



CREATIVE COLLABORATIONS UNDERGRADUATE RESEARCH

CONFERENCE



25TH
ANNIVERSARY

April 16, 2015 • 12 – 2:15 p.m.
University of San Diego • Hahn University Center
www.sandiego.edu/cc-urc

Student-faculty
Research
Scholarship
Creative Works



The Office of Undergraduate Research was established in September 2011 to promote research, scholarship and creative activities across campus. The office aims to ensure that USD undergraduates have the opportunity to engage in these activities both inside and out of the classroom. The Office of Undergraduate Research provides services to both students and faculty, and encourages collaborations across departments and disciplines.

The University of San Diego is an enhanced institutional member of the Council on Undergraduate Research.

WELCOME

to the 2015 Undergraduate Research Conference!

This year marks the 25th anniversary of an undergraduate research conference at the University of San Diego! While the name of the conference has changed over the years, its purpose remains the same and its scope continues to grow. What began in 1990, led by Dr. Marie Simovich, Department of Biology, with about 20 science students presenting their research, has grown to 211 multidisciplinary presentations in locations across campus. Creative Collaborations marks a long and proud history of encouraging student participation in research alongside faculty members who are distinguished teacher-scholars. Today we recognize not only undergraduate researchers, but the faculty who mentor them in research activities and those whose generosity help support their work.

As you will see today in the 187 posters, 10 interactive exhibits and 14 creative works being presented, undergraduates have opportunities to engage in research across the disciplines. This includes extracurricular and co-curricular research done in research-based courses and capstone experiences. These activities are in keeping with USD's mission to promote undergraduate research and creative inquiry as a distinguishing hallmark of a USD education.

Many of the students who participate in Creative Collaborations also publish their work in academic journals and present their projects at regional, national, and international conferences. The high quality work you see reflects the outstanding mentoring abilities of USD faculty, as well as the intellectual curiosity of our undergraduate students.

This year, Creative Collaborations is featured as part of the inaugural USD Research Week, which showcases research activities in the College and the schools across campus. Research Week, April 13-17, focuses on the importance of research at USD and honors students and faculty who have challenged themselves to extend learning beyond the classroom.

We invite you to browse the Office of Undergraduate Research website (www.sandiego.edu/ugresearch) for information about undergraduate research opportunities for students and faculty. Thank you for attending and supporting undergraduate research!

Sincerely,



Dr. Andrew T. Allen
Vice President and Provost



Dr. Sonia Zárate
Director, Office of Undergraduate Research



Schedule

Opening

12 p.m. Sonia Zarate, PhD
Director, Office of Undergraduate Research
Hahn University Center, Forums

Student Presentations

12:10 – 1:10 p.m. **First Session**
Poster Presentations, odd-numbered: Hahn University Center, Forums
Interactive Exhibits, odd-numbered: Hahn University Center, Forums
Visual Arts Exhibits: Student Life Pavilion, Exhibit Hall
Civil Rights Exhibits: Hahn University Center, West Alcove

1:15 – 2:10 p.m. **Second Session**
Poster Presentations, even-numbered: Hahn University Center, Forums
Interactive Exhibits, even-numbered: Hahn University Center, Forums
Visual Arts Exhibits: Student Life Pavilion, Exhibit Hall
Civil Rights Exhibits: Hahn University Center, West Alcove

1st Annual Research Week

April 13-17, 2015

Event Calendar: www.sandiego.edu/osp/research-week/index.php

50th Anniversary of the Civil Rights Act Events

Spring 2015 Semester

Event Calendar: <https://lib.sandiego.edu/uploads/904cd12a66481fe6110b6de0f9dca668.pdf>

UC West Alcove
April 13-17, 2015

The Legacy of Anita Hill: How the 1991 Anita Hill-Clarence Thomas Hearings Shaped Sexual Harassment Law and Awareness in America

Danielle Balderas and Colin Fisher

Less than twenty-five years ago, in 1991, a woman named Anita Hill stood before the nation testifying to Congress about Supreme Court nominee Clarence Thomas. For three days in October, Americans were transfixed before the television watching the law professor from Oklahoma speak to Supreme Court nominee Clarence Thomas' behavior as her boss at the Equal Employment Opportunity Commission (EEOC) and the Department of Education during the 1980s. Crude words like "long dong silver" and "pubic hair" shocked Americans when they were uttered in the Capitol. As Hill sat before an all-white male Judiciary Committee, she testified about Clarence Thomas' inappropriate sexual behavior discussing his sexual prowess, speaking to her about pornographic films with animals and rape scenes, and repeatedly pressing her for social engagements outside of work. Because sexual harassment law was relatively new, many Americans, and many members of the Senate Judiciary Committee, did not fully comprehend the nature of sexual harassment. Hill was peppered with accusations from the Committee as to her intentions and own moral character, flipping her status from the claimant to the defendant. But as Americans watched the hearings on television, a cultural transformation began. The catalyst was set in motion for increased sexual harassment awareness, and the 1990s would be filled with sexual harassment cases further lodging the issue in the mainstream consciousness of Americans. This thesis will examine the role of the 1991 Anita Hill-Clarence Thomas hearings in the shaping of workplace sexual harassment law and awareness.

UC West Alcove
April 13-17, 2015

Caminamos La Linea: Truths in the Borderlands

Jillian Grant and Andrew Cross

Caminamos La Linea // We Walk the Line explores the multiple truths witnessed by people who occupy the U.S.-Mexico borderlands through photographs, film, and collages. All three mediums comprising the project show my path of understanding what role the physical and psychological borderlands play for those who live in San Diego, CA / Tijuana BC and Nogales, AZ / Nogales SON. As the architect of this compilation of stories, I am imaginatively building a structure that both represents my grasp of what these multiple realities mean to those participating in the project and myself. Two years of gathering information and experiencing life in the borderlands create a narrative exposing both my fluctuating identity as an insider and outsider and the experiences of the participants who live amidst multiple borders. This coalescence of knowledge about the complexities of internal and external borderlands within and surrounding each of us represents my truth. Both the film and collages layer and fuse the stories of the participants in the project and my own personal narrative to create a palimpsest of the histories, experiences, and knowledge of over twenty people who occupy the U.S. - Mexico borderlands. The mural photographs will provide a formal representation of a participant's story. Together, the three components of this project work together to deconstruct the perceived dichotomy of the U.S.-Mexico border. The work was exhibited in the Visual Arts Center and in a corridor by the UCs in March 2015.

UC West Alcove
April 13-17, 2015

Gender Performance in the NCAA Rifle Championships: Where is the Gap?

Jason Kowalczyk and Nadav Goldschmied

The current study aimed to compare shooting performance between male and female athletes during the NCAA (National Collegiate Athletic Association) Rifle Championship from the 2007 to 2013 seasons. Distinct from most competitive sports, this sport requires little physical exertion, so physiological differences between the genders that generally bring about superior performance by males relative to females may have minimal effect on shooting performance. NCAA competitions, unlike Olympic shooting events today, allow male and female shooters to compete against each other. Using archival data covering a period of seven years, 555 scores of the best 149 shooters among mostly American collegiate athletes (the best of whom went on to compete in the Olympics) were analyzed using a generalized estimating equation (GEE) model. We found no differences in performance between the genders. The results suggest that Olympic shooting is exercising a “separate and (un)equal” policy which should be reconsidered.

UC West Alcove
April 13-17, 2015

The Repercussions of Pearl Harbor and Internment for Japanese Farmers and Their Property in San Diego

Rory Soltan and Colin Fisher

This investigation examines the effect of the Japanese attack at Pearl Harbor in 1941 for the Japanese farming community in San Diego County. Prior to the Second World War, Japanese Americans were critical to the agricultural sector in San Diego; however, internment forever uprooted them from their role in society. Xenophobic sentiments were prevalent in the post war period, making it tremendously difficult for Japanese Americans in San Diego to reclaim their former assets and land. As evidenced through primary documents and first hand interviews of former internees, it is clear that Japanese San Diegans lost their dominant position in San Diego agriculture and were forced to adapt to other industries in order to maintain their livelihoods. The varying degrees of success that Japanese San Diegans experienced in the post-war period relied on the ability of each family to adapt to the harsh realities of their newfound economic hardship.

UC Forums

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Heartmonic Symphony

Juan Alvarado, Savanna Blair, Hannah Halopoff, Stephanie Harrison and Kathleen Kramer

Heartmonic Symphony aims to combine the realms of art and engineering to create an interactive installment in which users can create music together. This installment will consist of four heart rate monitor stations where participants can have their heart rates converted into a musical output. An infrared heart rate monitor at each station will measure the participants' heart rates within 15% accuracy. These signals will then be processed by a Raspberry Pi and converted to music that will be played at the participants' measured pulses. Additionally, there will be an LED display composed of four different colors, one for each of the four stations. The LEDs will flash at a rate corresponding to the participant's heartbeats. Each participant will be able to see his or her heart rate in beats per minute on an LCD at the stations. This will allow participants to clearly see that the system is functional. The total structure will be no shorter than 6 ft. tall, and the heart rate monitors will be mounted approximately 4 feet from the ground. At this design stage, we have an operational prototype of the infrared heart rate monitor. Additionally, the Raspberry Pi has been programmed to control sound effects from four external inputs and to have two LEDs flash at different rates. Designing the heart rate monitor printed circuit board (PCB), connecting the heart rate monitor to the Raspberry Pi, programming the LCDs, and building a structure will be the next steps of our technical design.

UC Forums

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Reverse Osmosis Desalination System For Residential Use

Ryan Salisbury, Jeff Cefalia, Jeremy Hagen, Steven Mikhail, Cristina Bassion and Daniel Codd

The coastline of Costa Rica is lined with residential structures. Potable water for these residences is attained through a privatized "well service," infrastructure for potable water does not currently exist along this region. Fresh water is purchased at exorbitant rates, up to \$600 per week, and trucked in from a privatized industry where a monopoly exists over all large fresh water basins in the area. This solution is not sustainable. Exponential population increase coupled with industrialization has resulted in poor well conditions and increased cost and quality of purchased well water is declining. The quality of water, if not attained via this method, is incredibly poor with countless contaminants both natural (nitrates, arsenic, lead) and man-made (failed septic tanks, pesticides, household/industrial waste). An effective solution would allow simple and cost effective in-home seawater desalination - enabling private residents to convert seawater to potable water as desired. Current systems available at this scale are expensive and due to current reverse osmosis filtration methods, energy inefficient. The demographic along the region varies widely, as such any solution must be economically feasible for a range of residents and also achieve relative ease of maintenance.

UC Forums

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Kinetic Art Sculpture

Danny Cerda and David Malicky

I designed and built a kinetic art sculpture inspired by the works of David C. Roy. The final design was implemented into an Junior engineering class to teach students how to use the laser cutter and the basics of wood work and safe shop practices. This research project utilized kinetic movements, clock escapements, low friction bearings, and pulley mechanisms. CREO, a 3D parametric modeler, was used for the design and all parts were made with a Trotec laser cutter.

A Web Application for Textbook Information Retrieval

Sean Dennelly and Eric Jiang

One of the first ways that we are taught to digest information in an academic setting is through summarizing text. Fundamentally summarizing involves two activities, retrieval of relevant information and abstraction of that information. The goal of this application is to help students retrieve information most relevant to search topics of their choice. It will allow students to upload digital photos of their textbook and convert these photos to text on which they can run search queries. In addition to finding sections in the book that are most relevant to a search query, it will also have the feature to pull out definitions and key terms. The interface for this application will attempt to encourage students to use the application as a supplementary study tool rather than a replacement for reading the textbook. By automating the process of information retrieval, students can spend more time digesting information rather than spending the majority of their time looking for it.

Uncovering the Mathematics within Children's Literature

Riley Evans, Angela Goodwin, Caitlin Pyatt, Jane Friedman, Lynn McGrath and Amanda Ruiz

What can Little Red Riding Hood and other storybook characters teach us about mathematics? We explore connections between popular children's stories and uncover the mathematical content within them in relation to the California Common Core State Standards.

Learning Labs-Reducing Distraction in the Classroom Caused by the Introduction of iPads

Tanner R. Franklin and Saturino Garcia

The shift from paper and pencil to technologically advanced tablets and computers is in full swing and has been for many years. The San Diego Unified School District spent ten million dollars on iPads two years ago, while many private schools have forced students to purchase or rent their own. iPads and computers are thought to promote focus in the classroom and provide students and teachers with a better way of learning. An iPad has the ability to provide multiple digital textbooks, unlimited online resources, word processors and many other features that would otherwise be impossible for students to access. While iPads are thought to be mostly a tool, they often become a distraction for students. I have created a practical solution to the problem of distracted students. The new app brings a new level of interaction to classrooms by creating a fun, interactive platform for the iPad. This app provides teachers with the ability to track a students' progress through quizzes, monitor students' app usage time, monitor the students current status (whether the student is using the app or not), and keep track of the students' attendance. The teacher will also be able to record students' grades while students can constantly see their progress.

Writing a Book – The Project Leading to A ‘Green Chain: Inspiring the Future of Supply Chain Toward Sustainability’

Nina Hagemann, Alejandra Bohon, Victoria Mitchell, Scott Robertson, Liana Zurabyan, Vinicius De Sousa, Heather Hentzen, Bryant Jones, Montserrat Fernandez Servitje, Kirby Uranich and Simon Croom

As a constituent part of the special topics class, Sustainability and the Global Supply Chain, we undertook individual projects to research an aspect of sustainable SCM intended to result in a book chapter. The collected work of the class of 10 students is now being published as an e-book with the title above. The chapters represented a significant semester-long study intended to capture each student’s interest and provide primary and secondary research experience. Most of the topics studied were locally based (ie SoCal) and capitalized on a single or multiple elements of supply chain knowledge.

The Gentrification of Sound and Space in Las Playas de Tijuana

Lucy Hill, Can Bilsel, Daniel Lopez-Perez and Adriana Cuellar

Built along the edge of US-Mexico Border, Las Playas is a delegation of the city of Tijuana defined by its natural topography, social partition of neighborhoods via disparate land values, and the unnatural division of space by means of the distinct building typologies and their encasing walls. In the older sections of Las Playas built just above sea level the sidewalks are completely closed off from the houses via a hodgepodge of aligned fences, gates, and barriers. This rhythmic breach of space is found at every scale. Each region, neighborhood, block, and individual plot becomes a deaf musician dissociated from the other performers begging the question: how can we find consistency, and if not consistency at least interaction, through the vertical gashes created by topographical and architectural distinctions. The more established neighborhoods are built on a systematized grid while newer developments tend to be gated communities, and informal settlements precariously built on the hills above the canal of Los Laureles. This creates an inverted relationship between elevation and land values in that views of the ocean do not necessarily increase land value, but rather the regularity of transportation and land division. While my mapping exercise visually differentiates the dichotomy between formal and informal built environments I also seek to sonically distinguish how the people occupy these environments. By unraveling static sound recordings as well as several ?soundwalks? I highlight the difference in found sounds, their tone color, frequency, and dynamics.

Twelve-Tone Serialism: An Examination of the Works of Anton Webern

James Kinney and Christopher Adler

Mathematics and Music are related and intertwined, and the invention of serialism in the 20th century highlights this fact. Serialism is a technique of music composition that uses mathematics to structure different elements of music, such as pitch and rhythm. For hundreds of years, music all over the Western world was tonal, which means there is a hierarchy of some pitch-classes being more important than others. Serialism is a form of atonality, which is the composition of music that attempts to use all twelve pitch-classes equally. I examine twelve-tone serialism, which was created by Arnold Schoenberg and developed by his students Alban Berg and Anton Webern. This form utilizes a row, which is an ordering of the twelve pitch-classes that can be transformed in various ways and serves as the thematic material for the entire piece. In particular, I analyzed some works by Webern to see how he utilized twelve-tone serialism.

Modular Fare Collection Systems

Chris Marella, Rodrigo Sicre, Pablo Alarcon, Jorge Septien, Kathleen A. Kramer and James Gilb

This document contains a comprehensive overview of a modular architecture for fare collection systems. Currently, the main problems encountered by an embedded system arise when the system's internal functions are damaged, become obsolete, or are sought to be upgraded. The presented design provides a potential solution to these problems. A modular architecture groups common functionalities of the system into independent units, referred to as modules, which are connected by a standard interface. These modules will be self-contained functionality units responsible for performing specific tasks. Furthermore, these functionalities can be reused across multiple applications and thus reduce development time and cost. The design is a proof of concept, where the goal is to demonstrate the benefits of a modular design approach for systems or applications. The design is based on an existent mobile fare collection device and its core functions such as validating transactions and processing data. The final design aims to encapsulate such core functionalities into modules communicating through an Ethernet interface. At present, progress has been made in designing the overall structure of the modules, selecting major components, and establishing network communication between prototype modules. In addition, an initial mechanical design has been accomplished and a 3D-printed model is under production.

Visual Arts

Man Made

Ivy Guild and Andrew Cross

“Man-made” is a visual arts exhibition that consists of printmaking prints and photographic prints. The exhibit explores themes of man, man's form, natural forms, and design. The printmaking pieces are carved from copper and wood and printed with ink on paper. The prints focus on natural forms, two-dimensional interpretations of natural design, and geometric patterns in nature, such as shells, pinecones, and succulents. The photographic prints are generated through film and digital photographic processes, focusing largely on man. I explore the human figure in various settings, including private spaces, public spaces, darkness, and light. Posing the two categories within the man-made theme opens up conversation between the ties of man-made recreations of nature, nature's design, and humans within an artistic context. “Man-made” shows human form and natural design side-by-side in visually engaging manners that promote consideration and my own artistic growth.



Music Compositions

Founders Hall French Parlor

May 3, 2015 3:00 PM

Tuan-Viet Kevin Nguyen in Senior Piano Recital

Tuan-Viet Nguyen and Kay Etheridge

This performance features some of the more celebrated compositions for solo piano, and represents the culmination of Mr. Nguyen's piano study over the past four years as a music major with performance emphasis. The program opens with J.S. Bach's Fantasia in C Minor, BWV 906, a short, improvisatory-style composition which is best known for its rapidly-descending arpeggiations in the main theme. Ludwig van Beethoven's Sonata in F Minor, Op. 57, "Appassionata", is one of his most ambitious piano solo works and clearly demonstrates how he revolutionized the classical sonata form. Following a brief intermission, the program continues with Triste and Danza criolla, two movements from the popular Twelve American Preludes, by Argentinian composer, Alberto Ginastera. The program ends with the famous Hungarian Rhapsody, No. 2, by Franz Liszt, which features memorable themes and bravura-style figurations. The popularity of this work extends beyond the context of art music; it has been featured in many animations such as the Bugs Bunny cartoon "Rhapsody Rabbit", and the Mickey Mouse cartoon The Opry House. An ambitious program showcasing breadth of musical styles, and requiring the soloist to demonstrate both musical depth and technical mastery in an impressive array of moods and emotions. PROGRAM CONTENTS: Fantasia in C Minor, BWV 906 by J.S. Bach (1685-1750) Sonata in F Minor, Op. 57, Appassionata by Ludwig van Beethoven (1770-1827) Twelve American Preludes by Alberto Ginastera (1916-1983) Triste Danza criolla Hungarian Rhapsody No. 2 by Franz Liszt (1811-1886). Senior Piano Recital/Open to the public, free admission.

Camino Hall 153

April 30, 2015 5:30 PM

Mariachi in Secondary and Higher Education in San Diego County

Rebeca Tamez and Christopher Adler

In this paper, I will present how different mariachi teachers run their mariachi classes, and how the music is taught. I visited directors at multiple schools in San Diego County, including three different high schools, Southwestern College, and San Diego State University, to observe the mariachi classes that are offered at those locations. In each of the classes I looked for specific things, such as the way the music is taught to the students, the warm ups that are done as a class, and other aspects that I believe would be important to observe. After observing the classes I spoke to each director and asked them about their musical background, their experience in mariachi, and then about specific aspects of their teaching that I noticed while observing. The goal of this project is to study different methods of mariachi instruction in San Diego County, and to understand how those methods relate to the background and approach of each individual director. This topic is of interest to me because in the future I would like to be a music teacher, and more specifically a mariachi instructor. I have played and studied mariachi music for almost ten years. Senior Thesis Presentation in Music Theory/ Open to the public, free admission.



Poster Presentations

UC Forums

1

Exploring a New Commercial Typology

Tiffany Aceves and Daniel Lopez Perez

The Lexus dealership in Escondido, California has become an experiential superblock, an enclave of amenities that advertises a wealthy lifestyle. Sitting along a major southern California freeway, a giant LED billboard advertises the comfortable lifestyle that accompanies life with a Lexus. It combines features of the typical car dealership, shopping mall, convention center, and country club to accommodate the demands of the upper-class client. Lexus Escondido fully embodies the Lexus advertising slogan of “blending out” in its location and design and is the only commercial building in the vicinity surrounded by residential properties on three sides. It sits taller, larger, and more opulent than any of the commercial buildings in the area, which include a Ross, Dick’s Sporting Goods and Target. As well, the residential buildings are of a modest value and the residents of these would lead a more modest life than the dealership offers, this creates a disconnect in the immediate neighborhood. In my research during the fall semester I explored the validity of this site in relation to the social and economic makeup of the community. I found that the dealership caters to a more established community that lives on the periphery of Escondido. I want to continue to explore the validity of this new typological combination and the methodology behind its conception. Exploring exactly which components are derived from each related topography and how that changes the commercial landscape.

UC Forums

2

Exploratory Study of Parent’s Perceptions of Their Preschooler’s Screen Media Usage

Lara Adamiak and Patricia Kowalski

There are conflicting research findings and evidence about the value of technology in children’s development. Although the short- and long-term effects are still being investigated, the overall trend is that the contributions of technology to children’s development depend on numerous factors. Among these factors are whether children’s caregivers make informed choices about technology use, whether they monitor children’s technology use, and whether they successfully minimize technology’s overuse. Through the use of a Qualtrics survey, this study will investigate parents’ knowledge of the guidelines recommended by the 2013 American Academy of Pediatrics Policy Statement regarding children’s screen media use, parents’ beliefs about the effects such screen media have on children’s development, and children’s use of screen media. The participants will be parents of children at the University of San Diego’s preschool (Manchester Family Child Development Center) and Saint Georges Preschool in La Cañada, California. The expectation is that parents’ knowledge of the guidelines and their beliefs about the effects of screen media will predict whether they monitor their children’s access to screen time.

