chaparral Shrubs Suggest Leaf-Level Niche Segregation

Author(s): James Benjamin Young

Mentor(s): Stephen D Davis

Institution: Pepperdine University, Malibu CA

Niche theory has a widespread acceptance among zoologists; however, among botanists, it is controversial because of the simplistic resources utilized by plants. Niche segregation implies resource partitioning. Leaves regulate three major plant resources: light capture, carbon uptake, and water usage. At the leaf level, evidence of resource partitioning may exist among species with differential leaf morphology. One such example prevails in the co-occurring sumac (family Anacardaceae): lemonade berry (*Rhus integrifolia*) has thick, leathery leaves with little folding; laurel sumac (*Malosma laurina*), has thin leaves with dramatic folding; and sugar bush (*Rhus ovata*), has intermediate leaf thickness and folding. We hypothesized that differences in leaf mechanical strength correspond to differences in resource partitioning and morphology. To test this hypothesis, we measured leaf mechanical properties at a common site, where all three species co-occur, using a mechanical testing machine (Instron). The properties

measured were: 1) tensile strain at leaf break, 2) tensile stress at leaf break, and 3) Young's Modulus, which measures leaf stiffness. Laurel sumac was found to exhibit significantly greater tensile strain at leaf break than sugar bush, which was significantly greater than lemonade berry ($P < 0.5$, $n = 10$, one-way ANOVA). Laurel sumac also experienced significantly greater tensile stress at leaf break than sugar bush or lemonade berry. Furthermore, lemonade berry had significantly higher Young's Modulus than both sugar bush and laurel sumac. These observed differences in leaf mechanical traits among species suggest differences in resource utilization capacities by leaves under mechanical stress such as high winds, herbivory, salinity, or drought. This may represent a leaf-level niche segregation (a niche axis), which facilitates the coexistence of these three, closely related species, at coastal sites. However, the leaves of laurel sumac and sugar bush may be better adapted to the inland sites where lemonade berry is not found.

Slope Stability

Author(s): Richard Yu

Mentor(s): Binod Tiwari

Institution: CSU, Fullerton, Fullerton CA

We often overlook the importance of slope stability while planning and designing infrastructures. Slope failures and landslides occur frequently, resulting in a loss of millions of dollars and countless lives. Surface water runoff and groundwater infiltration after precipitation are considered as the main causes of slope failures. Slope stability analysis is performed to obtain a good understanding on the behavior of landslides. Shear strength of soil mass, geometry of slope such as topographic details as well as sliding surface depth at different locations, and position of underground water level are three important parameters that are involved in the slope stability analysis. During slope stability analysis, we calculate the ratio between the driving force causing landslide and the soil resistance against the landslide. Landslide is a three-dimensional (3D) phenomenon. Although two-dimensional (2D) slope stability analysis method is popularly used due to its simplicity and the lack of tools for 3D analysis, it does not provide accurate results. In this study, 3D slope stability analysis was performed using Spatial Analyst and 3D Analyst extensions of ArcGIS. The study was conducted on eight preexisting landslides located in Japan. The Japanese landslides were considered for this study due to the availability of required information for the 3D slope stability analysis. Required laboratory tests were performed to evaluate the shear strength and density of the soil mass, which were used in the slope stability analysis. Topographical information and depth of sliding surface were obtained with surface and sub-surface surveying methods, respectively. Using the two extensions of ArcGIS mentioned above, 3D models of all landslide blocks were prepared. The same 3D model could also be used to evaluate the 2D slope stabil-

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ity of the sliding blocks and can be used to compare with 2D slope stability analysis results obtained with available software programs.

Microspatial Genetic Differentiation in the Sow Bug Killer Spider *Dysdera crocata* (Araneae: Dysderidae)