The Influence of Foreign Policy of Asylum Acceptance Rates in the U.S.

Kathryn Adamson and Randy Willoughby

Evidenced by recent political rhetoric, reform of US immigration law is a current topic of scrutiny. However, reform of the individual process of granting asylum, a subset of immigration law, needs to be examined as well. Inconsistencies have characterized the asylum process since its initiation at the 1951 Convention relating to the Status of Refugees, which contribute to the need for asylum reform. An examination of these inconsistencies exposes a double standard between asylum seekers with some being favored over others despite conditions in their respective countries being similar. Factors leading to these contradictions include the presence or absence of conflict in the asylum seeker's home country, the country's standing regime type, the time period and the prevailing US relationship with that country. Therefore, this inconsistent implementation of asylum law is a reflection of US foreign policy intervention as opposed to pure adherence to the law. To support this claim, I will analyze three pairs of countries and the double standards they faced in regards to US asylum policy. The first relationship is between Nicaragua and El Salvador during the Cold War period, then Cuba and Haiti from the 1990s to the early 2000s, lastly Mexico and Honduras after the 2006 - 2007 rise in violence and the ongoing "War on Crime and Drugs." These case studies show that the evolution of US asylum policy has led to inconsistencies in the granting of asylum cases, despite relatively similar country conditions, exposing the influence of US foreign policy.

The Downtown Project

Elenai Alailima and Adriana Cuellar

Often eclipsed by the Strip, Downtown Las Vegas is an area in transition - with it's gaming and tourism center experiencing revitalization, and it's many residential neighborhoods undergoing gentrification. With both private companies, and the city government heavily investing into Downtown Las Vegas, the dichotomy between the tourism industry, and the local residents who inhabit the area is brought to a head. The Downtown Project focuses on the built environment of the site, by examining the urban area of Las Vegas, activity patterns, programs, and plans - and proposes an architectural intervention that will merge the two sides of the transitioning Downtown Las Vegas, contributing to the revitalization of the area while also preventing gentrification.

ViaSat Vehicle Health Monitoring System

Mariam Alali, Kathleen McGuire, Jessica Urbano and Kathleen Kramer

ViaSat currently has a machine to machine (M2M) terminal that is capable of transmitting GPS information via satellite to the ViaSat control center. The goal of this project is to expand the capabilities of the M2M terminal by transmitting vehicle health information using the terminal as well. Two components will be made, one that will interface with the On-Board Diagnostic port (OBD-II) of a vehicle, and one that will interface with the ViaSat M2M terminal. The two will communicate by Bluetooth to get information from the OBD-II to the M2M terminal where it can be transmitted via satellite using L-band frequencies. The scope of this project will be geared toward the trucking industry, where it is valuable for a third party to collect information on the vehicle and the driver's habits. The team is currently working to communicate with the OBD-II terminal and interface with the M2M terminal.

Applications of a Mathematical Model for HIV Transmission Dynamics of Homosexual and Bisexual Men in San Diego County

Brent Allman, Danielle Riethmiller and Ani Velo

Human immunodeficiency virus (HIV) is a worldwide epidemic that began in sub-Saharan Africa in the mid-20th century. After scientists realized that HIV infections were the cause of acquired immune deficiency syndrome (AIDS), they were better able to determine the leading causes of infection and methods of treatment. One of the main concerns with any epidemic is slowing the rate of transmission in efforts to eliminate it from a population. This project looks at transmission dynamics of HIV for men who have sex with men in San Diego County, CA. We aim to modify a model, created by Rapatski, et al (2005), with these new conditions in order to determine the behavior of HIV transmission in San Diego. We will use data obtained from the Center for Disease Control and the County of San Diego Health and Human Services Agency and with this information hope to effectively model the spread of the HIV epidemic for this area.

Battery-Operated Portable Amplifier System

Hamad Alnaser, Rennie Andrews, Nikolai Lukashuk and Kathleen Kramer

Most modern portable amplifiers usually have poor sound quality due to the components used to make them, since trade-offs are made to make a system more portable or less expensive. Our solution to this problem is to design and build a high fidelity (Hi-Fi), battery operated portable system (BOPAS) that would fill the need for affordable, high quality amplifiers with consumers who would like to enjoy better sound. Our amplifier system will be superior to other readily available products because it will utilize a Class D amplifier, which is known for its high efficiency, use higher capacity batteries that will deliver more than 6 hours of operation, and support the most popular forms of sound input (Bluetooth, USB, AUX, and AM/FM radio tuner). The overall dimensions of the system enclosure will be no larger than 24 cm x 24 cm x 24 cm (L x W x H) and its weight will be under 9 kg. High standard of sound quality will be met by designing and building the amplifier circuit to our specifications and testing the output for Total Harmonic Distortion (THD) within desired tolerances.

Synthesis and Study of Novel Dipyrromethene Complexes

Sara Aranda and Mitchell Malachowski

Environmental crises such as global warming due to carbon dioxide emissions and the depletion of fossil fuels have lead metal organic frameworks (MOFs) to be an emerging class of materials that have become an increasingly popular area of study. This is because of their potential for capturing and storing CO₂ gas due to their porous nature. Metal organic frameworks are comprised of an organic ligand bound to a metal ion. In the spaces where the ligand binds to the metal there are pores where gasses can bind and be taken out of the atmosphere. We are using Our dipyrromethene (dpm) ligands as our organic components because of their ability to form supramolecular assemblies. Three different dpm ligands were synthesized and complexed to copper and nickel ions. The goal of this project is to obtain a crystal structure of the metal complex and to better understand the electronic properties of the synthesized MOF. We will discuss these results and compare them to what is known from other dpm complexes.

The Dharma Bums Temple

Lucas Barmeyer, Niki Milan, Sara Butler and Evelyn Kirkley

The Dharma Bum Temple is centralized around the concept that anyone can learn Buddhism, no matter where they are from or who they are. The Dharma Bums, who are Westerners, began their practice in the Buddhist temples of Asia, but were not comfortable there. They realized people should be comfortable practicing their beliefs, so they established the Dharma Bum Center in San Diego. They used a simple apartment for the temple and made it open to everyone. They do not advertise the temple, but if someone searches them specifically and wants to learn more about Buddhism, their name will pop up. The temple is in the city, which makes it very accessible, and there are numerous classes to accommodate many. The temple does not require anyone to wear a robe; normal clothing will do, as long as you take off your shoes. The temple looks like a home, except for the fact that there is a seating and meditation area upstairs. Since the temple is very “normal”-looking, many people are not as apprehensive about being interested in Buddhism.

Universities and URLs: How Online Courses Impact Our Higher Education System

Julie Barrowclough and Craig Barkacs

Education is highly valued in America, and over the last several decades, institutions of higher learning have only increased in importance. Unfortunately, an increase in the importance of universities has also come with an increase in the price of universities. Increased tuition prices and decreases in state funding have led to discussions about the need for a shift in the business models of both private and public universities. One major factor impacting the higher education system is the emergence of online classes. Though some people choose to take online courses provided directly through their universities, others have started opting to participate in MOOCs, or Massive Open Online Courses. MOOCs offer interactive platforms that allow students to learn through videotaped lectures, online problem sets, and virtual access to professors or TAs. Many MOOCs are much cheaper than regular university classes, and some are even completely free of charge. Clearly, the state of higher education is in flux due to the emergence of these new types of accessible courses and the ever-rising prices of traditional universities. My research will address the pros and cons of online higher education versus traditional higher education. I also plan to look at the current business models of universities, and make predictions and recommendations about how they should adjust their business models in order to successfully accommodate the changes that are inevitably occurring in the sphere of higher education.

The Old World or the New?: How the Great War Shaped Immigrant Communities in Chicago

Rylan Beisner and Colin Fisher

In 1914, the outbreak of World War I caused a strong reaction between isolationists and those in favor of war throughout the United States, especially in Chicago. Germans had been immigrating to America for over a century. Prior to 1914, Chicago had the third largest German population in the world behind Berlin and Vienna. They had a huge influence on every part of the city from music to politics and were largely against American involvement in the war. The nation adopted an anti-German sentiment and the Germans lost their “most favored nation” status. The Poles also had a strong community within Chicago prior to World War I. Polish immigrants began building their own self-sufficient community which included churches, schools, and newspapers. Polish-Americans were divided by regionalism or political conflict, however they were united in the desire to see Poland reunited after the partitions of the country forced them to immigrate. Many were in favor of America becoming involved in the conflict from the beginning. As the war escalated, the German community’s influence waned which presented many opportunities for other minorities. Primary sources found in the Foreign Language Press Survey illustrate the changing attitudes of each group towards the war, each other, the conflict of loyalty towards the Old World versus the New World and how the status of these two ethnic groups changed as the war progressed. This is intended to show how the Great War inspired a radical range of ideas and beliefs that immigrants to America had not had to deal with before.

Using Weight and Length Relationship of *Fundulus parvipinnis* to Track Isotopic Signature Change on Different Tissues

Yuri Bejarano and Drew Talley

Wetlands are threatened ecosystems on which many species depend, thus knowledge of these habitats is essential for restoration efforts. To better understand southern California wetland food webs, we studied one of the most abundant fishes of these marshes, *Fundulus parvipinnis*. These mesopredators are a central component of the wetland ecosystem, and so can help us understand the broader trophic linkages of the marsh food web. Trophic position can be identified by using Nitrogen stable isotopes. These isotopes are easily tracked because they change somewhat with trophic level: when organisms feed, their tissues take the isotopic signature of their diet, plus a discrimination factor. Isotopic analysis of different tissues can also be potentially used to determine the diet of an organism, since different tissues require different lengths of time to reflect their food. A difficulty with isotopic analysis is that the rate of isotopic change varies significantly among both tissues and species. Further, if we are to understand how isotopic signature changes with age, we must understand the relationship between fish length and weight, as that allows us to calculate added biomass based on a simple length measurement. For this study, there were two goals; first to determine weight and length relationship of the local population of *F. parvipinnis*, and second to use this information to examine change in isotopic signature during the lifespan of *F. parvipinnis*, and how these changes vary among different tissues.

Destination: On the Border

Jacqueline Benedicto, Can Bilsel and Adriana Cuellar

The San Diego-Tijuana border is a unique area because it is a meeting point of two expanding metropolitan cities. San Diego and Tijuana share a bi-national identity, especially after the implementation of NAFTA in 1994. Since the opening of free trade, border crossings have increased in eightfold and the rate of production and exchange has also increased. An interdependence between the two cities has formed. The San Ysidro port of entry is the main border crossing for pedestrians and vehicles in terms of tourism, due to the accessibility to the San Ysidro Las Americas outlet and downtown Tijuana. On the other hand, the Otay Mesa Port of Entry is mainly used for commercial, trade, and transportation. Although the economic and architecture are different between the two cities, the urban form and context mirror each other through the border. In analyzing the overlap of cities, there is a connection between the use of formal and informal spaces. The border potentially becomes the center of the metropolitan areas of San Diego, CA and Tijuana, Mexico. I am proposing a system on the border that would contrast the program of the border as merely a transition space. Many proposed projects in regards to the border have tried to alleviate the stress and density of crossings through the entry ports, like the suggested Tijuana airport bridge over the border. However instead of the border separating the two metropolitan cities, my project will blur the boundary conditions between the cities.

Anthropogenic Activities and Environmental Stewardship of Riparian Areas in East Africa

Heleen Bennett, John Kiringe and Ron Kaufmann

Fresh water resources, such as riparian areas, are critical for human existence throughout East Africa. However, water quality and environmental stewardship in many of these zones have been compromised. This is especially apparent along the Kimana-Kikaragot River System in southern Kenya. Here, degradation can mainly be attributed to anthropogenic factors like sedentary lifestyle transitions among the Maasai tribe and a lack of connection between environmental awareness and sustainable action within the community. This study assessed the environmental status of the Kimana-Kikaragot River System while also evaluating perceptions of locals on degradation within the riparian area. As a result, human encroachment along the region was very apparent. Woody and herbaceous vegetation was reduced to about fifty percent and sheet erosion was found about twenty percent of the time due to sedentary agricultural practices. In addition to this, a large percentage of turbidity samples taken along the river did not meet the national consumptive requirements. Household interviews revealed that locals generally have low levels of ecological awareness in regards to sustainable stewardship, environmental legislation, and the crucial connection between increases in vegetation loss and erosion or sedimentation. However, a majority did indicate that water quality had decreased. Key informant government organizations (WRMA, WRUA, etc.) disagreed on the status of the river itself, but agreed that there was a lack of educational programming. In order to mitigate these problems, it is critical to initiate environmental education programs that promote environmental governance and empower local people to utilize natural resources sustainably.

The Writing on the Walls: Neolithic Artwork at the Ness of Brodgar

Chloe Berghausen and Alana Cordy-Collins

This paper presents the results of using Decorrelation Stretch Algorithm (DStretch) at the Ness of Brodgar site during the 2014 excavation season. The Ness of Brodgar is part of the UNESCO World Heritage site on the Orkney Islands of Northern Scotland. It was in use from 3200-2300 BCE and is the first Neolithic site to show evidence of paint. DStretch is a mathematical algorithm invented by Jon Harman to photograph worn away paint on stone. The use of DStretch in the field as a potential tool for the discovery of paint on the Neolithic megalithic structure yielded positive results. It was the first time DStretch had been used methodically on any archaeological site in Scotland. Use of DStretch suggested that two additional structures on the site have paint on the walls and stone piers. The project consisted of six weeks of excavation and photography, and then five months of further research.

Finding Genetic Algorithm Parameters that Work on More than One Problem

Armand Binombe and Rick Olson

Genetic Algorithms (GAs) were developed as a way to solve combinatorial optimization problems. As the name indicates, GAs behave like the natural process of evolution. They represent a solution to a problem as a chromosome with genes and try to improve the genes to get better solutions through selection, crossover, and mutation. GAs are used in multiple applications including computer modeling, creating job assignments, schedules for employees, minimizing travel distances, and lowering production costs. These are complex problems that would otherwise take a great amount of time and resources to solve but with the help of GAs they can be solved in less time and help businesses or systems become more efficient by saving time and resources. In a typical GA process, the selection, crossover, and mutation operators are tuned to a specific problem and the parameters for these operators are usually different on different problems. This makes it difficult to adapt GAs to new problems. We explore whether it might be possible to make a GA more robust by determining whether there are parameter settings that can efficiently solve two problems.

Student Demographics, Stress, and Mediating Psychological Variables: A Proposal

Kelly Birch, Christopher Dishop, Hannel Ortiz-Beckett, John Barnum, Kristen Daus and Veronica Galvan

Stress is incredibly prevalent in college settings. While the detrimental symptoms and effects of stress are well established, further research is needed to better understand possible differences in between student populations and the psychological factors involved. Previous analyses revealed differences in maladaptive perfectionism scores between students of different ethnicities. The proposed study intends to investigate the relationship student demographic factors, stress, and other mediating psychological variables. These variables will be measured through self-reported measures. We hypothesize that financial support, ethnicity, and first generation student status will be associated with scores on validated measures of perceived stress. We will also explore other variables including academic entitlement, social support, perfectionism, locus of control, and stereotyping that may mediate such correlations. Subsequent studies will also implement a saliva sample procedure to test levels of the endogenous steroid hormones cortisol and dehydroepiandrosterone (DHEA). These hormones have been correlated with maladaptive and adaptive responses to stress, respectively. This data will serve as a non-biased comparison to the student self-reported perceived stress data. The findings of these studies may provide insight into the factors and relationships underlying chronic stress levels in college students.

Fluorescence Microscopy Techniques for Characterizing the Microscale Mechanical Response of Entangled Actin Networks

Savanna Blair, Robert Fitzpatrick, Tobias Falzone, and Rae Anderson

Actin filaments are semiflexible polymers that display complex viscoelastic properties when entangled in networks. In order to characterize the molecular-level physical and mechanical properties of entangled actin networks it is important to know the in-network length distribution and the response of entangled filaments to local forcing. Here we describe two single-molecule microscopy protocols developed to investigate these properties. Using confocal fluorescence microscopy and ImageJ image analysis we have developed a protocol to accurately measure the in-network actin length distribution. To characterize the deformation of actin filaments in response to perturbation, we trap micron size beads embedded in the network with optical tweezers and propagate the beads through the entangled filaments while simultaneously recording images of fluorescent-labeled filaments in the network. A sparse number of labeled filaments dispersed throughout the network allow us to visualize the movement of individual filaments during perturbation. Analysis of images taken during forcing is carried out using a combination of vector mapping and skeletonization techniques to directly reveal the deformation and subsequent relaxation modes induced in entangled actin filaments by microscale strains. We also determine the dependence of deformation modes on the relative filament position relative to the strain.

A Zero Waste Future for the University of San Diego

Ashlyn Boatwright, Anne Keicher, Drew Talley and Paula Morreale

My research focuses on waste disposal habits of students, faculty, and staff at the University of San Diego (USD). The term “Zero Waste” is technically defined as 90% or more of waste is diverted from the landfill. However, it is also an innovative movement at USD to educate campus constituents about the harmful effects waste has on climate change. There have not been many studies conducted about Zero Waste, specifically on university campuses. There are many factors to consider when studying Zero Waste on universities, such as waste from offices, (i.e. paper), waste from dorms, (i.e. food and paper), and waste from the cafeteria, (i.e. cups and food). The Office of Sustainability and I administered a preliminary survey about campus constituents’ knowledge about waste and USD’s waste diversion efforts and recruited a team to conduct Zero Waste education on campus through the Zero Waste Guru program. Gurus serve as a sustainability voice for the rest of their community. It is crucially important to study Zero Waste strategies on universities because they act as a primary test for the rest of society.

The Opportunity of Borders

Katinka Bosch, Can Bilsel and Daniel Lopez-Perez

Walls have consisted in human culture since the beginnings of civilization. These physical borders mark the line of division between political, state, country or even religious boundaries. The purpose of these walls arguably has never changed. Countries still state that the reason for the building of a wall is for protection, just as in ancient times. Today however, walls develop into much more than a piece of protection, they become political statements of power, used for anti-immigration enforcement, and often create a strict definition of identity. Consistently, walls enhance an unnatural division between people and cause an exaggeration of difference on either side. How can a border become a zone of transition rather than a barrier between people? How can a wall continue to enhance the identities of the surrounding cultures, without creating a zone of tension and exclusion? My thesis explores the U.S. Mexico border with reference to Berlin and the removal of the Berlin wall. Berlin can be studied as a city that has overcome division and is now unified politically, socially and spatially. Therefore, Berlin can be used to inform an intervention to the U.S. Mexico border.

Perfunctionalism

Robert George Boyce, Daniel Lopez-Perez and Adriana Cuellar

The Canadian Arctic is an isolated extreme environment and the home of The Sahtu Dene. In relatively recent history the Dene have moved from a nomadic lifestyle into a housing solution provided by outside sources. This imposition of housing in combination with a lack of input from the local community has possibly created an unhealthy environment. This problem is exacerbated by the lack of roads into the area the Sahtu live. The Sahtu Dene lands are rich with natural resources in which ownership of has been in negotiation. Since the discovery of oil in Norman Wells in 1920 there has been a dramatic shift in interests in the region. Research will produce a moral and ethical design solution that navigates the interests of all parties involved with the paramount concern being the overall health and preservation of the Sahtu Dene culture.

Evaluating Methods to Sample Late Stage Larval Fishes in Mission Bay, San Diego

Jacob Brouker and Steve Searcy

Most marine fishes have a two part life cycle in which larvae develop offshore before transitioning to nearshore juvenile habitat. The larval-juvenile transition is known as a critical period because the number of larvae that survive to settlement is a good measure of future population size. Despite the recognition that monitoring settlement is important, the ability to identify and count settlers, especially in areas with complex habitats (i.e., seagrass beds, rocky reefs) is difficult. In this study, I compared two techniques to capture settlement stage larvae entering Mission Bay: light traps and SMURFS. Light traps are anchored cylindrical nets that have a light suspended in them to attract phototactic larvae at night. SMURFS (Standard Monitoring Unit for the Recruitment of reef Fishes) are cylinders of plastic fencing filled with kelp and attached to the bottom. Larval fish are thought to settle into the SMURFs as a refuge from predation. Light traps and SMURFs were deployed in Mission Bay Inlet for four consecutive nights in July 2014 and then once a week from September to October. Both types of traps were retrieved using snorkel gear and all fishes collected were identified, measured, and counted. Surprisingly, each trap collected different species. The light traps primarily collected arrow goby larvae (*Clevelandia ios*) whereas SMURFs collected Spotted Sand Bass (*Paralabrax maculatofasciatus*). This study highlights both the diversity of fishes that are utilizing Mission Bay as a nursery habitat and the danger of only using one sampling technique to monitor settlement of fish larvae.

Underdog vs. Top-dog: Testing the Concepts Utilizing the Semantic Differential Technique

Alaysia Brown and Nadav Goldschmied

Underdog entities are well-liked and supported (Goldschmied & Vandello, 2009) but how do they fare in comparison to their “arch nemeses,” the top-dogs? The current investigation employed the semantic differential technique (Osgood, Suci & Tannenbaum, 1957) utilizing a between-subjects design in which participants were asked to choose where their positions lie, on a scale between two bipolar adjectives (e.g., famous-obscure). This well-validated and extensively researched rating scale is designed to measure the connotative meaning of concepts. As predicted, the top-dog was superior to the underdog on aggregate measurements of potency (e.g., large-small), however in regards to evaluation (e.g., good-bad) the underdog received lower ratings. Lastly, in terms of measurements of activity (e.g., motivated-aimless) both entities were found to be equal. In line with past research (Goldschmied & Vandello, 2012; Vandello, Goldschmied & Richards, 2007), the underdog was found to be associated with inexperience and disadvantage, as well as lack of financial resources.

National Vulnerability? : The Impact of Cyber Warfare on the Future of National Security

Kit Brown and Randy Willoughby

Today's national security landscape is ever-changing and requires constant flexibility and adaptability from leaders and institutions. The concept of Cyber Warfare has received huge amounts of attention in the past year and will continue to do so as government agencies and private industries alike increase cyber defense spending. Due to the increasing prevalence of, and reliance on, technology seen globally, countries like the United States are incredibly vulnerable to cyber attacks from state and non-state actors that wish to "level the playing field" by hacking into secure databases of powerful nations to steal information or cause chaos by taking control of certain infrastructure. This project argues that cyber terrorism will become the next prominent policy focus for the United States because of the implications it has for the security of our energy and military infrastructure as well as the disruption potential it holds for manufacturing, finance, and information organizations that are so crucial to the functioning of the US economy. By examining historical case studies of cyber attacks, analyzing data to uncover developing patterns, and interviewing experts in the field, this paper will attempt to answer questions concerning how real the threat of cyber warfare is: Can states like Iran and North Korea, or even failing states, really cause damage to the United States through hacking? Can non-state actors? The answers to these questions will shape a large portion of national security policy in the near future.

The Gender Wage Gap in America: Reality and Repercussions

Alyssa Burns and Johanna Hunsaker

Within the academic community, there is much debate around the existence and importance of a gap between the wages of male and female employees, and whether a wage gap is an economic problem in the American labor system. Much of this disagreement is centered around the numerical measurement of the gap, as well as whether the social conditions that impact the wage gap are troublesome to society, or simply a result of American culture. My thesis will define the gender wage gap, examine the extent to which a gender wage gap exists in the American work place, as well as explore the various social reasons why a gender wage gap may exist. Finally, my thesis will explore the economic and financial implications that uneven pay may have on the American public as a whole, as well as seek to provide some plausible solutions to wage inequities.

In-Home-Energy-Display Device

Dallas Butler, Miluska Garcia, Filipe Calixto and Kathleen Kramer

The project includes the implementation of an in-home-display that will communicate with a plug to control an outlet. The in-home-display has the capability to provide information on energy usage coming from the household. It will then give feedback to show how much energy the house is using at the time, where it can lead to the goals of saving money and energy. The plug will work hand in hand with the in-home-display to meet these goals. The design will be using different two inputs to determine when an appliance will be controlled, total load and energy rates. This goal will be accomplished through the use of a Raspberry Pi B+ and an Arduino. The in-home-display will contain the Raspberry Pi B+ and will take readings from the smart meter via ZigBee wireless communication. The plug will then use Wi-Fi to obtain the energy data from the in-home-display to control the appliances. The main goal of this project is to help control energy usage within a household. Having a device that will work to help cut energy will not only help the household, but will help the utility company. The project thus far is in the design and creation phase, where it will be drawn up and built with the components to test in the future.

Dialogue with the Deceased: An Exploration of Virtual Spaces of Grieving

Bonnie Campbell and Susannah Stern

Universally, when confronted with mortality and loss, we form community to honor our loved one's passing. Today, online identities survive the deaths of those they represent, inspiring the construction of new grieving practices that temporally, spatially, and socially expand public mourning. A significant challenge to the classic and timeless rhetorical structure "the eulogy" is constituted by increased democratization of memorialization and nonverbal components within and a diffuse postmodern context. An interpretation of four virtual memorial case studies, conducted through the lens of rhetorical, and semiotic theories, is used to address the nature of these online spaces about the deceased, how each replicates and expands traditional eulogizing practices and what shifts might reveal about human motivation. The examination of eulogy as a highly persuasive rhetorical convention aimed at a bereaved preferred subject position informs a critical judgment of the tension created when memorialization is enacted in virtual public format open to an extended and unfamiliar network. The underlying signification of these representative case studies as texts reveal concern for postmodern impression management, opportunities for calls to action through social media channels, media and cultural convergence and the presence of intertextuality. This research stages a critical intervention between audience and these emotionally charged texts to make a meaningful contribution to our shared understanding of expansion of public mourning reflected in a replacement of persuasion with that of participation in the practice of eulogizing and the social utility of virtual memorials within the American collective conscience.

You Don't Have to Live Like a Refugee: Reevaluating Routes to Resettlement

Julian B. Carmichael and Gary Gray

Even after making it to the United States of America, the challenges for a refugee are many. Resettlement and adjustment to American society is a daunting task, and help is most certainly needed along the way. Although we may not be able to quickly solve the issues that sparked the fleeing of one's country, we can work to make resettlement a much smoother process. The Alliance for African Assistance works to provide refugees with the help they need to make the transition smoother. The Alliance provides services ranging from assistance to attaining aid through the Wilson-Fish Program, to gaining job experience as home caregivers and child caregivers, and to translation services. I am working as an intern for the Global Village Department under Mr. Cameron Brown. The Global Village Department helps refugees gain experience as home caregivers. By gathering valuable job experience, refugees hope to be able to land higher paying jobs. Attaining higher wage jobs could greatly ease the strains of the resettlement process. I wish to explore the benefits of job experience in the process of resettlement. So far I have developed and distributed flyers for the purpose of advertising the home care services, and I am developing a newsletter for the home care customers. I hope to aid the Alliance in gaining more customers for the Global Village Home Care services so that I may observe the positive effects job experience will have on the resettlement process.

Residential Energy Usage in Relation to Weather Conditions in San Marcos, California

Kayla Carpenter and Zhi-Yong Yin

This study examines the impacts of weather variation on residential energy demand for San Marcos, CA, using climatic data and SDG&E meter data in kWh for 563 households during January 17, 2014 to January 15, 2014. For seasonal energy use patterns, winter showed two peaks in energy usage, one in the morning at 9:00h and the second in the evening at 19:00h while summer showed generally high energy usage in the evening and peaked at 21:00h. Correlation analysis was performed between temperature and kWh for the peak hour by season. There was an inverse relationship for winter, with $r = -.190$, and a highly significant positive relationship for summer with $r = .729$. During peak consumption hour in summer the average household uses 1.4 kWh. The bottom 5% of the households, the low energy consumers, used less than .5 kWh; while the top 5% consumers used over 2.67 kWh. Further analysis on the correlations between individual household energy use and temperature revealed that during the peak consumption hour in summer, 374 households' energy usage was statistically correlated to temperature variation and they used 1.5 kWh on average compared to 1.0 kWh used by the other households. Our results suggest that implementing alternative energy technology, such as solar panels, can help reduce peak energy demand during the summer season.

Mostoles: A Case Study

Juan Luka Charrabe and Daniel Lopez-Perez

Mostoles is the biggest satellite town in the Madrid megalopolis. The megalopolis is a new city type resulting from the merger of the suburbs, then with satellite towns, to create a continuous fabric of asphalt and cement. The amount of such amalgamations allows for a new city type to be considered: the megalopolis. Madrid's metropolitan region is one of such megalopolis. I am focusing my first part of the research process on Mostoles. Mostoles used to be an small independent town, up to the sixties. In the 60s, the old city center was surrounded by a ring of mass housing developments that turn the town into a dormitory city.

Spontaneous Order: Is It Real, and Should We Defend It?

William Considine and Matt Zwolinski

Order can come from two sources, exogenous and endogenous. However, most of human history has focused predominantly on the study of exogenously made order instead of endogenous systems that have arisen more organically. In this project, I aim to address and discuss the nature of this endogenous, or "spontaneous," order in a modern context by looking at real world examples. Must rules create order, or can a grown order create rules? Can people function happily in a society where their concept of the rules and corresponding system are limited to their individual perspective? Is any attempt by humans to quantify and regulate human interaction flawed at the outset because of the inability to plan for every human complexity? Perhaps the ideal society is one in which the conditions for order are met, but the order that arises is uncontrolled by any one person or supervising body. The internet is one such example, wherein the conditions for individual sites being orderly were met, but its growth and evolution have been the result of immense endogenous growth rather than outside tampering. To describe a spontaneous order like the internet or various systems that I will elaborate on in the full presentation, one must distinguish between "rules" that are known to participants and "rules" that are merely a tool with which the observer describes behavior.

Clean Water for East Africa

Adan Cortez, Sarah Baker, Keith Macdonald and James Bolender

Access to clean and safe water is a global concern, and is one of the United Nations Millennium Development Goals. Arsenic has been found in groundwater sources around the world at concentrations above the World Health Organization drinking water guideline value (10 μ g/L). Individuals in affected areas are experiencing chronic arsenic poisoning and in turn, the issue has become a major public health concern. The University of San Diego has conducted preliminary sampling of water in the East African countries of Uganda and Kenya. In January 2014, an interdisciplinary team of students and professors spent time in Uganda, collecting water samples, and testing for arsenic. It was found that arsenic is present in many samples taken from groundwater, but not from water treated at government run water treatment facilities, indicating that arsenic is contaminating the water as a result of natural leaching from rocks, rather than from anthropogenic sources. Ultimate goals of this project are to identify the water sources that are most at risk for contamination and to mitigate this problem through the development of locally sourced filtration devices and education.

CHP1 and CHP2 Interactions with NHE1 in Adaptation of Non-Small Cell Lung Cancer to Hypoxia and Serum Deprivation

Wayne Cottle and Joseph J. Provost

The Sodium Hydrogen Exchanger Isoform 1 (NHE1) is vital in maintaining pH homeostasis and is regulated by several proteins including both isoforms of Calcineurin Homologous Protein 1 and 2 (CHP1 and CHP2). The metabolic rate of cancer cells is elevated and in hypoxic and serum deprived developing tumors intracellular pH (pHi) is significantly decreased. Cells must adopt survival mechanisms to escape these conditions. Earlier work suggests that CHP1 is required for basic NHE1 proton transport while CHP2 increases the proton transport kinetics. CHP2 expression may activate NHE1 allowing for pHi homeostasis. Therefore, we investigated CHP binding to NHE1 as a means for adapting to hypoxic and serum deprivation conditions. Using Quartz Crystal Microbalance (QCMd) we measured protein-protein interactions between NHE1 and CHP1 or CHP2. We also cultured H1299 cells with chemically induced hypoxia using dimethyloxaloylglycine (DMOG) and with serum deprivation in H1299 lung cancer cells. Cell exposed to hypoxia and serum deprivation showed a decreased pHi 0.2-0.4 pH units. When NHE1 is inhibited by 5-(N-Ethyl-N-isopropyl)amiloride (EIPA) the decrease in pHi was significantly lower than non EIPA treated cells, indicating NHE1 supports cell viability. The impact of hypoxia and serum deprivation on intracellular pH was also investigated in H1299 cells with reduced NHE1 or CHP2 expression (shRNA knockdown). Together this work suggests that CHP2 plays an important role in cell survival in lung tumor development.

Real-Time Low-Cost Radar Target Simulation

Amanda Cuevas, William Dow, Tj Reed, Phillip Storch and Kathleen Kramer

A low-cost Radar Target Simulator (RTS) lab tool is being developed for General Atomics Aeronautical Systems, Inc. (GA-ASI). For proof-of-concept, the RTS is being designed to provide synthetic target returns to GA-ASI's Due Regard Radar (DRR), but its architecture will accommodate future improvements allowing the testing of other families of GA-ASI radars. The RTS will function as a Digital Radio Frequency Memory (DRFM), using a Human Machine Interface (HMI) to create an engagement model. The RTS will provide returns mimicking real world targets. Through the HMI, the user will be able to adjust parameters including Radar Cross-section (RCS), range, velocity, and clutter, allowing for comprehensive simulation of a wide variety of air-to-air engagement scenarios.

A Middle Miocene Ichthyolith Record from the Chinook Trough (ODP Site 886: North Pacific Transect)

Jose Cuevas, Elizabeth Sibert and Richard Norris

Ichthyoliths are fossilized remains of fish, in particular the teeth, scales, and denticles, and may be found in just a few grams of sediment, usually in sizes below 100 micrometers. These faunal remains may be used as a paleoclimatic proxy as they represent vertebrates and other higher order animals and their responses to environmental fluxes. In the period of interest, an event known as the Middle Miocene Climatic Optimum occurred associated with higher global temperatures and CO₂ levels. These altered environmental conditions in turn affected ocean circulation patterns and the life found therein. These microfossils occur with reasonable frequency in red clay formations of the North Pacific such as ODP Site 886, and here we use this proxy to demonstrate the faunal response to the transition between the greenhouse world and the icehouse world which occurred through the Miocene.

Reducing Risk in the Construction Industry

Grace Daly, Steven Sumner and Alyson Ma

The construction industry is responsible for roughly 3-5% of the US GDP annually, employs over 6 million people, and is a leading indicator of economic development. As our country continues to recover from the Great Recession, the construction industry is heating up again. With this recent abundance of work, financial default for construction firms is becoming increasingly common. The growth phase presently occurring in the construction industry creates an environment that is extremely risky for general contractors. After interning with JE Dunn Construction in Kansas City this past summer, I have gained a better idea of the risks general contractors face when selecting subcontractors and the strategies used to mitigate these risks. In this paper I seek to explore some of the leading causes of financial default to assist Risk Analysts underwriting subcontractors. Another topic I would like to explore is the effectiveness of JE Dunn's safety programs in reducing the risks faced in the field, which has a direct impact on the firm's financial positions. Data has been provided to me by JE Dunn and will be applied in an econometric model. Results are as yet undetermined, but it is expected that they will be consistent with prior literature on financial default, and it is hoped that statistical significance will be found in relation to the safety program's success. This paper seeks to offer some insight to the Risk Management department at JE Dunn and provide guidance in shaping future company policies.

Explaining the Persistence of Female Genital Mutilation in Egypt

Kristen Darling and Avi Spiegel

This project examines the persistence of Female Genital Mutilation (FGM) in Egypt, despite a legislative ban on the practice in 2008. Between 100 and 140 million girls and women worldwide have undergone FGM, with 27.2 million women cut in Egypt alone. The procedure involves the alteration of aspects of the female genitalia, including removal of the clitoris or narrowing of the vaginal opening. While many contend that the practice continues because of traditional, cultural, or even religious norms, I argue that FGM remains prevalent in Egypt because of a widespread lack of education on the subject, exacerbated by the educational disparities between men and women. Furthermore, a judicial failure to enforce laws banning the operation only serves to perpetuate FGM in Egypt. I first explore the religious and cultural reasoning behind the practice in Egypt, and then explain why commonly held theories fail to explain the persistence of FGM. I then propose education as the most compelling explanation, examining literacy, higher education, and FGM educational programs as key components to ending FGM. Finally, I examine the failure to prosecute FGM in Egypt, looking to France as a model for discouraging the practice. Overall, I posit that failures at the grassroots and judicial levels create a suitable environment for female genital mutilation to persist in Egypt.

Effects of Oceanic Currents On the Navigation of Leopard Sharks

Issac Davidson and Andrew Nosal

Leopard sharks (*Triakis semifasciata*) in La Jolla, CA, appear every year for reproductive purposes and show strong site fidelity. The mechanism that both guides these sharks to the cove and keeps them there is unknown. To test their ability to navigate back to their home site, leopard sharks were collected individually and attached with a tracking device. Two treatments were applied to the sharks: control (no manipulation) and experimental (plugged noses). After being prepared, the sharks were released at a site approximately six miles from land. Sharks were tracked for a period ranging from four to six hours, with GPS coordinates and respective water current velocity being recorded every five minutes. As the open ocean is very dynamic environment with varying currents, the question set out to answer is whether current has a significant effect on the shark's swim patterns. The approach for this question involved is the analysis of the data from the tracks using the programs ArcGIS, Excel, and Oriana. Specifically, the parameters analyzed are swim direction, average swimming speed, and path straightness (and how these criteria differ between the path traveled by the shark and the path the shark would take given no currents in the ocean).

Binding Determinates of Sodium Hydrogen Exchanger 1 for Calcineurin Homologous Protein Isoforms 1 and 2

Jevaughn Davis, Chelsea Marshall and Joseph J. Provost

The Sodium Hydrogen Exchanger, (NHE1) is an ubiquitously expressed protein that exchanges an intracellular proton (H⁺) for an extracellular sodium (Na⁺) and regulates cell volume, intracellular pH homeostasis and cell motility. The Calcineurin Homologous Protein isoforms 1 (CHP1) and isoform 2 (CHP2) each regulate NHE1. CHP1 and CHP2 share a 66% amino residue homology, yet CHP1 and CHP2 have different binding affinities for NHE1. No work has determined the differential binding site for each CHP isoform. Here we will show the binding determinates of NHE and the CHP Isoforms by mutagenesis of key amino residues in the CHP binding domain from AA 803-845. Sequence and structural analysis demonstrated that eight amino residues may play an important role in the binding of NHE1 and the CHP isoforms. These key amino residues are Asn519Ala, Asn519Asp, Ile518Gln/Ile522Gln, Ile534Lys, Ile537Lys, His523Gly, His523Ile, and Asp536Gly. We have expressed and purified the c-terminus of wild-type NHE1 and mutations for each putative CHP interaction site. The protein interactions of recombinant CHP1 and CHP2 is determined using thermal denaturation and other biophysical methods. This work will identify potential interaction sites in common and unique for each CHP isoform and NHE1.

The Effects of Human Activities on Habitat Quality for Maasai Giraffes in Osupuko and Olepolos Wildlife Sanctuaries

Sydney P. Davis and Shem M. Mwasi

Habitat quality and resource availability within wildlife dispersal areas in the Amboseli ecosystem are experiencing degradation due to pastoralism and agriculture by humans, which negatively affects the wildlife species that utilize these dispersal areas. Maasai giraffes are a common species that utilize these areas, but information on how human activities and the presence of domestic livestock affects the Maasai giraffe is limited. This study was conducted in two wildlife sanctuaries: Osupuko and Olepolos. Habitat condition assessment was done to determine the quality of habitats found within each sanctuary. The Point-Centered Quadrat Method was used to determine the number of five major and common species found in a giraffe's diet. Animal Counts were conducted to determine the number and habitats that giraffes and livestock utilize. Results show that despite the high extent of damage, closed bushland was utilized by Maasai giraffes regardless. There is a high number of Acacia tree species with the least amount of vegetation damage, but *Grewia bicolor* was one of the least abundant tree species with the most vegetation damage. The number of shoats and giraffes observed in different habitat types in both sanctuaries was not significant ($r = -0.816$, $P\text{-value} = 0.1.84$, $N=4$; $r = -0.889$, $P\text{-value} = 0.111$, $N=4$). The number of cattle and giraffes observed in different habitat types in both sanctuaries was not significant ($r = 0.775$, $P\text{-value} = 0.225$, $N=4$; $r = 0.949$, $P\text{-value} = 0.051$, $N=4$). Our results suggest that Maasai giraffes are less vulnerable to habitat degradation, there is adequate food supply to sustain a viable giraffe population, and the presence of livestock does not affect the presence of giraffes in different habitats.

Characterizing Sodium Uptake in the Blackskirt Tetra (*Gymnocorymbus ternetzi*)

Nicholas Day, Richard Gonzalez and Marjorie Patrick

The blackskirt tetra, (*Gymnocorymbus ternetzi*) is a native fish of the Rio Negro, a tributary of the Amazon River, which is ion-poor and very acidic (pH<5). This species possesses a sodium uptake mechanism that is quickly upregulated during low pH exposure so as to prevent net loss of ions from their blood to the water due a stimulated efflux. Immunolocalization studies confirm the presence of both Na⁺/K⁺ ATPase and V⁺ type H ATPase transporter proteins in the blackskirt tetra gills and that their location shifts to a more protected region of the gill when fish are exposed to low

pH water. Western blotting indicates that the quantity of both ATPase proteins is unchanged and assays show that both ATPase activities remained unchanged at low pH. Isotopically measured sodium uptake was insensitive to both ouabain and bafilomycin A1 exposure. Protein expression assays indicate the presence of an epithelial sodium channel (eNaC) and that a large component of the low pH-stimulated Na⁺ influx is phenamil sensitive. We propose a novel coupling mechanism of the basolateral ouabain-insensitive isoform of Na⁺/K⁺ ATPase with an apical (water facing) eNaC transporter.

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Were Chili Peppers and Cacao Used in the Southwest United States During 500-1350 A.D.?

Alexia De Loera, Melanie Zaucher and David O. De Haan

Previous researchers have found molecular markers for cacao in mugs from New Mexico that date back to 1100 AD for the presence of chocolate, a seed native to Central America, by identifying theobromine, theophylline, and caffeine. A popular drink in Mesoamerican cultures that dates back to 1400 BC is the mixture of cacao seeds with chili peppers in water. The molecular markers for identifying chili peppers are capsaicin and dihydrocapsaicin. It would be interesting to find traces of cacao and chili peppers because it would suggest trade and/or migration, as well as culture similarities between people from central America and Southwest United States during 500-1350 A.D. In order to identify chili peppers mixed in with cacao in the pottery a new identification method was developed. In this study capsaicin and dihydrocapsaicin were used to confirm the presence of chili peppers. In collaboration with the David W. May Indian Collection, this project focused on finding the presence of not only molecular markers of cacao but also of chili peppers in mugs found in the Four Corners area of the United States that date back to as early as 500 AD up to 1350 AD. The impetus of this project is to better understand the culture of the Four Corner's area during Prehispanic times.