Author(s): Alyssar Zein, Jacqueline Salas, Mindi Catala

Mentor(s): Martin G Ramirez

Institution: Loyola Marymount University,
Los Angeles CA

Dysdera crocata is a nocturnal, ground dwelling hunting spider whose principal prey is isopods. Unlike most spiders, ballooning behavior (aerial dispersal on wind blown silk threads) has never been reported in the genus *Dysdera*, limiting its dispersal abilities to overground dispersal. The goal of this study was to analyze the distribution of genetic variation among populations of *D. crocata* at an urban park to determine the extent of genetic differences on a local scale. In 2008-2009, we collected adult and juvenile *D. crocata* from 12 sites at the park ($n = 214$). Each sample consisted of all spiders adjacent to the base of a single tree or group of trees. We determined the genotypes for each spider at 8 polymorphic allozyme loci. Individual samples were genetically variable (mean $H_o = 0.168$) and in conformance with Hardy-Weinberg equilibrium, except for a reduction or absence of heterozygotes at the PGM locus for six samples. Inter-site genetic differentiation was largely non-existent, as reflected in minimal genetic distance values (mean = 0.0025), even for sites separated by potential barriers (e.g., drainage ditch, road, open lawn). The genetic homogeneity among our samples probably reflects the effectiveness of nocturnal wandering among trees, perhaps facilitated by the park's closure at sunset. The heterozygote deficiency at PGM was unexpected and we are currently investigating factors which might foster the underrepresentation or absence of heterozygous individuals at our sample sites.

Visualization of Several Aggregation States of the Amyloidogenic Protein A β 42 Using Atomic Force Microscopy

Author(s): Casey Zelus

Mentor(s): David Moffet

Institution: Loyola Marymount University,
Los Angeles CA

The aggregation of the amyloidogenic protein A β 42 is linked to the onset of Alzheimer's Disease. It has become evident that A β 42 is capable of aggregating into a variety of different oligomeric states. We used Atomic Force Microscopy to visualize the formation of several of these oligomeric states under a wide range aggregation conditions, such as temperature, concentration of A β 42, and

sample agitation. We find that some conditions, such as high temperature with no agitation, promotes formation of long fibers, which ultimately form amyloid. We describe conditions where A β 42 aggregates into small oligomers or amorphous aggregates. These conditions may help to identify the specific oligomeric state of A β 42 responsible for the progression of Alzheimer's Disease.

Delta-Catenin Modulation of Gamma-Secretase Function in Alzheimer's Disease

Author(s): Lillian F Zhang, Mochtar Pribadi

Mentor(s): Hong Wu

Institution: UC, Los Angeles, Los Angeles CA

Alzheimer's disease is a progressive neurodegenerative disorder characterized by extracellular amyloid beta plaques and intraneuronal neurofibrillary tangles, which results in severe atrophy of the cerebral cortex and cognitive dysfunction. Genetic mutations in the presenilin-1 protein (PS1) result in familial Alzheimer's disease (FAD). PS1 is the active site for the gamma-secretase complex (γ -secretase), which cleaves the amyloid precursor protein (APP), and gives rise to amyloid beta peptides. FAD mutations in PS1 increase the ratio of the abnormal amyloid beta-42 peptide (A β 42) to the normally produced A β 40 peptide by affecting γ -secretase function. A β 42 is more prone to aggregation than A β 40 and is the main component of amyloid plaques. Delta-catenin (δ -cat), a neural specific protein important for cognitive development of the brain, has been known to interact with PS1. The present study seeks to address whether or not this interaction influences the production of amyloid beta peptides. Our studies suggest that *in vivo* plaque deposition is considerably amplified in δ -cat loss-of-function transgenic mice, which exhibit significant cognitive deficits. Furthermore, *in vitro* studies reveal that δ -cat appears to effectively modulate γ -secretase activity. These results indicate that δ -cat interaction with PS1 may positively alter cleavage of APP by γ -secretase, thereby decreasing the ratio of A β 42 to A β 40. Given the importance of this ratio in plaque formation, these results highlight a potential role for δ -cat in Alzheimer's disease pathogenesis.

The Effect of Dbf4 and Cdc7 on Yeast Cell and Its Cycle

Author(s): Michael Zhou, Anh Tran

Mentor(s): Wendy Dixon

Institution: California State Polytechnic University,
Pomona, Pomona CA

CDC7 protein is a kinase protein that gets activated by forming a complex with an activating subunit, Dbf4, in *Saccharomyces cerevisiae*. The two protein kinases, Cdc7-Dbf4 kinase and cyclin-dependent kinase, triggers a chain reaction that causes the phosphorylation of the MCM