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Metals in San Diego's Mission Bay Sediment: a Spatial and Temporal Study

Kimber De Salvo and Bethany O'Shea

The distribution of metals (copper and zinc) in Mission Bay's sediment in San Diego, California were studied along six sampling sites during one year in order to know their spatial and temporal variations. To determine the concentrations of Cu and Zn that could potentially be mobilized from the sediment, laboratory analysis using the standardized EPA method 3051A was applied. Freshwater and urban runoff enters Mission Bay from the adjacent urban watershed; Rose Creek, Cudahy Creek, and Tecolote Creek. The creeks' freshwater input seemed to be a significant source of metals during the rainy season. Results varied spatially with an increasing gradient for both metals from the front (Cu: 3.1 ppm and Zn: 16.3ppm) to the back of the bay (Cu: 30.3 ppm and Zn: 128 ppm). The three sites towards the front, without creek input, had significantly less metal concentration (Cu: 17.9 ppm and Zn 41.35 ppm) than the three sites towards the back (Cu: 21.35 ppm and Zn: 90 ppm). Results varied temporally throughout the year with general increase in metal concentration throughout the entire bay during the rainy season. Based on the results, the findings seem to indicate that urban runoff is the source of high metal concentrations in Mission Bay.

Minimal Spanning Trees of Simple Connected Graphs

Ryan Demuse, Danielle Watson and Jane Friedman

A Graph is a mathematical structure that is defined by a set of vertices and a set of edges connecting the vertices. A Spanning Tree of a graph is all of the vertices and a subset of the edges such that no cycles remain from the original graph. Given a certain number of vertices, we want to determine if there is a simple graph with this set number of vertices that has some precise number of spanning trees. We have improved the previously known bound for the minimal number of spanning trees for graphs that have 3, 4, or 8 as the only factors of the number of vertices. We wish to develop a method to deconstruct a graph into “prime” subgraphs for which we can systematically calculate the number of spanning trees for large, otherwise unwieldy graphs.

Utilizing a “Natural Urbanization” of City Height’s Canyons

Danielle Divittorio, Adriana Cuellar, Daniel Lopez-Perez and Can Bilsel

City heights is a community within the city of San Diego, containing potential for further housing and city development. Within this metropolitan area of San Diego there contains an urban ecology which is not being utilized in a way to enhance the area’s conditions. Author Wolf Mangelsdorf created the idea of a “metasystem” which introduces an idea that I utilize to compose an architectural thesis hypothesis for the development of City Heights. “When regarded as a whole, the flows of a city- made up of people, water, energy, information, materials and waste- constitute a large and complex ‘metasystem.’” With a successful flow and metasystem within a city, there is then the opportunity for human activity, change and adaptability. I have begun to depict the four existing canyons and the urban ecology of these natural canyons, which are located in the southern region of City Heights. The canyons themselves are not being utilized to their full potential. I hypothesize that dissecting the existing conditions of the canyons, Swan Canyon in particular, can give a basis to start an intervention within the neighborhood that can help enhance the city conditions. These canyons are surrounded by urbanization; however, using the human hand to “naturally urbanize” these canyons the space can be utilized for human interaction with the land. Bridges, walkways, bike trails, observatories, museums and/or designated parking are some urbanization ideas that when incorporated into or near the canyons, can lead to further city improvement.

A Survey and Analysis of the Fragmentary Ceramic Artifacts of the David W. May Collection

Caitlin Doherty and Timothy Gross

The David W. May Collection came to the University of San Diego in 1994, following the death of Zama May, mother of David May, a former student at the University. At the time, the collection included over 1,660 Native American, and specifically southwestern, artifacts from the family’s private collection. The University has since sought to supplement the collection with its own acquisitions and, as a result, the May collection now contains over 2,000 artifacts and modern works of Native American art. However, a great deal of the collection not counted among these artifacts remains in storage space at the University and has been largely unexamined. Among these resources are dozens of bags of potsherds, mostly of southwestern origin. While several of the bags contain the pieces of a solitary vessel, a bag labelled M-93 contains 149 sherds from approximately 100 separate vessels. In the first phase of the project, the student has taken an inventory of the contents of these bags, identifying the cultural origin of the sherds, and ultimately has attempted to reconstruct any vessel for which sufficient pieces are present. In doing so, the fragments have become useful toward the educational mission of the collection. In a secondary phase, a software program (DStretch), originally designed to enhance the visibility of faded pigment of pictographs will be tested for its ability to enhance partially obscured primary-use designs on southwestern pottery.

Simulations of the Microcirculation in the Human Conjunctiva in Healthy and Diabetic Patients

William Dow and Frank Jacobitz

The microcirculation includes the smallest arterioles, capillaries, and venules with vessel diameters ranging from 8 to 150 μm , and it represents a region where active and passive exchanges of nutrients and metabolites take place. Analysis of the conjunctiva microvasculature based on observation and limited quantitative analysis has proven to be successful in identifying changes associated with diabetes, hypertension, sickle cell anemia, and other vascular related disorders. This study uses a simulation code, which includes measured morphometric data, projected mechanical properties, and dynamic information, to compute the flow in different regions of vessel networks. The conjunctiva of one healthy and one diabetic patient have been simulated, with the goal of predicting disease states through a comparison of diameter, pressure, and vessel curvature distributions. The vessel curvature was calculated as the ratio of the total vessel length divided by the straight line distance from start node to end node. A value equal to one denotes a straight vessel with no curvature. The healthy network has a mean of 1.12, maximum of 3.32, and population standard deviation of .28; the diabetic network has a mean of 1.21, maximum of 11.33, and population standard deviation of .87. The data shows that the diabetic network has more curvature and a broader range of values than the healthy network; this may be a useful measure to distinguish healthy and diabetic patients.

Dopamine Modulation of Decision Making in *Drosophila Melanogaster*

Alyssa Eash and Divya Sitaraman

Even with the growth of research in the field of neuroscience, there is still little known about what drives organisms to make the choices they do. In humans and other complex species, many environmental and genetic factors can influence a single choice, so we must turn to a simpler organism in order to study the process of decision-making. For many insects, the location of egg-laying has a large impact on the success of the next generation and is influenced by both environmental and innate factors. This holds true for the *Drosophila melanogaster* as they exhibit a natural preference or avoidance for certain substrates when laying eggs. The female *D. melanogaster*'s egg laying motor program may thus provide a measurable behavioral output that results from a simple decision-making process. This then leads us to our question: what neurons or neural circuits are involved in regulating this choice behavior? Dopamine is important for a variety of functions, including motor control, motivation, and reward, but more specifically in *Drosophila*, it helps regulate the egg-laying motor program. There are approximately 200 dopaminergic neurons in the fly brain, divided into 21 clusters based on morphological and functional similarities. We will use high-resolution cell specific targeting tools to manipulate these neurons and test a function in the egg-laying paradigm. Results from these assays will illuminate the role of dopamine in decision-making.

Defining a Refugee

Katrina Eckweiler and Gary Gray

“Defining a Refugee” does not only express the hardships of seeking refuge in the United States of America but it also conveys how the process, in turn, will define the life of the asylum seeker. This process is unbeknown to many people and has gone overlooked by American citizens for decades. My internship at the Trans-Border Institute has shown me how imperative it is to fight for the lives of immigrants and asylum seekers. I hope to be able to share my research so that others can know the problems and difficulties this country faces in regards to asylum and so that others who are interested can begin to inform themselves and help with the cause.

Internship in Mayor Kevin L. Faulconer's Office: An Inside Look

Cameron Edinburgh and Don Giaquinto

My name is Cameron Edinburgh and I am a policy intern in the Mayor's Office in the City of San Diego. As an intern, I have the distinct pleasure of working on projects that directly affect my local community- this is an overwhelming but highly rewarding part of the job. It is an honor to serve the community and to represent the Mayor through written correspondence and even some interaction with local businesses. The areas in which I have been working thus far include military and veterans' affairs, volunteer services, and community outreach. Specifically, I work under the Director of Protocol, who holds a position that demands a great deal of flexibility, as it presents new obstacles to overcome every day. Mayor Kevin Faulconer's commitment to cooperation is made evident by the way he empowers those working for him. From my first week on the job I was challenged to rise to the standards of a highly functioning municipality, and as a result I have experienced tremendous growth in just a few short months. Attending City Council meetings has allowed me to witness the way in which bureaucracy operates on a micro scale. Additionally, it has been a beneficial learning experience to observe the way the Mayor interacts with the local legislature. As I progress in my internship and develop the critical skills becoming of a political scientist, I hope to work on some of the more high profile issues that the office encounters.

Redeveloping Redevelopment

Madeline Entrikin and Daniel Lopez-Perez

Beginning in the 1960s and continuing to present day, the United States and Europe have been greatly affected by the process of deindustrialization. The driving force behind this concept of deindustrialization is the rapid growth in manufacturing industries in developing countries, thus displacing work from advanced economies. Consequently, advanced economies have seen an increase of employment in service industries. The fact is, if a job can be outsourced for cheaper pay, than that job is in grave danger of becoming extinct in advance countries. Although the economic and social side effects of deindustrialization are a large concern, another issue is the wasteland left in a post-industrial city. The city of Portland is not a stranger to this stage of redevelopment; while regions have flourished into successful neighborhoods, other areas of the city remain stunted in a postindustrial state. The South Waterfront development of Portland is attempting to develop one of these postindustrial sites into a sea of high end condos, with a plan to construct 26 towers by 2024. As this neighborhood is wedged in between the Willamette river and the freeway it has potential to become an island utilized only by the residence who can afford to live there. My intervention will redevelop this redevelopment in an attempt to nit the fabric of the city of Portland with the neighborhood of the South Waterfront.

Development and Use of a Quartz-Crystal Microbalance for Nanoporous Film Mass and CO₂ Uptake Measurement

Emilio Evans-Grijalva, Elizabeth Webster, Fangyuan Tian, and Lauren Benz

Our project entails finding ways to use nanoporous materials in environments to slow the process of global warming. To do so, we are developing a quartz-crystal microbalance instrument to measure how much carbon dioxide a hybrid nanoporous material called "ZIF-8" adsorbs. We are in the process of constructing a vacuum chamber to house the experiment in a low temperature, low pressure environment. We have also performed experiments to determine the mass of the ZIF-8 itself, so we can calculate how much carbon dioxide is absorbed on a per mass basis. This project is at the interface of chemistry and engineering.

An Unfinished Story: How Did Mark Intend to Conclude His Gospel?

Justin Fabian and Eugenia Constantinou

The Gospel of Mark concludes like no other gospel, and does not fit even the most liberal conventions of ancient literature. For over a century Biblical scholars have attempted to make sense of the abrupt cliffhanger of the final verse, 16:8. The consensus originally held that Mark did not intend to conclude his gospel on that fateful verse, but that he either died before its completion, or, more likely, the original document was damaged and the original ending was lost. Later, in the rise of “reader response” literary interpretation, the tide of scholarly opinion overwhelmingly overturned. The contemporary consensus now holds that Mark did indeed intend to conclude his gospel with verse 16:8. On the contrary, this thesis demonstrates that Mark did not intend to conclude his gospel with verse 16:8, based off of the literary and historical context of its original writing. By looking at the major arguments for and against intended authorship of ending with verse 16:8, it becomes apparent that there is much more strength in favor of a lost ending. Meanwhile, the new change in scholarly consensus can be explained by the rise of postmodern Biblical interpretation and reader response methods, and not by newly found concrete evidence. This finding creates a profound impact on how we read the gospel. In conclusion, as meaningful as they can be, we cannot impose postmodern interpretations on the original author, and must take care to understand the author’s original intent in the context of a missing ending.

Synaptic Mechanisms Enderlying Learned Behaviors in Drosophila Larvae

Kevin Fain and Divya Sitaraman

One of the main goals in neuroscience is to demonstrate how observable animal behaviors can be predicted from complex neurological processes. It is commonly understood that genetic factors influence human behavior, but how can a scientist explain how these genes interact with countless environmental stimuli to produce behavior? The complexity of the human brain would make it impossible to determine how each structure influences behavior, so the spotlight was brought to a simpler model organisms first. Model organisms typically express some complex neural structures within a simpler, more easily organized brain. *Drosophila Melanogaster*, for example, use olfactory systems that are strikingly similar to those of humans and other mammals. Eventually mapping out the structures and functions of the insect olfactory system, will enable conceptualization of conserved mechanisms underlying learned and innate behaviors. By associating various odors with food reinforcement in a classically conditioned learning paradigm we will demonstrate how the absence of these structures and/or biological processes alters behavior. Larvae mutated against expression of specific genes involved in synaptic plasticity will be tested according to the same learning paradigm as genotypic controls and wild type *Drosophila* larvae. Observable behavioral differences between mutant and control groups will be presented to elucidate the role of synaptic plasticity in adaptive behavior.

What's in a Phase? How Millennials Are Defining Emerging Adulthood

Leanne Falzon and Lisa Nunn

This project explores the ways in which millennials use online, blog-style media to define the new life phase of emerging adulthood. This phase was theorized by psychologist Jeffrey Arnett, who suggests that we are not only taking longer to reach the milestones of adulthood, but are actually in an entirely new stage of life in our twenties. By conducting a content analysis of articles that describe and define the twenty-something phase, written by both emerging adults themselves as well as more formal, adult-centered news sources, this research attempts to locate the social, political, cultural, and economic characteristics of emerging adulthood. Comparisons between the two types of media identify congruencies and incongruencies between social expectations of the stage and lived experiences of the stage. Central to the data is the theme of ambiguity, and the difficulties of navigating a phase of life without any of the clear cultural instructions we are familiar with.

Architecture + Agency in City Periphery Mass Housing Developments: The Case of TOKI Kayaşehir, Kayabaşı, Istanbul, Turkey

Sou Fang, Daniel Lopez-Perez, Can Bilsel and Adriana Cuellar

Kayabaşı, a concentrated residential neighborhood of single-use high rise towers located on the west-end periphery of Istanbul, Turkey, offers a snapshot of the recent architectural and urban developments in Istanbul. On one hand, the logic of globalizing the city has been animated and driven by top-down political ambition, being, the production of the city as a real estate proposition. On the other hand, the notion of the city as a public domain concerned with the common good has reinforced necessary alternative models of development away from the mass housing superblock. With socio-economic and political forces driving rapid urbanization and urban transformation, people with little to no capital in informal developments and city centers, at-large, are displaced from their homes and pumped into a mortgage-based market through government subsidized mass housing on the periphery. Yet, these peripheral developments are located in far proximities to city centers, jobs, education, healthcare, and other forms of access. In the case of Kayabaşı, we find a conglomerate of single-use residential towers (government subsidized mass housing). The picturesque scene provides two futures: 1) the end of public life as we know it, or 2) the beginning of an urban renaissance. This thesis seeks to imagine the latter by reverse engineering the single-use tower through an urban imaginary, in which an urbanization over time through the architecture and agency of the people turn the existing conditions into an urbanity at the scale of the locality.

Collaborative, Sustainable, and Community-Based Change: Creating a Holistic Model for the USD Medical Brigades

Stephen Ferraro, Robert Brewster, Sarah Adams, Emily Wang and Kevin Guerriero

The USD Medical Brigades have been participating in service trips to rural regions of Honduras, Nicaragua, Panama, and Ghana since 2010 with the support of the student-led, non-profit Global Brigades (GB) organization. Through the years GB has developed a holistic model, which includes ten different types of brigades: (Medical, Dental, Water, Architecture, Microfinance, Human Rights, Public Health, Environmental, Engineering, and Business). A key feature of GB's approach involves direct collaboration with community leaders in the rural areas in order to assess the needs as well as the interest and willingness of the different communities to work together with GB. This collaborative focus is paramount to the long-term success of the project, in which the implementation of multiple brigades ultimately leads to a situation of complete self-sustainability and the departure of GB from a given community. This Creative Collaborations project is based on the development of a "curriculum" for the USD Medical Brigades that helps link the aforementioned holistic model of the Global Brigades with both the academic and intellectual climate of USD and local and international communities. Ultimately, we hope to have a curriculum with "student learning outcomes, readings, research assignments, written and oral reflections, and co-curricular activities" that can be used every semester in preparation for each brigade. It is our premonition that combining the traditional classroom-based academic coursework with hands on projects and community involvement will further catalyze and compliment the mission and values of USD. In this way, the USD MB will function in a more holistic and sustainable manner and, potentially, become an even stronger example of "changemaking" at USD. The MB's academic advisor, Dr. Guerriero, has been guiding us on this project, and he will continue to work with us "as we prepare for our next brigade to Honduras this summer" and thereafter.

By My Side: Level of Social Support Affects the Negative Emotional Outcomes of Rejection

Ingrid Filakousky and Jennifer Zwolinski

Social rejection threatens an individual's fundamental needs and negatively affects mood (Sommer et al., 2001). Although numerous studies have shown that active social support alleviates physical pain (Brown et al., 2003; Master et al., 2009), less research attention has been given to whether active social support alleviates the emotional pain of rejection. The current study examined whether level of support from a close friend attenuates the negative emotional outcomes of peer rejection. A total of 31 primarily Caucasian (58.1%) female (80.6%) freshman year (61.3%) students brought a close friend to the study. All participants were exposed to the Future Alone rejection paradigm and were randomly assigned to either receive social support (52.7%) from the friend during rejection or to be separated. Participants completed the Aversive Impact Inventory to examine post-stressor levels of fundamental needs (e.g., belonging, control, meaningful existence, self-esteem) and mood. ANOVAs indicated that rejected participants with the supportive presence of a close friend reported less thwarted fundamental needs, $F(1, 28), 10.18, p = .004$, more positive mood, $F(1, 30), 11.85, p = .002$ and less negative mood, $F(1, 30), 11.74, p = .002$, relative to participants who were alone. Although all participants experienced the rejection stressor, the actively supported participants reported feeling less rejected than unsupported participants, $F(1, 30), 9.00, p = .005$. These results suggest that active support from a good friend mitigates the emotional distress of rejection more so than the presence of a close friend in an adjacent room.

Investigating Emotional Deficits in Autistic Infants

Alanna Flynn and **Isabella Mutschler**

Autism Spectrum Disorder (ASD) is defined by socio-emotional deficits. On this background, the goal of this research was to investigate emotional deficits in autistic infants with regards to interpersonal relationships in comparison to healthy controls. Some research suggests that the prevalence of ASD is increasing. The data of this study has been acquired at the University of California San Diego Autism Center of Excellence. One main goal of this center is to identify early indicators of ASD in infants (1-3 years of age), which could lead to earlier treatment and better therapy techniques. The current study used the Vineland Adaptive Behavior Scales to compare parent-reported socially adaptive behaviors in young autistic infants and in healthy controls.

Settlement of Barnacle Larvae Within the Southern California Rocky Intertidal

Diana Fontaine and **Nathalie Reynolds**

Barnacles release larvae from where they are attached in the rocky intertidal, so that their young develop in the coastal ocean. These larvae, called nauplii, remain offshore and grow through multiple stages, eventually metamorphosing to the last larval stage called a cyprid. Cyprid larvae must be transported from offshore waters back to the intertidal, find a suitable habitat on which to settle in the rocky intertidal, attach to the substrate, and metamorphose into a juvenile (metamorph). Thus, by tracking barnacle settlement we can infer which oceanographic conditions promote successful transport to the rocky intertidal. We measured daily settlement of barnacle larvae in the rocky intertidal of Southern California from April-July 2014, and October-January 2015 to see if barnacle settlement varied seasonally when different oceanographic conditions occurred. There were 12 sites within the rocky intertidal, and at each of these sites, PVC settlement plates were bolted to the rocks. Every day, plates were collected, replaced with a clean plate, and brought back to the lab where they were examined under a microscope for total number of barnacle metamorphs. We compared settlement to water temperature, which is indicative of oceanographic conditions. Settlement was higher during the spring-summer months than in the fall-winter months, and peaks corresponded to changes in water temperature when oceanographic fronts may have delivered cyprids to shore.

Juice on Tap's Business Website

Jasper Forest, **Bonnie Cobarruvias** and **Eric Jiang**

In this project, we develop and design a website for the juicing company, Juice on Tap. The website will aid as a business promotion and client login database. The Juice on Tap business website will be designed to guide customers through their journey to purchasing a bottle of a customized, fresh, and delicious juice. It will have three main features for the customer: an "About the Company" section, the ability to subscribe to a weekly subscription of fresh juice, and the ability to design a customized juice. The desired outcome of Juice on Tap's business website is to provide customers with a quick, efficient, and enjoyable experience of purchasing Juice on Tap's juice. The purpose of this project is to gain experience in web design and programming. We believe a working website will be a great addition to our portfolio to demonstrate our work to future hiring companies.

51st Congressional District Internship In Review

Jazmin Yania Garcia and Gary Gray

The 51st Congressional District Office located in Chula Vista, California is a federal government office available for constituents of the district to be able to receive any aid with issues at the federal level. Staff members of that office work at the discretion and on behalf of the elected representative of that district and offer services such as; proclamations, letters of support, and serve as intermediaries between federal agencies and the constituents if they are not being served properly. The primary objective of this internship is to understand the obligations of an elected representative and understand the purpose of a Congressional District Office. This has required knowledge of the differences between local, state, and federal policies and agencies. Furthermore, I came to find the necessity of a Congressional Office and became aware of the benefits that surely outweigh the costs of a District Office.

6 Million people, One Voice: A Study of the Catholic Church's Role in Filipino Political Society

Garrett Gaughan and Mike Williams

This paper explores the role the Catholic Church has in Filipino society and how that role has effected the political process in the Philippines. It is the position of this papers that the nature of the relationship between the Church and the Filipino people has allowed the Church to become what Joel Migdal calls a “strongman” within civil society, i.e a social actor working within the society that has gained enough legitimate political authority to challenge the state’s monopoly of political power. This relationship has grown out of historic roots of separation of Church and State as well as the shifting role of the Church as a provider and advocate of social-economic justice. From its position as a “strongman,” the Church is able to insert itself into the political sphere in everything from public policy, funding for public works and election results. The following paper will address the “strongman” relationship both theoretically and empirically. It begins with a more comprehensive look at Migdal’s theory presented in his work Strong Societies and Weak States, and demonstrates how strongmen are able to effect government policy. Next, using this theory in the context of the history of Church-State relations in the Philippines, it establishes how the Church became a strongman over the last couple of decades. Finally, using survey data collected in parishes in the Philippines, it provides empirical evidence of the mutually reinforcing social mechanisms that allow the Church to influence government policy via Migdal’s theory of the “triangle of accommodation.”

Sherman Oaks a Neighborhood Divided

Robert Genochio and Daniel Lopez-Perez

Sherman Oaks is a neighborhood of transition and division. Just over the northern side of the Santa Monica Mountains, it announces the beginning of the San Fernando Valley. Furthermore, it is an area visibly divided by the Ventura Blvd, 101 Freeway and L.A. River, each splicing their way across the neighborhood and delineating a clear north and south division of wealth. My thesis will engage with these physical conditions and focus on the potential of the river as a resource for social mediation and urban renewal. Borrowing from Reyner Banham's, "Los Angeles: The Architecture of Four Ecologies," which reduced the experience of the city to life in the "Foothills," "Plains of Id," "Surfurbia," and "Autopia," I argue the L.A. River poses a fifth ecology. Unlike any major city in which the waterfront is an area of both social and economic value, in Los Angeles the city has turned its back to it and dismissed it to be a concrete wasteland, a scar built into the urban fabric. However, community efforts and a city revitalization plan have enabled significant investment into restoring the river ecology and providing continuous public access. In a city lacking sufficient green space, the L.A. River presents an opportunity to introduce miles of greenway to the urban environment, a natural spine to grow around. I will investigate the city's unique morphological response to the conditions surrounding the river, 101 Freeway and Ventura Blvd in order to map the physical forms of division in Sherman Oaks.

Jewish Assimilation in San Diego: Congregation Beth-El and Conservative Judaism

Arielle Gladstone, Colette Brokop, Sophia Gaffney and Evelyn Kirkley

Congregation Beth-El has become very integrated into San Diego politically, socially, and culturally. Beth-El prioritizes being good citizens and caring for the greater good over all else. They are members of a social action community within San Diego County. They work on the La Jolla Project with congregations of other faiths and provide aid year-round to homeless shelters. They also support the Western Workers Service Alliance, which provides services to low-income, working families (mostly African immigrants) in Normal Heights. The synagogue has adapted this way because of its focus on Tikkun Olam, which means repairing the world. Outreach to all is the mission of the congregation, with particular attention to Jewish outreach. They emphasize being relevant, important, and interesting to all Jews. Without this relevance, their rabbi fears that Judaism will not fare well in the future; there won't be any young Jews promulgating the Jewish faith. Congregation Beth-El offers traditional worship that all synagogues offer, including Sabbath and daily services. But in an effort to broaden appeal, they also have yoga, hikes on Saturday, community bike rides, and numerous social events to connect people and build community.

The Sting of Rehabilitation: How the Routine Use of Pepper Spray in San Diego Juvenile Detention Facilities Violates Youth Rights

Taylor Glogiewicz and Erik Fritsvold

In comparison to national standards, evidence suggests that the use of oleoresin capsicum spray (“OC spray” or “pepper spray”) in San Diego juvenile detention facilities is rampant and callous. In 2014, the Youth Law Center and 10 different organizations filed a complaint with the Department of Justice asking for an investigation into the potential violation of youth’s constitutional rights in San Diego juvenile facilities. They stressed the fact that pepper spray is often used on those at risk of suicide, for failure to follow instructions, for room extractions, on medically contradicted youth, to excessive amounts, and as a first resort. This article will explore the topic of pepper spray in juvenile facilities in San Diego with an emphasis on constitutional law. I will argue that the SDPD’s use of OC spray violates youth’s rights under multiple standards. While physically and mentally dangerous, OC spray also engenders an atmosphere of mistrust and resentment within juvenile facilities, unduly impacting youth of color and those of limited English language proficiency. The complaint filed with the Department of Justice marks a unique opportunity for that office to force top-down and statewide change, unlike it has in the past dealing with issues county by county. Though any policy change away from the heavy reliance on pepper spray would be beneficial, the complete elimination of its use is not only possible practically speaking, but would represent the best course of action for the rehabilitation of youth into the future.

Effects of Deposition Parameters and Supercritical Carbon Dioxide Treatment on Surface Morphology and Electrical Properties of Pentacene Thin-Films

Steven Go, Brendan Gee, Robert D. George and Truc T. Ngo

This research is focused on improving the electrical properties of organic thin-film semiconductors, specifically pentacene. Pentacene is known for its potential use in flexible organic thin-film transistors in electronic devices with low cost and light weight advantages. In this work, pentacene thin-films are first prepared using the organic vapor phase deposition (OVPD) method, then treated with supercritical carbon dioxide (scCO₂) in presence of a molecular modifier, benzene-1,4-diboronic acid (BDBA). Potential effects of the scCO₂ treatment on film surface structure, morphology, and electrical properties are then evaluated. Pentacene thin-films are deposited at 3 different temperatures: 623K, 643K, and 648K, tested with two pentacene sources of different purity levels. Films then undergo scCO₂ processing with BDBA in presence of 4.6 mol% methanol, at 323 K and 90 bar. Scanning electron microscopy (SEM) and Fourier-transform infrared spectroscopy (FTIR) are used to characterize film surface morphology and structure. Film sheet resistance is also calculated based on electrical measurements made with a 4-point probe. Results show that purer pentacene source deposit films at a slower rate compared to less pure pentacene, especially at lower temperatures. This allows pentacene molecules to arrange themselves into a more crystalline and uniform structure, resulting in enhanced conduction. Further electrical data analysis is underway to determine the effects of scCO₂ treatment on film sheet resistance. The results from this study provide useful information to optimize the OVPD film deposition and scCO₂ treatment process to produce thin-films with desired physical and electrical properties for various electronics applications.

Invasion and Distribution Potential of an Invasive Sea Lavender in the Ocean Beach Salt Marsh

Daniela Goldsberry, Sadia Aziz and Bethany O'Shea

Coastal marshes and wetlands are important habitats for many native plant species in San Diego. In the Ocean Beach Salt Marsh, abundance of the endangered California Birds Beak (*Cordylanthus maritimus*) is decreasing while the invasive sea lavender (*Limonium duriusculum*) is becoming increasingly more widespread. Previous studies suggest that sea lavender abundance increases with elevation, however, the effect of sediment chemistry on sea lavender has not been evaluated. The purpose of this study was to characterize sediment physicochemical properties with time and sea lavender abundance throughout the marsh. A total of 54 sediment samples were collected from three regions representing a range of wetland vegetation dominated by the invasive species, the native species, or a combination of both. Sampling was repeated six times over the course of a year. The region of the marsh dominated by invasive sea lavender is characterized by the lowest sediment moisture (5%), the highest salinity (7,000 uS/cm) a neutral to slightly acidic pH (6-6.5), and excess sediment nitrate (mean NO₃-6.25 mg/L). The effect of grain size, nutrients (K, Ca) and metals (Cu, Pb) is being investigated. Results to date indicate that the invasive sea lavender thrives in topographically higher regions of the marsh routinely used for dog walking whilst the endangered birds beak is commonly found in the more swampy regions subject to less human and dog traffic. These findings may help contribute to future land use plans and protection of this sensitive section of the San Diego River and coastal marsh.

Steve Baer: An American Green Architect

Aaron Goldsmith and Colin Fisher

In the late 1960s and early 1970s, architect Steve Baer created revolutionary structures at the counterculture community of Drop City. From there he started Zomeworks, a sustainable building supply company. He also served on a number of government solar commissions. In this thesis, I will show that Baer made significant yet largely unrecognized contributions to the green architecture industry.

Uncovering the Effect of DNA Topology on the Mobility and Conformational Dynamics of Crowded DNA Molecules

Stephanie M. Gorczyca, Cole D. Chapman and Rae Anderson

Using single molecule fluorescence microscopy and particle-tracking, we examine the effects of crowding on the diffusion and conformation of large, double-stranded circular DNA molecules. To determine diffusion, we track the mean-squared-displacement of single fluorescent-labeled DNA molecules embedded in solutions of different crowding agents. Using image analysis techniques, we also characterize the conformational change (from random coil configuration) induced in DNA by crowding. Our previous studies with linear DNA crowded by dextran reveal crowding-induced mobility reduction of DNA, dependent on crowder size, and elongation of DNA random coils, dependent on DNA size. Here, we compare our previous results to those for circular DNA crowded by varying crowding agents including dextran, Ficoll and Polyethylene Glycol. We determine the dependence of circular DNA mobility and conformation on the level of crowding, molecular weight of the crowding agent, structure of the crowder, and DNA length (11-115 kilobasepairs). Thus, this research uncovers the underlying mechanisms responsible for observed DNA dynamics in crowded environments and biological cells.

Innovative Uses of Social Media for Professional Selling and Professional Relationship Building

Katherine Gordon and Carlton O'Neal

Social media is widely used for the purposes of marketing and selling. Over the past few years, companies have started using sites such as Facebook, Twitter, Instagram, and Pinterest as a tool to increase their sales and build a more personalized relationship with their customers. The purpose of this research is to discover the best practices of using social media for professional selling, what business decorum dictates, as well as what unexpected gaps of social media usage currently exist. I hypothesized that there are leaders in the sales world that have discovered innovative uses of social media. In order to test this hypothesis, I interviewed dozens of professional salespeople from various industries in order to record what sites are used most commonly, which are found to be the most effective, and which seemed to have the most potential for undiscovered innovative uses. The results of my research suggest that the best practices of using social media for selling are dependent on a variety of factors including the price of the product, age of the salesperson, age of the customer, and size of the company. I have concluded that there are several innovative uses of social media that have proven to be effective and profitable that can be adopted by salespeople as they see fit for their specific needs.

Analysis of Da Vinci Total Laparoscopic Hysterectomies

Granados Ana and Enrique Jacome

Da Vinci Total Laparoscopic Hysterectomies performed by Dr. Enrique Jacome over the course of 5 years were analyzed in order to assess the outcomes of robotic surgical techniques. Gynecologic aspects of the patient's pre-operative, operative, and post operative status were gathered and assessed. All candidates that received the surgical procedure were included. Statistical analyses from previous years confirm that the Da Vinci produces an overall better outcome than previous surgical techniques for hysterectomies.

The Effect of Metabolic Intensity on Basal Metabolic Rate in the Eared Grebe

Chyna Gray, Luis Estevez, Brent Allman and Hugh Ellis

The Eared Grebe is a diving waterbird with a complex migratory cycle that places this bird at several destinations over the course of a year. For most of the year, Eared Grebes are flightless while feeding on invertebrates in saline bodies of water. In the fall, the birds enter a period of their migratory pattern called staging, in which they begin rebuilding fat stores and molting flight feathers. During the grebe's time on the water, their digestive viscera are enlarged and their pectoral muscles become atrophied. When it is time to migrate to a different site, their breast muscles become enlarged and the size of their digestive viscera decreases drastically. This dramatic change in body composition should be accompanied by a change in basal metabolic rate (BMR) as suggested by the literature (Daan et al. 1990, Hammond et al. 2000, Vezina and Williams 2003). However, the Ellis lab has collected data that support a different explanation. The Ellis lab hypothesized that changes in the intensity of tissue metabolic rates accompanied changes in migratory stage and were more important than tissue size changes. To test this hypothesis, the Ellis lab performed enzyme assays to measure metabolic intensity in seven tissues of grebes with different body compositions. The enzymes used were citrate synthase (CS) and lactate dehydrogenase (LDH); we also began looking at 3- hydroxyacyl coA- dehydrogenase (HOAD) and pyruvate kinase (PK). Results to date support the thesis of the lab. Pectoralis (flight) muscle shows significant differences in CS independent of tissue size.

4TH ANNUAL VISUAL ARTS STUDENT EXHIBITION

APRIL 11 - 29, 2015

SHARI AFUSO
MICHAELA DAVIES
MURIEL ERCK
JILL GRANT
AMBER HALL
MADISON HARRIS
CHANDLER HUBBARD
KASSI KARABAICH
ZZ KREBS
SEAN RIVERA
ERIN THEODORA
MICHAEL VAN MIERLO
MICHELLE WINTERSTEEN

**STUDENT LIFE PAVILION EXHIBIT HALL
M-F 8 a.m.-11 p.m., S-SU 8 a.m.-11 p.m.
FREE ADMISSION**

**OPENING RECEPTION DURING
CREATIVE COLLABORATIONS CONFERENCE
ON THURSDAY, APRIL 16 12-2 p.m.**



SCULPTURE

ZAC APPRIORIO
The Contemporary Art

Handwritten text on a purple box, including the words "RECIPE" and "INGREDIENTS".

Handwritten text on a newspaper clipping, including the words "LIFE" and "ART".

Handwritten note with illegible text.

The Dichotomy of Public and Private Art: Examining the Representation of Women in the Work of Honoré Daumier

Rose Guth and Sally Yard

19th century French artist Honoré Daumier is best known for his lithographic satirical political cartoons, but he also notably depicted the everyday situations and toils of people in the streets of Paris for his own artistic pleasure. After being imprisoned for one of his more biting political caricatures, Daumier devoted himself to these portrayals of common people who, in his extensive oeuvre, came to embody not only their present epoch, but also revealed truths about human nature that have endured through the centuries. His quick hand as a master draughtsman gave him the ability to convey intense emotion in every stroke of a painting or line of a lithographic print, independent of his chosen subject matter. In this thesis paper I will look specifically at Daumier's representation of women in the two separate spheres of his work as an artist: public and private. Firstly, I will examine his public representation of women in his lithographic work for popular French satirical periodicals such as "La Charivari," which often characterized women as symbols of France. Secondly, I will examine Daumier's portrayal of women outside of the everyday audience in his private works that employed media including oil paint and watercolor, and often showed women as humble workers and mothers. By focusing in on two specific pieces by Daumier—one lithographic print and one painting—I aim to examine the conception, creation, and reception of both his personal and widespread work in order to gain a better understanding of Daumier's artistic practice and the artistic perceptions of women in 19th century France.

The Regulation of Differentiation of *Rhodospirillum Centenum* into Motile and Stationary Cell Morphologies

Amy Hammond and Terry Bird

The bacterium *Rhodospirillum centenum* may differentiate into motile cells or dormant cysts in response to nutritional stress. We have conducted chemotaxis assays on a defined semi-liquid medium and found that *R. centenum* splits into subpopulations of motile and stationary cells. Furthermore, the motile and stationary cell types form stable lineages that retain their respective phenotypes even after culturing in fresh liquid medium. We are investigating whether the master transcriptional regulator, CtrA, controls the bifurcation of starving *R. centenum* populations. We employed RT-PCR to test the hypothesis that changes in CtrA expression level are responsible for maintaining bistable life stage transitions in *R. centenum*.

An Analysis of NHE1 Phosphorylation on Steady State Intracellular pH

Daniel Hasle, Mark A Wallert and Joseph J. Provost

The Sodium-Hydrogen Exchanger 1 (NHE1) is involved in cell scaffolding, mobility and intracellular pH (pHi) homeostasis in most cells. The C-terminus of NHE1 is phosphorylated by several protein kinases, each contributing to NHE1 function. While investigation of one or two sites have been conducted with various agonists, we do not have an understanding of how these sites coordinate or if there is a hierarchical phosphorylation regulation of NHE1. To determine the potential phosphorylation-dependent regulation of NHE1 on pHi, we focus on four protein kinases with known sites on NHE1; ERK 1-2, protein kinase B (AKT), RhoA kinase (Rock) and ribosomal s6 kinase (RSK). To measure the impact of these four kinases we will treat cells with three different agonists; lysophosphatidic acid (LPA), platelet-derived growth factor (PDGF), and phenylephrine (PE). We first determined the dose response for each agonist in fibroblasts deficient in NHE1 expression (PS120 cells) and in stable expressing human NHE1 in PS120 cells (PSN cells). To determine the role of each kinase on NHE1 basal activity, cells were treated with each agonist and steady state pHi was determined 15-20 min after addition of agonist. Increases in pHi of 0.18 to 0.2 were observed for agonists. The role of each kinase was determined by treating cells prior to agonist with a specific cell permeable kinase inhibitor (1uM MK-2206, 10uM BI-D1870, 10uM Y27632 and 0.5uM SCH772984). The impact of direct phosphorylation was determined for each agonist in cells expressing human NHE1 with Ser/Thr to Ala mutations for each kinase site. This work begins to identify the coordinated and role of multiple phosphorylation events on NHE1.

The Effects of Sustained, High-Velocity Exercise on Gene Expression in California Yellowtail (*Seriola lalandi*)

Kelli Hatter and Sue Lowery

California Yellowtail muscle fibers have been observed to exhibit two drastically different development patterns resulting from the speeds at which they are exercised. When fish are exercised at a moderate rate their muscle fibers grow in diameter-hypertrophy; when they are exercised at a fast speed, new muscle fibers are produced-hyperplasia. To determine the underlying reason for this difference in muscle development, our summer research project exercised fish at: fast, moderate, and control speeds for a sustained amount of time to determine what is happening on a cellular level to cause the observed differences. Specifically, we are interested in the role of both IGF and HIF transcription factors in influencing the hyperplasia observed after sustained, high-speed exercise. My hypothesis is that an oxygen debt is incurred in the white muscle fibers and this leads to hypoxic conditions in the tissue. If HIF is found to be present in larger quantities in the tissues of fish that were swam at fast speeds as opposed to the control and moderate speeds, we will be able to conclude that there are very low levels of oxygen in the muscle fibers and that the HIF transcription factor is influencing signaling pathways to induce a hyperplastic response.

Growth Rates of Ethnic Enclaves in the Los Angeles Metropolitan Area

Dana Heintz and Alan Gin

This research examines what characteristics of an ethnic enclave, or an ethnically homogeneous neighborhood, cause foreign-born individuals to locate in that area. The study utilizes a sample of ethnic enclaves within the Los Angeles Metropolitan Area from 2000 to 2010 to observe this social phenomenon. Social characteristics were obtained from the 2010 American Community Survey and the 2000 Decennial Census SF3 Sample Data about each particular neighborhood. The models focus on two primary ethnic groups: Hispanic and Asian. Between 2000 and 2010, two conclusions can be made. Overall, the concentration of foreign-born individuals decreased within ethnic enclaves. Additionally, English proficiency is inversely related to the growth of ethnic enclaves. This demonstrates that a strong presence of native language is a pull factor that results in more immigrants locating in that area. Public policy should focus on bolstering English proficiency for immigrants to assist their transition out of a parallel society, and into the national society.

Kitchen Religion: Comparative Research on Jewish and Buddhist Diets

Jane Henderson and Evelyn Kirkley

Followers of Judaism tend to practice a kosher diet. Kosher simply means what is right or fit, but now it refers to the laws about what food is permitted. These laws have their purpose in separating the people of Israel from the rest of humanity and protecting their culture. Orthodox groups say that because God directly ordains the laws, they need to be obeyed. It is seen as a way of honoring God by sanctifying them and their devotion. Dietary laws are associated with holiness and the mastering of refraining from desire. Similarly, Buddhist reasoning for keeping a vegetarian diet is because the Buddha commanded it as a way to practice compassion. One cannot live a satisfying life while also consuming meat. It inhibits an escape from samsara. Both Jews and Buddhists have inclinations toward vegetarian diets because of their reverence for all life. Animal suffering becomes a large reason for avoiding certain foods because eating them inevitably distances believers from their ultimate goals, enlightenment and the Messiah's arrival.

Swords, Samurai, and the Rise of Nationalism in Meiji Japan

Michael Herman and Yi Sun

In 1868, the Meiji Restoration marked a radical change in Japan as the country moved wholesale away from traditional Japanese culture and embraced western culture, technology, and economics. This shift especially effected the Japanese military. During this time, the Samurai class was widely disliked and effectively disbanded. The Imperial Army adopted Western military advisors and technology and completely redefined the image of the Japanese warrior. Instead of the discipline and honor that was required to be called a warrior before, the Japanese warrior was now defined by how well he could march and shoot a rifle. Ironically though, leaders of Japan's new modern imperial army soon began to wear swords which had resemblance of the swords of old and even later, began to carry newly manufactured samurai swords. My historical question is: why is this? The sword was the Samurai's chief weapon and even after the Samurai class is no more, we still see the influence it had on the country. My tentative thesis is that the sword is a window on how the military simultaneously hoped to modernize and westernize while holding on to their version of a pure, uncontaminated past as is so common in nationalist movements.

Preparation of Peptide-Starch Hybrid Materials for Biomedical Applications

Francisco J. Hidalgo, Peter M. Iovine and Joan Schellinger

Peptides serve as therapeutic agents that offer several advantages over small molecule drugs such as selectivity and biocompatibility. There are, however, still some issues involved in developing peptides as drugs such as decreased bioavailability due to enzymatic degradation. Several peptide modifications are being investigated which include covalent attachment of synthetic polymers such as polyethylene glycol (PEG) to improve the peptide's efficacy as a drug. Alternatively, studies involving polysaccharide conjugates as peptide modifiers are also being investigated to enhance peptides' stability, transport and immunogenicity. Our goal is to prepare novel hybrid biomaterials that contain both peptides and starch in the same molecule. The starch residue will increase the circulation half-life and the solubility of the peptides, and also render increased biocompatibility. Our synthetic strategy relies on the use of a modular platform with 3 building blocks: the starch, the peptide and the small molecule chemical linker. Each block will be prepared separately and attached by conjugation methods involving disulfide exchange and a novel dibromomaleimide chemistry. We anticipate these hybrid biomaterials will have potential applications in drug delivery and as therapeutic coatings on biomedical devices.

Environmental Social Activism in the San Diego-Tijuana Transborder Region

Christina Hirt and Julia Cantzler

This research examines the obstacles and opportunities social activists face when attempting to fight environmental injustices in the San Diego-Tijuana transborder region. The project undertakes a case study of the Environmental Health Coalition (EHC) - the leading environmental justice organization in the region, which operates on both sides of the US-Mexico Border. Using a qualitative case study design, structural and ideological obstacles to transborder collaboration were identified through primary and secondary sources, participant observation, and interviews with activists and experts. The analyses conclude that despite a strong rhetoric of binationalism employed throughout border activists' campaigns, the strategies that are utilized have been vastly local and short-term in focus. While activist organizations like the EHC demonstrate a keen awareness of the binational implications of environmental injustices and tout the benefits of a binational approach to addressing these problems, discrepancies are present due to obstacles that are economic, political and perceptual in nature. Ultimately, perceptions about environmental injustices as well as their character affect whether communities engage in local, short-term strategies to address immediate health concerns, or binational, long-term strategies that address the paradigmatic structures that underlie and perpetuate injustices. Key variables that shape community members' and activists' perceptions of environmental injustice include the economic situation that dictates individuals' priorities and their ability to affect political decisions, as well as jurisdictional inconsistencies caused by the physical and political nature of the border. These findings contribute to a relatively sparse body of literature on the dynamics of transborder environmental justice activism by demonstrating the strategic shortcomings that perpetuate a true lack of binational collaboration in the San Diego-Tijuana region.