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complex (replicative helicase) as well as in the initiation of DNA synthesis. During the cell cycle, the two parts of the kinase complex, Cdc7 and Dbf4, helps the protein to function properly. Both Cdc7 and Dbf4 have been tagged with different fluorescent proteins to track their locations in yeast during the cell cycle. We have focused on examining the Cdc7 in yeast. We used a wild-type yeast, strain BJ5459, that has a green fluorescent tagged (GFP)-CDC7 gene expressed under control of the native Cdc7 promoter and a MYC-tagged DBF4 gene under control of the Gal 1, 10 promoter. We grew the yeast in glucose to express only the GFP-CDC7 gene, and another student in the lab grew the yeast in galactose to express both the GFP-CDC7 and the MYC-DBF4. Our results showed that the tagged (GFP)-CDC7 gene was expressed and visible after staining with DAPI; which allows us to view the stain under ultraviolet condition. Since these experiments are being done in a wild-type yeast background, a small amount of endogenous Dbf4 may be affecting the results. Because of this fact, we are now beginning to examine the expression of the GFP-CDC7 and MYC-DBF4 in a dbf4-3 mutant yeast background. The dbf4-3 is a temperature sensitive mutant of the DBF4 gene. By performing the experiments in the dbf4-3 mutant, we will ensure that no native or endogenous DBF4 is expressed when the yeast are grown on glucose under the temperature arrest conditions. We will examine the yeast in the same fashion, but now within the dbf4-3 background.

The Involuntariness of Belief, Sola Fide, and the New Perspective on Paul

Author(s): Peter D Zuk

Mentor(s): Kindy DeLong

Institution: Pepperdine University, Malibu CA

Since the very inception of Protestantism, the doctrine of *sola fide* has been widely regarded as a defining characteristic. It asserts that Christian faith is the only way one can attain salvation, with "Christian faith" defined at the least as a belief in the resurrection, divinity, and redeeming power of Jesus Christ. I will argue, however, that the notion of *sole fide* is shown to be rationally untenable by two key philosophical principles. The first is the idea that "ought implies can" with regard to moral obligations, and the second is the psychological impossibility of choosing what one believes. Together these principles entail that a strong deontological ethics of belief – a view which posits moral obligations pertaining to belief holding – is untenable. It follows from this that *sola fide*, which is such an ethic of belief, must be false as well. I will then argue that while the convicted Protestant (as well as Christians of other stripes) might understandably view this as reason for great dismay, there is no cause for alarm because *sola fide* is not nearly so biblically supported as many have supposed. The so-called New Perspective on Paul opens the door for an understanding that both avoids the problems of *sola fide* and turns out to be better grounded in the biblical text

itself. This is achieved primarily through (A) a reexamination of Paul's use of phrases that have in English been translated "faith" and "works of the law" respectively and (B) the resulting change in perception of the relationship between his thinking and that of the Palestinian Judaism of his time. A rejection of *sola fide* for the reasons stated provides the opportunity to craft an alternative soteriology with its basis in the New Perspective idea of salvation through covenantal membership.

Photosynthetic and Water Status Response of a Chaparral Species, *Heteromeles arbutifolia*, to Post-fire Light Limitation and Artificial Browsing

Author(s): Mary C Zuniga, Iolana N Kaneakua, Lane H Clemons

Mentor(s): Stephen D Davis

Institution: Northern Arizona University, Flagstaff AZ

Chaparral species that resprout after fire in the Santa Monica Mountains face barriers to reestablishment. One of the barriers may be competition for light due to rapid growth of post-fire annuals or the presence of invasive plant species. Also, excessive browsing by deer may deter post-fire reestablishment. If light limitation persists, post-fire resprouts may deplete carbohydrate stores, attempt photosynthetic compensation, and shift leaf optical properties. Furthermore, plant water status may be impacted. We tested these hypotheses by comparing the photosynthetic activity during summer time as well as the seasonal change in water potential of post-fire resprouts of *Heteromeles arbutifolia* (toyon) under four treatments: shade, irrigated, browsed, and control. Shaded plants were grown under low PPFD of ~200 $\mu\text{mol m}^{-2} \text{s}^{-1}$. The irrigated treatment eliminated water stress as a confounding factor, and the browsed plants were artificially browsed in May 2009. Water potentials of the four treatments were compared to adult plants and resprouts free of any treatment, which served as controls. Photosynthetic activity of the plants was measured with light and CO_2 response curves, and the water potential was measured at predawn and midday. The parameters measured were maximum net photosynthetic rate (A_{\max}), light compensation point (A_{comp}), CO_2 inside the leaf at 2000 ppm external ($C_{i,2000}$), quantum yield (QY), chlorophyll fluorescence (F_v/F_m'), predawn water potential (Ψ_{pd}), midday water potential (Ψ_{md}), and leaf absorptance (a). Significant differences were found among all three treatments, in all parameters measured, with the exception of F_v/F_m' ($P > 0.05$, $n = 6$, by one way ANOVA). These changes in photosynthetic performance were consistent with acclimation to shade and acclimation to water stress. If shading or deer browse are severe, our results suggest that thresholds for survival may be exceeded, leading to resprout failure and eventual vegetation-type conversion.