Development of a System for Rapid Prototyping of Electrical Circuits Using Conductive Ink

Christopher E. Hodge, Ryan A St.onge, Adam F. Moreau and Ernest Kim

In the field of Electrical Engineering great interest has arisen recently in the fields of flexible electronics and rapid circuit prototyping. While current circuit prototyping options are often very costly, take a considerable amount of time and require dozens of harsh chemicals that can have devastating effects on the surrounding environment, our new design eliminates those three major factors by providing the end user with a cost effective, quick and green method by which circuits can be created and tested. We are utilizing a conductive Gallium-Indium 24.5 alloy as a base on which to design our system. The differing application methods for this alloy have been evaluated by a number of researchers including our team. We are building a fully automated X/Y gantry to drive our hydraulic atomizing spray nozzle with which we will be dispensing the ink alloy. We have been testing our conductive ink with a large variety of substrates and deformations to prove its acceptability for use as a trace coating. We have also shown how to make large batches of the alloy from raw materials for low cost, a key difference from other conductive ink alloys which can cost up to as much as 50 times more.

Building the Bogeyman: Teutonic, Russians, and “The Other”

Ryan Hogan and Colin Fisher

In the 1240s conflict broke out between the Teutonic Knights and the Orthodox Christian people of Medieval Russia. Why? With a similar religious background and shared economic interests, the two groups seem unlikely enemies. Through an examination of popular medieval culture - poems, songs, stories, and so on - I hope to illuminate certain features of the ideology of Crusade. Specifically, that this culture created an “other” - a repository for all things seemingly outside of Christianity - which is then cast in conflict against the European self. If we explore how this phenomenon functioned in the crusading world, we can better understand what ideological forces may have influenced the Teutonic Order's decision to attack Novgorod. Ultimately, I hope to demonstrate that the Europeans of this time would have seen themselves as part of an ongoing struggle of what might be called “bad worship” and , in light of this fact, attacking and converting the people of Novgorod would have been viewed as a natural part of this process.

A Study of Slider-Crank Mechanism Optimization

Aaron Huott and Ming Huang

The slider-crank mechanism is a simple device that converts translational motion to rotational motion. This mechanism is commonly used in kinematic and dynamic motion analysis problems because of its simplified geometry and straightforward process. It is found most commonly used as a pneumatic piston used to translate gas energy into rotational energy for movement. Creating a design program to model the motion of the system can provide information about the system's efficiency and energy output. Prior research conducted by Eres Soylemez was focused on deriving equations to model the mechanism through complex algebra and vector loop equations to create a way to model the system motion given the stroke, working stroke rotation and offset of the system. This research study builds upon Soylemez's research to further examine the properties of the system and see if there is a simpler design process to model the mechanism. The output of the system will be derived from kinematic and geometric constraints. Once simplified, further optimization and control can be added to improve the overall design. Using MATLAB software, an iteration can be created to model the workspace and find the maximum transmission angle that optimizes the systems efficiency. An optimal design for a given input stroke, working stroke and offset to the system will be demonstrated.

Ambiphilic Phosphine-Substituted Boronate Esters

Nick Huynh, Shawn Wright and Timothy Clark

Ambiphilic phosphine-substituted boronate esters have significant potential as precursors to phosphine ligands, as bifunctional ligands, and as catalysts in small molecule activation. New methods to access a variety of scaffolds containing both a phosphine and a boronate ester would be a valuable way to access these useful compounds. The selective phosphine directed C-H borylation provides direct access to these intermediates using an iridium pre-catalyst without the use of an added ligand. Moreover, a complimentary route to achieve ambiphilic phosphine-substituted boronate esters has been developed through the C-H borylation of protected phosphines (non-directed). The protection of phosphine substrates is done with the use of a masking group (borane/BH₃), and is necessary to achieve the complimentary ambiphilic molecule with with opposite regiocontrol. The non-directed C-H borylation requires an electron-rich ligand, 3,4,7,8-tetramethyl-2,10-phenanthroline (TMPHEN), to achieve the desired C-H borylation. The substrate scope and proposed reaction mechanisms will be discussed.

The Vocal Repertoire of Hawaiian Short-Finned Pilot Whales and its Implications on Speciation Status

Alaine Ibarreche and Amy van Cise

Pilot whales are cetaceans in the family Delphinidae, with other species of dolphins and toothed whales. Despite having a complex social structure similar to those of their highly-studied relatives, little is known about the short-finned pilot whale vocal repertoire. Past studies (Sayigh et al., 2013) have indicated that repeated call types comprise a large portion of both individual and intra-population vocalizations. The IUCN Redlist currently lists short-finned pilot whales as a "Data Deficient" species, indicating that more information is needed to determine the extent of heterogeneity between populations. Because most threats to short-finned pilot whales are regional, such as hunting in Japan and ship strikes in Hawaii, determining if/where speciation groupings lie will lead to better conservation efforts targeting specific populations with particular risks. Research done at the Scripps Whale Acoustic Lab has been looking into the range of recorded call types, and the implications this can have on the speciation status of short-finned pilot whales. My research focused on categorizing the Hawaiian short-finned pilot whale vocal repertoire, concentrating on the most commonly repeated call types. These results will then be compared with the vocal repertoires of Eastern and Western Pacific populations to determine if any inter-population communication differences exist. If these differences are sufficient to deem regional short-finned pilot whale groupings as separate sub-species, specific conservation action may be required with certain sub-species under high threat.

Geogenic Concentrations of Seventeen Metals in the Torrey Sandstone, San Diego, CA

Dillon Itri and Eric M. Cathcart

The Embayment area of San Diego County contains 17 recognized formations. The geogenic metals concentrations within these formations has not been adequately assessed. In this study, we present the results of over 50 in-situ geogenic soil samples from the Torrey Sandstone Formation of San Diego, California. All of the soil samples were analyzed for metals following EPA 6000 / 7000 Series Methods on an ICP Mass Spectrometer. The 95% UCL for 17 metals was calculated using the statistical software package ProUCL. The EPA Region 9 Soil Screening Level for Arsenic at residential sites is 0.67 mg/kg. Our results show the Arsenic concentrations in the Torrey Sandstone exceed this and other commonly used health risk soil screening levels utilized by many regulatory agencies in California. Understanding the range of geogenic metals concentrations in sediments provides crucial information that regulatory agencies need to determine remediation thresholds. Additional research is needed to assess the bio-availability of the Arsenic, the potential impact to human health and the environment, and the impact these results may have on current regulatory thresholds for assessing soils on residential and commercial properties in San Diego County. Further research is currently underway to identify the range of concentrations of metals in additional formations throughout the San Diego Embayment.

Characterizing Binding Determinants for Acetylation of Histone H4 by Hat1 Acetyltransferase

Barbara Ivos, and Robert Dutnall and Joseph J. Provost

Histone acetyltransferases (HATS) are a family of enzymes that interact with histone proteins, which work together to unwind DNA in chromosomes via transfer of acetyl groups onto amino acid lysine from the histone. Hat1 is a particular enzyme that binds with the H4 histone protein, and its interaction with the peptide tail of H4 is an important area of study as it may play either a direct or indirect role in the expression of genes. Understanding the specificity of the Hat1 binding interaction may aid in better understanding of why some diseases arise. Through analysis of yeast Hat1 and synthetically produced histone H4 peptides, the activity of the enzyme is compared with various peptide tail lengths of H4. It has been found that residues (amino acids) 1-7 of the tail either play an indirect or direct role in the binding interaction process. It is difficult to fully understand this interaction until specific residues are taken out, and whether or not their removal will directly or indirectly affect Hat1 activity.

The Relationship Between Anxiety and Working Memory

Yeung C.S. Jackson, Amir Nader and Suway Jenna

Worry is characterized as repeated negative emotional experiences regarding plausible future events. But when symptoms become chronically unmanageable and excessive, it can lead to significant impairment, such as hindering a person from completing simple daily chores, work, school, sleep etc which, are also features of generalized anxiety disorder (GAD) (American Psychiatric Association et al., 2014). For these reasons it is important to understand what factors contribute to the difficulty of controlling worry in highly anxious individuals. For example, anxiety is associated with reduced working memory (WM) capacity (Eysenck, Derakshan, Santos, & Calvo, et al., 2007). According to Baddely and Hitch's model of WM (Baddeley et al., 1986), it is the limited storage for temporary sensory information that is further processed for the performance of a task. In one recent study, high worrying undergraduates showed a decrease in WM when actively worrying compared to when thinking about calmer topics (Hayes & Hirsch et al., 2008). This has also been replicated with adolescents (Owens M et al 2012; Trezise, K., & Reeve, R.A., et al 2015) but not with clinically anxious adults. In the current study we examined WM in 80 patients with GAD and used the Hamilton Anxiety Rating Scale (HARS) to assess anxiety symptoms. Our measure of WM was the random number generator (RNG) task. Preliminary results show a significant correlation between working memory capacity and anxiety, $r(80) = .25, p < 0.02$, suggesting that WM is related to anxiety in this population. These results suggest that treatment focused on WM enhancement may benefit individuals with GAD.

Innovating Web Applications

Jeremy Jacobson and Eric Jiang

The goal of the gluon framework is to provide a way for web developers to easily build web applications by defining a structure for their application, connecting of different services and systems into a homogenous application while writing little to no code so as to not complicate the process. In this project, I use the framework to create an interactive web application where users can upload and collaborate on different files with support for commenting and versioning: a social dropbox. This application, like many others, is focused on user interaction where data can be viewed and changed simultaneously by different users—a modern web application. As developers, we need to keep up with the pace of the Internet and the gluon framework is a perfect example of adapting to meet the changing needs and demands. Using this tool, one can develop web applications more effectively and efficiently.

From Pong to Call of Duty: the Evolving Stance on Violence in Video Games

Patrick Kallas and Colin Fisher

My project entails the study of how video games have been viewed in the academic community, and how this view has changed over time. To study this, I will be looking at what has been published in scholarly journals, educational books, and dissertations within various fields of study, such as psychology, health, and education. My thesis is that initially in the 70s and 80s, scholars had a fairly positive view of video games. Early academic works held the belief that video games could be used as educational material, such as helping children learn, studying diseases, studying the brain, and testing computers. After several highly publicized school shootings in the 1990s and popular outcry linking video games and violence, many scholars began to take a more critical look at the effect of these games. Other scholars responded by challenging these results and showed that there was no link between video games and violence.

Convertible Arbitrage: A Mathematician's Perspective

Nadia Karimenko, Samantha Armstrong, Carolynn Stuart and Cameron Parker

We will investigate the behavior of convertible bonds. First, we will mathematically model when a convertible bond is acting like a bond versus when it is acting like a stock. Then, we will focus on the most accurate way to determine the optimal price in order to know when we have opportunity for arbitrage and how to execute the strategy. We will do this by studying convertible price behavior, including the Black-Scholes equation, and the Binomial Option Model, and determining which of the variables, simplifications, etc. in each of these equations are most important in determining the most accurate price for a bond. Lastly, we will determine the most precise point in time in which we have optimal opportunity for convertible arbitrage in a fluctuating market.

Plan Myanmar: Drug Production & U.S. Policy

Alexandra Kearns and Randy Willoughby

This project is focused on the production of illicit drugs in Myanmar, specifically heroin, and the potential United States policy towards this illegal industry. A comparative approach to the United States driven Plan Colombia will be taken to explore whether a similar endeavor would be successful in Myanmar. Aspects of the illegal economy of opium in Myanmar will be examined in comparison to similar qualities in Colombia. There will also be a discussion on why the United States has not created a "Plan Myanmar," and if there is a potential for one in the future. Historically, Myanmar was a part of the infamous Golden Triangle, and although this area is no longer the world's leading opium producer, Myanmar has remained a continual player in global opium production as the second largest producer in the world. Beginning in 2013, the United States began to provide counter-narcotics funding to Myanmar, but nowhere near the scale of Plan Colombia. As Asia grows in importance as a region, awareness of the illicit drug economy of Myanmar will need to increase as well.

Occupy

Anna Keig, Can Bilsel, Adriana Cuellar and Daniel Lopez-Perez

Influenced by the protests and events taking place in Taksim Gezi Park in Istanbul, Turkey in 2013, my thesis project has developed into an understanding of political protests and their environments. From 1989 in Tiananmen Park in Beijing, China to current protests in Place de la Republique in Paris, France I have identified seven international locations that have demonstrated similarities in events: "Tiananmen Square" Beijing, China 1989 "Al-Tahrir Square" Cairo, Egypt 2011 "Puerta del Sol" Madrid, Spain 2011 "Syntagma Square" Athens, Greece 2011 "Zuccotti Park" New York, USA 2011-2012 "Taksim Gezi Park" Istanbul, Turkey 2013 "Place de Republique" Paris, France 2015. In my research I am finding the similarities in these locations and events with regards to the police interventions, size of parks, green space, and attempting to understand how the people located themselves there and why. With my research I am attempting to understand what an ideal public park would look like as it pertains to human occupation. The parks and squares studied give information as to why they were chosen as the location for the protest or event and attempt to predict how a population will occupy again. While there is no universal typology to the form of a public park, this research will become a template for new development in public space.

Investigation of the Effect of Mutation on the Protein Channeling Mechanism of Malate Dehydrogenase Isoforms with Citrate Synthase

Lily Kha and Joseph J. Provost

Malate dehydrogenase (MDH) and citrate synthase (CS), two key sequential enzymes in the metabolic tricarboxylic cycle, are believed to interact to form a functional dimer in which oxaloacetate (OAA) is channeled between the two active sites. This mechanism of protein channeling, the direct transfer of OAA, allows for increased efficiency in the pathway due to the increased specificity for the interaction and an independence from random diffusion. This channeling interaction, however, is seen only with mitochondrial malate dehydrogenase (mMDH), not cytosolic malate dehydrogenase (cMDH). To better understand and define the necessary factors for this channeling interaction, we first analyzed the properties of the two isoforms of malate dehydrogenase. Sequence and structural analysis demonstrated several conserved domains between cMDH and mMDH, however, residues that were present in one isozyme that were not found in the other were more prominent. Despite these differences, docking simulations indicated that cMDH still had the ability to form a functional dimer with CS. Furthermore, computational characterization of the cMDH/CS and mMDH/CS fusion proteins indicated a difference in electrostatic surface potential where the cMDH/CS fusion displayed a more negative charge. Nonetheless, the residues of cMDH and mMDH have similar properties, suggesting that the proteins should interact with other proteins in a comparable fashion. Potential sites of mutation were obtained from these analyses, followed by the engineering of the primers needed to carry out the mutations. From these experiments, we begin the investigation of the necessary factors for protein channeling between MDH and CS.

ROV

Isaac Farias, Dan Hastings, Autumn Khalily, William Meyer, Andrew Perkins, Brian Schnaars
and Daniel Codd

University of San Diego Department of Environmental and Ocean Sciences does not have a device that can view and collect contents in the ocean, or on the ocean floor. The device aims to improve research and education for the students and faculty. The Department of Environmental and Ocean Sciences cannot afford a commercially produced ROV exceeding \$20,000. The purpose of our Senior Design Project is to design a remotely operated vehicle to meet the needs of the USD Department of Environmental and Ocean Sciences. The ROV will be operable to a depth of 100 ft with live video feed and sample taking capabilities (i.e., less than 2.5 in long). The power source will be a 12 VDC lithium battery that will apply power to four servo motors for forward/reverse and up/down movements. The ROV will have a maximum operation time of 30 minutes. The total cost of the ROV prototype is projected to be less than \$1700.

The International Criminal Court Through the Lens of History: How Local Narratives Can Avert the Current Crisis

Taylor Kilpatrick and Dustin Sharp

The International Criminal Court is at the forefront of the international transitional justice realm today. Despite its omnipresence, the court system faces harsh criticisms, evaporating legitimacy and a call for its removal that is gaining traction. At the epicenter of the ICC's crisis situation is the harsh dichotomy between global and local considerations, a debate that spans the entire history of the international criminal justice movement. By assessing historical tribunals as well as contemporary situations of atrocity, this paper seeks to address the absence of local narratives and involvement in the structure of the ICC. In particular, I explore the extent to which the tension between global and local exist in the legacies of the Nuremberg Trials, the International Criminal Tribunal for Rwanda, and the "Hybrid" Special Court for Sierra Leone, in order to understand the role of local involvement in building a more successful court system. The ICC is currently paralyzed by the dilemma of global v. local and I argue that this is a structural problem that can ultimately be overcome. By incorporating local practices and collaboration into the framework of the court, global and local interests have the potential to be complementary within the ICC. Looking forward, this effort towards local and global cooperation may allow the International Criminal Court to emerge from the current turbulence with a positive legacy.

Examination of Transformation of Post-19th Century Industrial Factories; An In-Depth Look into the Fiat Lingotto Factory and Its Transformation

Alara Kiratlilar and Adriana Cuellar

In post 19th century industrial cities there was an abundance of factories and industrial plants that were left unoccupied. As the functions of these cities shifted, the need for a successful architectural plan became clear. However there is various routes architects and planners can take when they are trusted with this transformation job. For my research I plan to examine whether this projects succeed or fail in their attempt in transformation. For the first phase of the research I examined the Fiat Lingotto Factory in Turin which was built between 1916 -24. However after production means were relocated the factory itself became obsolete and Renzo Piano was selected for its renovation. For the second phase of my project I plan to delve further in depth to Lingotto's relationship to the city of Turin and other industrial sites that are similar to it.

Psychology and Happiness

Brianna Kirkpatrick and Rebekah Wanic

I will be exploring the relationship between personality and happiness as it pertains to psychology. Researchers have found that the Big 5 Personality Inventory has connections with happiness; therefore, I will be expanding on this current literature with predictions and recommendations on happiness inducing behaviors and strategies. My independent variable is personality and my quasi-independent variable will be gender. I will be measuring happiness and happiness inducing behaviors as my dependent variable. To evaluate and assess both personality and happiness, I will be conducting survey research. The survey will consist of a brief demographics section, an abbreviated version of the Big 5 Personality Inventory, a modified Differential Emotions Scale to measure happiness, a scenario to assess participant's mood increasing strategies, and finally a self-report of their own happiness inducing behaviors. I believe that those scoring high on extraversion will also note more positive emotions during the last week, engage in more happiness inducing behaviors, and provide better strategies to increase happiness. Next, I believe that those scoring high on neuroticism will note more negative emotions during the last week, acknowledge less activity of happiness inducing behaviors, and rank less adaptive strategies to increase happiness. Also, I think those who report frequent engagement in happiness inducing behaviors will rank the mood increasing strategies better than those with less frequent participation in happiness inducing behaviors. Finally, I predict that females will report more variance in happiness with a greater combination of both negative and positive feelings of emotions during the last week.

Completing the Synthesis Pathway for the Coenzyme Tetrahydrobiopterin (BH4) in the Nematode *C. elegans*

Alec Knapp, Aleks Vitomirov, Joachim Laetzer and Curtis Loer

In animals, the coenzyme tetrahydrobiopterin (BH4) is required for synthesis of neurotransmitters including dopamine and serotonin that are important for normal nervous system function. The first two steps of BH4 synthesis are performed by the enzymes GTP Cyclohydrolase 1 (GTPCH1) and 6-Pyruvoyl Tetrahydrobiopterin Synthetase (PTPS). The final two steps of synthesis are typically carried out by Sepiapterin Reductase (SR), although other reductases can also perform the steps in some cases. We are studying BH4 synthesis and regulation in the model organism, the nematode *C. elegans*. Its nervous system is much simpler than that of a human or mammal, with only 302 neurons, but using mostly the same neurotransmitters. Although many aspects of BH4 synthesis in *C. elegans* are understood, including the functions of GTPCH1 and PTPS, there is no SR enzyme. We are using both computational methods to predict which reductase enzymes in *C. elegans* might be able to bind BH4-related molecules, and laboratory work with *C. elegans* reductase mutants to try identify the protein(s) that perform the final synthesis steps of BH4.

Overlooking the Introvert: An Analysis of the Effects of Introversion and Extroversion on Job Interviews

Caroline Knetsch and Robin McCoy

My research examines the personality traits of introversion and extroversion as defined by psychologist Carl Jung and instrumentalized by Katharine Cook Briggs and Isabel Myers Briggs as the Myers-Briggs Type Indicator regarding job interviewing within the business environment. Introversion and extroversion are described as attitudes based on where a person puts their attention and gets their energy. Extroverts are stimulated by having other people around, while introverts prefer to recharge through solitary activities. While roughly a third to a half of the population of the world has been identified as introverts, the business environment today seems to be intently focused on face-to-face interviews where interviewers fire off question after question and expect immediate and eloquent responses. The business environment is ever-changing, yet the standard interview process has remained the same for decades. My research will take a closer look at typical interview practices and how they affect people in their job search today. I will also examine the traditional business environment as a whole in order to determine which factors make certain environments more conducive to either the introvert or the extrovert. Ultimately, I aim to determine how companies can interview potential job candidates in the most unbiased way possible in order to create an inclusive business environment for all employees.

The Role of Response Regulator DivK in Encystment and Motility in *Rhodospirillum Centenum*

Joe Kraft and Terry Bird

The purple, photosynthetic alpha-proteobacteria, *Rhodospirillum centenum*, regulates changes in cell morphology through a complex phosphorelay. Previous studies of *R. centenum* suggest that the signal transduction system controls a master response regulator, CtrA, to affect transitions between motile vegetative cells and dormant, desiccation resistant cysts (Bird, Mackrell, 2011). Research into *Caulobacter crescentus*, a distant relative of *R. centenum*, has shown that DivK is an upstream regulator CtrA activity. The aim of this study was to determine whether the DivK ortholog affects life cycle transitions to cyst cells in *R. centenum*. A divK deletion strain was transformed with a DivK expression plasmid containing a fully functional divK, and then their chemotactic and encystment phenotypes were analyzed. Increased motility in the divK mutant with the empty plasmid suggests lower levels of encystment, and decreased motility in the wild type strain with the fully functional divK suggest greater levels of encystment. These results support the hypothesis that active DivK does indeed inhibit the phosphorylation of CtrA.

Determination of “Brown Carbon” Products In Glycolaldehyde, Methylamine, and Glycine Reaction Mixtures

Taylor Kress, Franco Faucher, Melanie Zauscher, Mellissa M. Galloway and David O. De Haan

Light absorbing particle-phase organic compounds, or “brown carbon,” are produced through atmospheric reactions involving amines and aldehydes, yet the products of many such reactions have not yet been identified. This project examines reactions between the common atmospheric compounds glycolaldehyde, methylamine and glycine. Using HPLC, UV/Vis, electrospray mass spectrometry, and fragmentation data, major products from the reactions have been identified as well as likely structures of highly conjugated, N-containing oligomer compounds responsible for light absorption. The formation of N-containing aldol condensation products suggests that atmospheric amines can serve as both catalysts and reactants in aqueous-phase chemical processing that produces brown carbon. Further work will include increasing product separation to more easily identify light absorbing, brown carbon products.

Distribution and Identification of Fish Eggs in an Internal Wave Transport Mechanism

Claire Kuelbs and Sue Lowery

Internal waves have been proven to transport invertebrate larvae onshore, but there has been little indication on whether internal waves transport fish eggs. Fish eggs are typically buoyant and are often found in neustonic samples, and internal waves often cause fronts that transport oils and other light particles. This research aims to determine whether there are patterns to the distribution of fish eggs. Before 2003, when genetic barcoding was proposed as an identification mechanism, fish eggs could only be identified visually, using color, size, and shape. However, this method can be unreliable, so this research utilizes the COI barcoding gene to identify fish eggs to a species in samples taken in the South La Jolla State Marine Preserve, an area known to experience internal waves. Samples were taken within internal wave events and also at times without internal waves. Simply based on abundance, fish eggs are transported via internal waves, as more fish eggs were found in internal wave samples than normally found in the sample area. Also, there are higher numbers of fish eggs were found in the surface and at the bottom. Further analysis is occurring to determine patterns based on spawning behavior, tidal period, or lunar cycle. General conclusions would state that internal waves do transport fish eggs, although it is presently unclear as to whether this is by chance or correlated to another factor.

The Women of 1994: Women in the Republican Revolution

Kate Kuenzle and Colin Fisher

The purpose of this research is to examine the role that women played in the 1994 Republican Revolution. Previous scholarship concerning the 1994 Republican Revolution focuses on the political, electoral causes and ramifications of the Revolution as well as its impact on the American feminist movement. In contrast, this examination builds off the work of political scientists and historians focusing on women in conservative politics, to explore how the women elected to office in 1994 gained and retained power in an environment of hyper partisanship. The research focusses on the seven women who were elected to the U.S. House of Representatives as part of the Contract with America examining voting records, legislative efforts, congressional records, and media sources. The study finds that some paths to credibility for conservative women led to more political success than others.

Domestic and International Policy in San Diego

Adrianna Lagorio and John Ly

The Mayor's Office of San Diego is a hub of policy and interaction among the local and international actors. One of the main challenges of Mayor Kevin Faulconer's administration is developing effective domestic policy that can be enforced to better the infrastructure and economy of San Diego. Another challenge of this political office is the closeness of the city to the international border and the dual issues that face both communities. There is the constant flow of capital, business, agreements, and conflicts between Tijuana and San Diego. The bilateral relationship between these two countries require constant communication and the forming of policy to resolve conflicts that arise. San Diego is one of the most unique cities in the United States due to the diverse array of policy issues that the city faces. As an intern in the Mayor's Office I hope to learn how this team of individuals goes about solving and prioritizing different policy issues to respond to the domestic and international security challenges San Diego faces. I also hope to understand the outreach and relationship the Mayor's office maintains with Mexico and the dynamic players in keeping this relationship cooperative and healthy. I hope to learn different policy approaches and analyze the steps the Mayor has taken to resolve both domestic and international matters. The San Diego Community and the International border have unique issues, as well as, a vast amount of connected issues, which can only be solved through new policies and innovative ideas.

Understanding Inter-Annual Variation in Abundance of Larval Spotted Sand Bass, *Paralabrax maculatofasciatus*, in Mission Bay, CA

Caroline Leinung and Steven Searcy

Marine organisms often show large fluctuations in population abundance. Understanding changes in year class strength (the number of juveniles added to a population in one year/spawning season) is convoluted by the fact that most marine organisms have a two-part life cycle, in which larvae develop offshore before settling to near shore juvenile/adult habitats. Although mortality during all life history periods is important, monitoring the number of larvae that survive to the larval-juvenile transition is often a good indicator of the number of individuals that will survive to become reproductive adults. In this study, I deployed standard monitoring units for the recruitment of fish (SMURFs) to examine weekly settlement patterns of spotted sand bass, *Paralabrax maculatofasciatus* from June-October of 2014 in Mission Bay, San Diego, CA. To examine interannual variations in abundance, I compared the settlement data that I collected with that from the previous two years (2012 and 2013). Large year-to-year changes in abundance of spotted sand bass were related to variance in oceanographic conditions (water temperature and chlorophyll levels) in offshore waters. In particular, low settlement in 2014 was related to anomalously high water temperature. Knowledge of factors that impact temporal variation in settlement is essential for effective management and conservation of marine fishes.

Protein Adsorption Characteristics of Amphiphilic Starch-Containing Hybrid Polymer Films

Allison R. Linehan, Arijit Sengupta and Peter M. Iovine

End-functionalized starch macromolecular reagents were grafted to urethane-linked polyesters via copper-catalyzed azide alkyne cycloaddition chemistry to provide amphiphilic hybrid polymers. The starch concentration in the final graft copolymers was varied from 10-36 weight percent and the impact of starch concentration on protein repellency was studied. Quartz crystal microbalance with dissipation (QCM-D) was used to probe the interaction of these polysaccharide-containing copolymers with bovine serum albumin in a thin film mode. A general trend correlating higher starch concentrations in the graft copolymer structure with more efficient protein repellency behavior was observed.

Shedding Light on Female Darkness: A Cultural/Historical View of Literary Racism

Kelly Lonergan and Jeanie Grant Moore

This research explores how literature's representation of women based on the dichotomy of lightness and darkness has impacted modern notions of racialized gender roles and female sexuality. It elucidates how this dichotomy disadvantages not only women as a whole by disregarding their complexity, but particularly how it has contributed to the representation of women of color as dangerous and sexually aggressive. This insidious devaluation and othering of women of color is apparent throughout history with roots tracing back for centuries that reveal a triangulated theme between race, gender, and class. This is largely due to the exoticizing and eroticizing of foreign locales and their inhabitants, especially in literature, during the colonial era. The light/dark dichotomy took root in the United States in a manner unparalleled worldwide, for it is here that the colonies and the nation became one. Racial and gendered stereotypes took root here to create a society that, even after emancipation and the civil rights movement, is impacted by generations of cultural and literary reinforcement of the dangers, sexuality, and inferiority of dark women. Yet overarching themes of gendered racism and the division of women into light and dark categories connected to morality are evident in the literary past and media-laden present worldwide. Acknowledging the cultural weight of the interaction between history, society, and literature is crucial in elucidating their impact on cultural understandings of race, gender, and sexuality, and this research hopes to play a role in shedding light on the literary prejudicial treatment of women of color.

The Buddhist Temple of San Diego

Jessica Lowery, Lamson Vu, Harry Schmachtenberge and Evelyn Kirkley

The Buddhist Temple of San Diego (BTSD) has faced adversity during its establishment and growth in the San Diego community. It has adapted well while maintaining what makes it culturally unique. Geographically, San Diego doesn't have a large Japanese population. The BTSD started out simply as a gathering place for practicing Buddhists. Through obstacles such as discrimination and oppression, it bloomed into the welcoming sanctuary it is today. It matured and forgave aspects of American culture that alienated it, most prominently the internment camps of World War II. The BTSD has developed a diverse community that includes not only those of Japanese descent, but native San Diegans and all those who are interested in the teachings of the Amida Buddha. The traditions of meditation and peaceful reflection in daily life have morphed into a more American style of practice through weekly services for the whole community and friendly suggestions to be mindful of one's spirituality when not in the temple. Establishing the BTSD as a respected organization in San Diego was not easy. It was first called the Buddhist Church of San Diego to garner respect and dissuade objections to its existence. Only after a number of years of being an exemplary community could they call themselves a temple without criticism.

Population Status of the White Shark in Mossel Bay, South Africa

Andrea Mast, Rabi'a Rykklief, Lauren Peel, Danielle Goodreau, Pierre Pistorius, Ryan Johnson and Nathalie Reynolds

There is a great concern over the status of the great white shark population, and South Africa is recognized internationally as a region of high abundance of the great white shark species *Carcharodon carcharias*. There is a very limited amount of information available regarding the demographics of the sharks due to a lack of knowledge regarding population metrics and an insufficient conservation effort. The aim of this ongoing research project is to identify the spacial patterns in relative abundance and to investigate the size and composition to define the population structure. By attracting the sharks to the research boats using chum and bait, data such as estimated size and dorsal fin ID is collected. Seasonal and spacial patterns are analyzed to determine where the greatest number of great white sharks are located and at what time of year they are most abundant in Mossel Bay. The sharks are also placed in cohorts based on size to determine whether it influences their spacial and temporal distribution. This study is important to gain a better understanding of the great white shark population, and is done in hopes of establishing an index for white sharks in Mossel Bay.

Latin American Women's Testimonial Literature of the 20th century

Alison Mccandless and Amanda Petersen

This research explores testimonial work by Latin American women that tell of experiences of war and the struggles of poverty. This project specifically examines four women of Latin America that have gained much literary attention in with their testimonial works: Rigoberta Menchú, Domitila De Chungara, Elvia Alvarado and Elena Poniatowska. Testimonial literature reveals the importance, but also the challenges of bearing witness to the past and articulating those experiences alongside a fight for justice.

Functionalization of N,N-Dimethylaminobenzyl Boronate Esters into Boronic Acids

Alexandra Mcgee, Kathryn A. McGarry and Timothy B. Clark

Boronic acids are of particular interest in the synthetic community due to their various applications in target-directed synthesis. Gunter Wulff synthesized aryl boronic acids possessing a pendant amine, shifting conditions for binding sugars to biologically relevant pH's. In order to streamline the formation of a diverse array of these "Wulff-type" boronic acids, the Clark group identified the opportunity to use readily available organoboronate esters as precursors to these biologically relevant targets. The Clark group has worked on substrate-directed C-H borylation in which the benzylic amine is used to direct a catalyst to the desired ortho position on the benzene ring. The "Wulff-type" boronic acids are formed from the hydrolysis of the aryl boronate esters. These boronic acids have been synthesized with a variety of electronically and sterically diverse functional groups that can be incorporated into sugar sensing materials.

Biofuel Cooking System: for the Community of El Cercado, Dominican Republic

Faith Meade, **Alyssa Zamora**, Myles Morris, Jose Lapuerta, Jeremiah Medina, Ruairid Donaldson and David Malicky

An assessment of the El Cercado community, in the Dominican Republic, by University of San Diego faculty and students found a community subjected to harmful gaseous and particulate emissions due to the use of biofuel in their cooking practices without proper equipment and ventilation. The biofuel used by the community currently is wood leading to local deforestation. The team will design a stove and biofuel grinding system to turn crop waste into a solid biofuel using appropriate technology to address this problem. The stove will release less than 70 ppm CO into the kitchen, 1 liter of water in 10 minutes, and run on fuel produced by the grinding and pressing systems. The grinding system will reduce one pound of crop waste into a solid biofuel in one minute. The team has chosen a dual burner dual chamber stove filled with lava rock to capture and store the heat produced by the combustion. The grinding system will consist of an abrasive wheel and sprocket connected by a chain to a pedaling system. The press will be a combined compound-toggle press constructed from wood to condense the ground biofuel into a solid burnable briquette. The biggest constraint of these designs is their budget. The stove must be constructed for 35 USD, and 75 USD each for the grinder and press in the Dominican Republic.

Developing a Chlorination System for Water Distribution in Developing Countries

Jeremiah Medina, **David White**, **Karly Jerman**, Jeremy Hagen and Truc T. Ngo

Following a field assessment trip to the town of El Cercado in the Dominican Republic in spring of 2014, our team of USD engineering students and faculty returned with several ideas for ways the Shiley-Marcos School of Engineering could help improve the lives of the community. The team began working on a prototype in-line water chlorination system at USD. In recent years the water in El Cercado has become tainted with coliform bacteria, resulting in outbreaks of cholera that have killed many people. By setting up a prototype, they were able to test a chlorination system to treat the source water. The team collected a broad range of data including water pH levels, total dissolved solids, alkalinity, hardness, total and soluble iron concentrations, and free and total chlorine concentrations. This data provided our team with vital information that prepared us to properly address the water distribution needs of the town. The team successfully installed this system in two different El Cercado communities during the return implementation trip in January 2015.

Local Patterns in Host-Selection by Anemone Symbionts in Bocas Del Toro, Panama

Samantha Mercer, Olivia Bourque, Kimberley Rogers, Caroline Hughes, Grace Dennis, Caitlin McAleavey, Michael Melinger, Annemarie Kramer and Drew Talley

The close interactions between two species, known symbioses, are essential components of many habitats. In the marine environment, cleaner shrimp and anemones represent one example of symbiosis in which both species benefit from the interaction, and these relationships are crucial parts of marine ecosystems. The associations made between many symbiotic cleaner shrimps and their host anemone species are influenced by local ecological factors, resulting in regional variations in symbiont-host preferences. As we face rapid global environmental change, understanding the local patterns of this host specificity will be essential to maintaining healthy marine environments. However, sea anemones from the Caribbean coasts of Panama, as well as their symbiotic relationships, have been poorly studied and are largely under-represented in the current literature. The purpose of this study is to identify the local host-selection patterns, specifically regarding host-size and host-species, of anemone symbionts in the Bocas del Toro, Panama region of the Caribbean. We surveyed 12 sites in this area for the presence of symbionts on the host species *Bartholomea annulata*, *Bartholomea lucida*, *Condylactis gigantea*, *Stichodactylus helianthus*, and *Lebrunia danae*. The individual symbiont species *Periclimenes yucatanicus* and *Mithrax cinctimanus*, as well as symbionts overall, were found to have a significant preference in host-species (*S. helianthus*) and host-size (large hosts). This suggests these species may be less resistant to changes in host species abundances, and may have future implications as environmental changes alter local anemone distribution patterns.

The Importance of the 1978 Select Commission on Immigration and Refugee Policy

Katie Modesitt and Colin Fisher

In 1978, in the midst of an intensifying debate over immigration policy, the Select Commission on Immigration and Refugee Policy was created by public law 95-412 in order to “study and evaluate [?] existing laws, policies, and procedures governing the admission of immigrants and refugees to the United States.” This Commission has received very little consideration from historians; however, the work of the Commission and the consideration of their findings in a 1981 joint congressional hearing represented an incredibly important point in the debate over immigration policy in the late 20th century. This study demonstrates the significance of the both the establishment of the Commission and the joint congressional hearing by illustrating how the Commission integrated the principles of the open society and the rule of law into specific policy proposals as well as how the joint hearing’s reaction to three specific policy proposals, the large-scale amnesty program, the rejection of a temporary worker program and the endorsement of the Refugee Act of 1980, exemplified the diverse debate that existed around Immigration policy at the time.

Diversification Patterns of Mesquite-Feeding Beetles in North and South America

Veronica Moffitt and Geoffrey Morse

We report upon a comparative analysis of reoccurring seed beetle colonization of mesquite (*Prosopis*) in North and South America. In order to analyze these associations, I sequenced the mitochondrial protein-coding gene Cytochrome Oxidase 1 (CO1), the nuclear protein-coding gene Elongation Factor 1-alpha (EF1a), and the nuclear ribosomal large subunit gene (28S) to create phylogenies of four seed beetle genera. The phylogenies support hypotheses of three independent colonizations of *Prosopis*: the proclivity of these independent colonizations suggests that the colonization of mesquite is due to convergent evolution to begin to feed on an ecologically dominant host plant. We examine whether speciation in each lineage occurs in a predictable fashion based on the geographic distribution and chronology of diversification of their host plants.

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Evolutionary and Ecological Diversification in *Mimosestes* Seed Beetles

Kirsten Monahan and Geoffrey Morse

This project examines the evolutionary history of the seed beetle genus *Mimosestes* through molecular DNA analysis, examination of host associations and consideration of interspecific competition. Evidence suggests that phytophagous insects such as *Mimosestes* tend to evolve from a specialist ancestor towards a generalist descendent, and as oviposition behavior is shown to correlate significantly with diet breadth expansion, we find that biogeography is an important factor in the emergence of new species. Through DNA sequence analysis, we are able to examine the previously hypothesized existence of cryptic species in two widespread generalists. The phylogenetic tree of the genus *Mimosestes* allows us to evaluate the degree to which biogeography influences speciation events, host plant shifts and interspecific competition.

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Visualization of Flow Structures in Turbulent Shear Flows

Adam Moreau, Quinn Pratt, Harrison Schmachtenberger and Frank Jacobitz

Velocity shear is a main mechanism to produce and sustain turbulence in geophysical flows and engineering applications. In this study, a homogeneous turbulent shear flow with constant shear rate is considered. Direct numerical simulations are performed with the goal of visualizing turbulent flow structures. This goal is complicated by the coordinate transform used in simulation codes to apply periodic boundary conditions, and an inverse transform was implemented numerically. The code uses a Fourier collocation method for the spatial discretization and a fourth-order Runge-Kutta method for the temporal evolution. The simulations are performed on a grid with $256 \times 256 \times 256$ points and evolve in time until an asymptotic state has been reached. The simulation results are then post-processed and a variety of flow quantities, for example vorticity components or vorticity magnitude, are visualized using NCAR's Vapor software package. Finally, the images obtained from Vapor are encoded into movie files. The results clearly show the flow's transition from isotropic initial conditions to anisotropic shear turbulence. The shear turbulence is characterized by vortex structures inclined to the downstream direction. It appears from the movies that this inclination angle remains constant throughout the simulation.

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Excavating Middle-Earth: Tolkien, the Norse and Christianity

Katherine Motsinger and Joseph P. McGowan

It began as a quest for the largely lost mythology of the English people. While the Norse, the Finns, the Slavs, the Germans, and even the Irish have written records that preserve the lore of their ancestors, the English preserve fragmented scraps of their own mythology. Visions of nameless warriors forgotten to history hover at the periphery of the English imagination, specters with no recognizable bodies. Tolkien sought to fill this gap in England's literary heritage by creating the "long-lost" tales of his people-tales that would reflect the cultural and religious influences upon England in her childhood. Of course, things did not turn out quite as he imagined. In the process of producing a compendium of epic tales, Tolkien began to create the realm of Middle-Earth. Drawing heavily from Norse Mythology and Icelandic sagas, literary landscapes populated by Northern dragon slayers and doomed gods, *The Lord of the Rings* blends "pagan" elements with Christianity to create a hybrid English mythology. Tolkien, in crafting *The Hobbit*, *The Lord of the Rings* and *The Silmarillion*, painstakingly has constructed a world in which fate coexists alongside free will, allowing for moral cultivation that is less prominent in Norse mythology and pre-conversion Saga literature. By evolving the Norse devices of doom, fate, destiny, chance, and free will, Tolkien has revealed a Christian order that adds a fully-developed moral dimension to Middle-Earth. This exposition ultimately illustrates Tolkien's view of the necessity of a Christian order in a world plagued by evil.

A Study in Cruise Tourism: Istanbul, Turkey

Dylan Murphy, Can Bilsel and Adriana Cuellar

In recent years, as cruise tourism grows throughout the Mediterranean, not only in popularity, but in the size of ships themselves, port-cities have needed to adapt. My thesis project in architecture examines the historic city of Istanbul, Turkey, in reference to its cruise tourism. This research includes typological, physical, geographical, and population studies, which will culminate in an architecture intervention within the city. It is my hope to design and program a space that will not only include all of the necessities to deal with ship tourism and customs issues, but will begin to integrate the larger ships themselves, and the people within, into the urban fabric of Istanbul, Turkey.

Anti-Virus Testing Suite

Evan Nagata, Daniel Partynski and Eric Jiang

As we enter a new interconnected world of technology, anti-virus software has become more important than it ever has before. Existing anti-virus software does an acceptable job of detecting potential threats based on their signatures; that is they are able to detect threats that have already been seen by other users. However, the problem of detecting malware that has never been seen before is an active area of research. In this project, we are actively building a set of tools that will allow users to test the ability of their anti-virus software to detect threats without resorting to a signature look up. We will produce a semi-automatic testing suite that will walk the user through testing their anti-virus and will show them the sectors of their computer that their anti-virus is able to protect. This will aid users in selecting an anti-virus package since they will know which popular anti-virus packages are good at protecting against common threats.

Measuring Parallelization of OpenCL Programs Using Kremlin

Anthony Nguyen and Saturnino Garcia

Parallel computing is a form of computation where several calculations are done at the same time. Parallel computing has become a prominent topic in recent years due to the limitations of scaling hardware. By splitting tasks into multiple parts that can be done in parallel, more work can be done by multiple processing units, which bypasses the hard limit imposed by current hardware. OpenCL is a programming framework that makes parallel programming with graphical processing units, specialized processing units, easier to do. This research project utilizes a parallelism profiling tool called Kremlin, developed by Dr. Saturnino Garcia. Using the profile created by Kremlin, a parallelism plan can be developed that tells a programmer how best to apply OpenCL to parallelize their program. Research presented will demonstrate the efficacy of following the parallelism plan as opposed to manual analysis.

Building Web Applications Using New Web Development Tools

Paul Nguyen and Eric Jiang

The purpose of this project is to explore new web development tools, specifically the full-stack javascript frameworks, non-relational databases, and web components. The goal is to show how these new tools can reduce the development code base, reduce development time, and increase maintainability. The study involves rebuilding the ACM Club website's homepage, user accounts, and event planner with the new development tools. The new website is then tested for quality attributes such as code organization, maintainability, and performance. The outcome of this research is the identification of the strengths and weaknesses of the emerging web tools. The findings will be beneficial for the web development community looking to use these new technologies in their future projects.

Disentangling the Drivers of Beta Diversity in Invertebrate Communities Along a Latitudinal Gradient

Avery L. L. Nickerson, Kate S. Boersma and Adam M. Siepielski

Quantifying variation in the composition of communities, and differences in community composition among sites (beta diversity), along spatial gradients such as latitude can provide insight into the mechanisms structuring communities. Variation partitioning of beta diversity can reveal whether underlying environmental factors are associated with certain community assemblages, a concept known as environmental sorting, or that these assemblages are simply a random draw from the broader species pool. Disentangling these two possibilities is key to understanding the underlying processes that structure communities. Such insight can ultimately aid in the understanding the sensitivity of communities to variation in environmental conditions, which has many conservation implications. In this study, we quantified variation in aquatic invertebrate communities and environmental factors among freshwater lakes along a latitudinal gradient. We found that beta diversity increases with increasing geographic distance between sites. This pattern likely reflects differences in the regional species pools among geographic locations along the latitudinal gradient. Environmental variables (pH, dissolved oxygen, water temperature, and conductivity) are associated with beta diversity, but these environmental conditions varied little with latitude. Species richness and Shannon diversity show significant latitudinal patterns: both increased as latitude decreased. We also found that environmental factors were good predictors of species richness and Shannon diversity, but these variables differed from those that explained beta diversity. Overall, our results suggest that local environmental variation is more important for explaining variation in species composition among sites than space alone.

Video Tracking Using A Phase-Only Filter

Nicole Nino, Twain Glaser and Kathleen Kramer

Image correlation utilizes the frequency domain by use of two-dimensional complex Fourier transforms. In phase-only filtering, the magnitude is normalized and results use only the phase information. Phase-only filter image correlation is applied to image recognition and tracking and shown to provide clearer identification than the standard fast-Fourier transform approach. The phase-only filtering correlation method is expanded to video and used to track objects through a series of frames. To accurately follow an object as it may change aspects in the scene, the matching image is updated as the image in the scene changes. In this application, the target tracking in the video image is performed in real time. The solution can be implemented to provide real time results while accurately measuring and tracking an objects path through a scene.

United Nations: Perpetuating Peace? A Historical Overview with a Contemporary Analysis

Taylor Noonan and Mike Williams

United Nations: Perpetuating Peace? A Historical Overview with a Contemporary Analysis focuses on United Nations Peacekeeping Missions. Understanding the United Nations from a historical context, this project will portray the changing nature of peacekeeping missions following the end of the Cold War. This research will distinguish between the different peace missions that the United Nations performs, and it will assess the language of the mandates and the efficacy thereof. This project also explores the integral influence of the Security Council, and how the current structure of the United Nations may need to change in order to adapt with the perpetually changing world. This research will further exemplify the need for consistency and clarity in regards to UN Peacekeeping mandates and the participation of UN member-nations in order to truly be effective.

A Photo Album App for the Technology Age

Donna Ohlmaier and Eric Jiang

In the years before hand-held devices, photos did not have a large digital presence. Photos were taken on a fresh roll of film, developed, and printed. Afterward, they were commonly displayed in photo albums to be shared with friends and family. Now, social media gives us the perfect opportunity to share memories when given the right platform. This project focuses on developing the right platform for families to continue sharing photos and memories, all in one place. The app features a customizable photo story for each user, and an interactive page where users can see an overview of their family network connections. This application will allow families, even those living across the world, to share photos in the way that they might have before technology.

Peroxidase Activity in Switchgrass (*Panicum virgatum*) Increases Following Infestation by Yellow Sugarcane Aphids

Elliott Paine, Charli Worth and Lisa Baird

Plant Type III peroxidases may have more functions than a Swiss army knife, but that ubiquity is a challenge when researchers attempt to define the role that peroxidase plays in plant defense response to herbivory by insects such as aphids. Switchgrass (*Panicum virgatum* pop. Kanlow) was planted in standard potting soil in the USD greenhouse and grown to the fifth leaf stage. Peroxidase activity was surveyed across leaf age and location within each leaf. Results showed that soluble protein increased significantly from 5.2 to 8.1 mg protein per gram fresh weight as a function of increased leaf age. Specific activity of peroxidase increased with increasing leaf age from 175 to 340 nmol/min/mg protein. Within individual leaves, soluble protein and peroxidase activity measured in four leaf sections (from sheath to tip) showed no significant trend. Infestation of *P. virgatum* pop. Kanlow leaves by yellow sugar cane aphids more than doubled soluble protein concentration per gram fresh weight of infested leaf tissue compared to non-infested leaves. In addition, the specific activity of peroxidase increased significantly and was related to the density of aphids on the leaf. Tissue prints made from leaf cross sections onto nitrocellulose were used to localize peroxidase activity to the fiber bundles above and below each vascular bundle in the leaf, and to the perivascular fiber bundles of larger veins in switchgrass leaves. Characterization of individual isoforms of Type III peroxidase by 2D gel electrophoresis and ESI-LCMS/MS will be discussed.

A Question Answering System for the USD Portal

Dan Partynski and Eric Jiang

The efficacy of a question answering system depends on the method used to construct a formal meaning representation of a user's query. In this project, I developed a statistical machine learning algorithm that can translate a list of natural language tokens in a parse tree of a custom regular grammar. I found that the algorithm has the potential to successfully facilitate the answering of natural language questions by mitigating the problem of linguistic variation through the use of statistical patterns. This type of system has the potential to improve a user's search experience because posing queries in natural language is more accessible to the general public. In order to test the system, I gathered various pieces of data on the USD website and started to build a program that could answer certain questions about the University.

Tudor Plays Project

Amanda Pendleton, Judith Caywood, Yasmine Hachimi, Anthony Nguyen, Emily Bezold
and Maura Giles Watson

The Tudor Plays Project (TPP), which launched at USD this academic year, is the first large-scale long-term Digital Humanities (DH) project at USD. Over the next several years, the Tudor Plays Project will create and disseminate digital resources for the study and performance of 20 pre-Shakespearean English plays, including those from the circle of Thomas More. These important plays are often neglected because no modern editions are available; we will remedy that situation with the TPP website, which will go live next year. The website will include historical contextualizing materials, such as performance videos, and multi-modal articles on Tudor household drama and on the influence of humanist thought on emergent Renaissance drama. The anonymous More Circle play *Gentleness and Nobility* was the TPP's pilot text during 2014-15; the TPP team has developed the first-ever modern English performance edition of this play and is now creating a new teaching edition of the play. This spring, the TPP team is also using the Lexos text analysis program to conduct a computational authorship-attribution study of *Gentleness and Nobility*; this study will settle a long-standing scholarly dispute over who wrote this important humanist play.

Drug Violence and Public (In)Security: Mexico's Federal Police and Human Rights Abuse

Dominic Pera and David Shirk

Violence in Mexico, with dramatic political, social, and economic consequences on both Mexican and US populations, has risen dramatically in the past decade. Research has shown that the Mexican military is largely responsible for human rights abuses in Mexico. This paper will seek to answer why there are so many human rights abuses committed by the Federal Police, as public security is a police role and its deterioration threatens lives, security, and the rule of law. This paper will look at what scholars have said about the causes of police violence and public insecurity. Some say that history is responsible, pointing to evidence that suggests that legacies from Mexico's PRI system (one-party authoritarian rule) and the rise of drug trafficking has created ineffective, corrupt, and weak police forces. Others say that the Federal Police institution is inefficient and has resulted in militarized public security with human rights consequences. A third explanation is that there is exists a cultural problem in Mexico in which corruption and distrust create a society that is prone to insecurity and human rights abuses. This paper argues that the heightened activity of drug cartels and increase in drug-related violence in Mexico is the primary cause of Federal Police abuse in Mexico. Through an analysis of human rights abuses committed by the Federal Police in Mexico, compared with trends in drug violence throughout the country, this paper will demonstrate linkages between time and geography that reflect the relationship between drug violence and Federal Police abuse. Variance in data trends raises new questions regarding police protection mechanisms, relationships between police and drug cartels, and human rights abuse reporting mechanisms. A cyclical and multidimensional problem in Mexico exists in which corruption, the police, and drug trafficking organizations interrelate and create a culture of impunity.

Bridging the Gap

Niccolo Piacentini and Daniel Lopez Perez

My projects records and translates Kumeyaay culture so that it can be understood by contemporary civilization, emphasizing the relationship these people have to the land and nature. Step one is creating a map of the area surrounding La Huerta. This map contains the location of the Kumeyaay ceremonial sites, sacred lands and other important locations, as well as the current boundaries that prevent them from gaining access to these places (there are currently drug cartels, ranches and other entities which are illegally intruding into Kumeyaay territory, but there is no document to prove it). For each of the sites, I will create a profile with pictures and information in order to show the significance it holds for the Kumeyaay. Such a map has never been created and it would be the first official document to convey such information. This will help the Kumeyaay make an international claim for access to their legally defined land. The other purpose of this map is educational, allowing a large part of the Kumeyaay cultural traditions to be recorded and passed on through generations, while also being understood by members of the dominant society. Step two involves the design, achieved alongside local leadership, and construction of a community center for La Huerta. This community center's purpose will be to display the information which is conveyed on the map, as well as providing a location for the community to meet and strengthen the cultural identity of the people.

Identifying Expression of the Polymeric Immunoglobulin Receptor in *Danio rerio*

Rommel Pinlac and Valerie Hohman

The immune system faces a wide array of foreign invaders causing infection especially on mucosal surfaces. Immunoglobulin plays a significant role in this system by binding to target pathogens in order to destroy them through a variety of mechanisms. In most vertebrates, secreted immunoglobulin is transported from the submucosa to the lumen by transcytosis and becomes active. The polymeric immunoglobulin receptor (pIgR) is a protein that facilitates this process. Functional pIgR has been characterized in mammals, amphibians, and even some species of teleost to which *Danio rerio* (zebrafish) belong. We have identified a DNA sequence that likely encodes pIgR in zebrafish through RT-PCR. The sequence shares identical residues with a teleost pIgR domain that demonstrates binding in another species with soluble immunoglobulin. This mimics the novel mechanism of secretory immunity. In addition to sequencing characteristics, location specific expression in epithelia of liver, intestines, kidneys, and gills confirm a pIgR-like protein. Antisense RNA probes will be generated for hybridization. By in situ hybridization, the sequence will bind to mRNA expressing our target sequence in the tissues in order to localize expression. We hope to elucidate a clear mechanism for secretory immunity by characterizing the polymeric immunoglobulin receptor.

Investigation of the Interaction and Role of CHP1 and CHP2 with Mutated NHE1 in Lung Fibroblasts

Thomas M Polveroni-Edwards, Lea Kiefer and Joseph J. Provost

Intracellular pH (pHi) homeostasis is crucial for cell survival. The membrane protein Sodium-Hydrogen exchanger 1 (NHE1) is one of the major contributors to a stable pHi. Additionally, NHE1 serves as an anchor for intracellular proteins. NHE1 also plays an essential role in Non-small cell lung cancer (NSCLC) metastasis as a side effect of the transporter's increased activity to compensate the Warburg effect. Several phosphorylation sites and protein cofactors affect NHE1's activity. The two isoforms calcineurin homologous proteins CHP1 and CHP2 each bind to the C-terminus of NHE1 and regulate its function. CHP1 is ubiquitous and is key for basal level NHE1 activity while CHP2 is primarily expressed in gut cells, detected in most cancer cells and increases proton transport. To better understand the role of NHE1 and CHP1/CHP2 we generated RFP-CHP1 and GFP-CHP2 and transfected each into lung fibroblasts expressing tagged NHE1 (PSN cells), into lung fibroblasts lacking NHE1 (PS120 cells), and into lung fibroblasts expressing tagged and mutated NHE1 (PSN Mutant cells). Cellular distribution of each CHP was determined and showed significant translocation of CHP1 and CHP2 to the plasma membrane in PSN cells while no localization was observed in PS120 cells. The specific amino acid required for CHP-NHE1 interaction is determined in cells expressing one of eight different NHE1 amino acid substitutions at the putative CHP-NHE binding domain of NHE1. To investigate the role of CHP2 binding to NHE we expressed GFP-CHP2 in PSN and PS120 cells and conducted wound-healing assays. In addition to cell migration rates, we tracked the migration path of individual cells to assess the impact of each NHE1 mutation on CHP2-influenced motility.

Facilities Access Control and Management

Ramon Prado, Jorge Septien and Eric Jiang

Most facilities need to have control of who can access certain machines or rooms so they make a proper use of the material. Nowadays, the way of controlling access is using security cards. We want to design a platform to monitor and manage access to the different areas in the facilities and allow users to get dynamic access keys through their smartphones. Our platform tries to mitigate the problems encountered in access control for organizations and facilities. Access keys can be obtained, shared, and destroyed depending on the defined protocols required by the organization. The application aims to substitute security cards for a safer, easier, and more useful way of granting and gaining access to places and services. The web application main goal is to administer permissions of the users and monitor who and when are people accessing, while the mobile application provides a fast way of accessing this permissions throughout a facility. The goal is to create a more dynamic access control system through mobile application technology.

Differential lipid binding properties of FAR proteins of nematodes, Na-FAR-1 from *Necator americanus* and Hp-FAR-1 from *Heligmosomoides polygyrus*

Kenneth A. Pulmones, Jennifer L. Bath, Joseph J. Provost

Fatty acid- and retinol-binding proteins (FAR) are secreted throughout the life cycle of blood feeding intestinal parasitic nematodes of humans and animals. These alpha helix rich proteins of about 20kDa play a major role in host-parasite interaction and pathogenesis by sequestering certain retinoic acids (RA) or retinol derivatives from the host. Interference with these intercellular lipid mediators compromises immune defenses causing chronic helminth infections thereby making FAR-binding proteins potential vaccine and drug target candidates; no information to date is available on the mechanism by which FAR binds. Previous works have developed various peptide vaccine antibodies based on the domains of Hp-FAR-1 from *Heligmosomoides polygyrus* (mouse) to neutralize FAR binding function. We have expressed and purified recombinant affinity tagged Hp-FAR-1 and Na-FAR-1 from *Necator americanus* (human) and have used them in various thermal-shift an ELISA assays to define the affinity of these FAR proteins for retinol and determine which antibodies interfere with retinol binding. This data illustrates the binding of FAR with retinol, as well as with the Na-FAR-1-design antibodies. Furthermore this evidence suggests that the antibodies that neutralize FAR in mice also bind to human FAR proteins.

The Effects of Cell Phone Conversations on the Attention and Memory of Bystanders

Rachel Putris, Mallory Cless, Audrey Olchondra, Mattie Monroe, Lauren Fisher and Veronica Galvan

In the current age of technology, societal attachment to cell phones is extremely prevalent. The widespread use of cell phones carries with it a variety of impacts on both the cell phone user and the bystander overhearing the conversation. The study examines the cognitive effects of memory and attention on bystanders overhearing several different conversation types. A non-cellular two-sided conversation was compared to a one-sided cell phone conversation. Under these two conditions there were also two different scripted conversations carried out, one considered “juicy” in content and the other boring. The participant was lead to believe they were participating in a study comparing the ability to unscramble anagrams to the ability to understand a short story. The researcher left the room while the participant was instructed to complete an anagram task. Meanwhile, a scripted one-sided or two-sided conversation was carried out between confederates believed to be fellow participants. Some participants were exposed to the “juicy” conversation, while others were exposed to the “boring” conversation. A recognition task measuring memory of the conversation and a questionnaire measuring distractibility followed. It is predicted that a one-sided conversation will be more distracting due to the decrease in predictability compared to a two-sided conversation. It is also predicted that the juicy conversation will distract the participant from the anagram task more than the boring conversation. The increased demand on attention during a one-sided and juicy conversation is hypothesized to result in a decrease in performance on the anagram task and an increase in performance on the recognition task as compared to those exposed to a two sided and boring conversation. The implications include that certain types of conversations and content may be more distracting and annoying to bystanders in public domains, which may encourage people to change how they communicate in public.

Hare Krishna Temple: Hinduism

Samirah Qabazard, Caitlin Teno, Jasmyn Sosa-Houston, Lauren Musial and Evelyn Kirkley

Members of the Hare Krishna Temple impact the surrounding Pacific Beach community by making their faith more prominent. The temple is evangelistic within its immediate area. Monks distribute literature every day in various parts of the community to spread the Hare Krishna religion. Several monks explained that they heard about the temple on various college campuses in San Diego. Evangelizing on a college campus appeals to the younger crowd, which is the general demographic of their congregation. The encouragement of open-mindedness and intellectual growth that is present at a university is a perfect atmosphere for missionaries from the temple to seek new members. The temple is open to anyone who wants to learn more about the religion. Interest is also generated through festivals, which include traditional vegetarian feasts, chanting, and of course, fun! Festivals originate in Indian culture and include diverse rituals that center on Hindu traditions. The energy, color, smells, and beauty of the festivals attract visitors to the temple. The monks warmly welcome anyone from any faith or background to participate in temple activities.

The Power of Secrecy: Cryptography in Prison Gangs

Monica Ramakrishnan and Jane Friedman

A prison gang is an exclusive inmate organization that operates within an incarcerated setting. In order to successfully operate without reprimand and to preserve their high levels of secrecy, prison gang leaders use a complex system of multifaceted mathematical algorithms to encrypt and decrypt messages, known as cryptography. Broadly speaking, the codes invented by prison gang leaders encompass the well-established rules, history, and identifiers of traditional prison gangs. Since these elements are so ingrained in the philosophy of the gang and its members, it regularly surfaces in their inventive codes. The study of cryptography within prison gangs is divided into two essential components: (1) the mathematical analysis of prison gang codes and (2), the sociology behind cryptography as a driving source of power.

First, through the analysis of various ciphers through a mathematical lens, we can analyze the mechanics of covert communication methods. Second, through the analysis and application of Hobbes and Machiavelli's classic works, we can conclude that since cryptography provides a perception of entitlement, identity, and privilege, it holds a type of power that is imperative to the intercommunication growth within prison gangs. The resemblances of prison gangs to the power dynamic and hierarchical structures found in philosophical theory lead to a comprehensive rehabilitative program that utilizes cryptography skills. Since power is the driving factor behind many covert operations, the analysis indicates that such a transformation would have an astronomical effect on crime and recidivism rates.

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Support for the Underdog Brand When Sampling Commercial Products: The Limiting Effects of Motivation

Veronica Ramirez and Nadav Goldschmied

The tendency to support disadvantaged entities that lack resources to succeed (i.e., the underdog effect), has been demonstrated across several domains such as politics and sport. The present study extended the investigation into the realm of marketing by having individuals evaluate real products (in contrast to vignette only manipulations). Participants assessed two stain-color paint swaths supposedly representing underdog and favorite brands (in reality they were of the same kind). In study 1, participants liked more and perceived the underdog to be of better quality. In study 2, participants were ostensibly tested for visual acuity and then told that their acuity was either considerably below, or above the average (random assignment) before proceeding to evaluate the brands. We found that this manipulation eliminated the underdog effect (with no difference between low vs. high acuity participants). Thus when participants become motivated appraisers, they overcome their inherent preference for the underdog.

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Combating Topographically Insensitive Development Along the San Diego River

Nathan Rebelo and Adriana Cuellar

The Navajo Region is comprised of approximately 8000 acres and includes the communities of Allied Gardens, Del Cerro, Grantville, and San Carlos. It is an area characterized by mesas, steep canyons, and rolling hills- about a quarter (2230 acres) of the Navajo Region is marked by steep slopes of thirty-five percent or greater. The Navajo Region features Mission Gorge- a site of an early mission dam and state historical landmark. It also includes Cowles Mountain, the highest peak in the San Diego city limits topping out at 1591 feet. As well as Lake Murray, a city-owned reservoir and recreation facility including one hundred and forty acres of water surrounded by four hundred and sixteen acres of government owned land. For my thesis research, I intend to study the strip of development on Mission Gorge road that is between Princess View Drive and Margerum Drive which encompasses the worst area of clash between use and zoning. The zoning in the area is topographically insensitive and includes a two hundred and fifty acre sand and gravel quarry that goes against multiple regulations previously set by the Community Plan. While being extremely destructive to the aesthetic of the neighborhood it also is infringing upon the San Diego River and is destroying the natural habitat that it provides to many species. The San Diego River is an essential part of the Navajo Community because it provides a natural source of water to the community as well as interconnects the dozens of canyons and waterways that wind throughout the area. My intention is to reimagine this strip of development in a manner that rehabilitates the land surrounding the river while also creating a focal point for the community that will help reconnect the individualized "micro-communities." While the Navajo Region was successful in creating a community layout that respected the existing natural terrain, it disregarded the most prominent ecological feature, the San Diego River.

The Effects of Light In Photoreceptor cell of *D. melanogaster* Neurodegenerative Disease Models

Margarita Sanchez, Alexis Thomas, Sean Vogel, Jillian Wothe, Ernesto Reyes and Adam Haberman

Recent studies have shown that human degenerative diseases such as Alzheimer's, Parkinson's, Huntington's disease as well as Spinocerebellar Ataxia (SCA) share similarities in which neurons of affected patients are unable to properly degrade aggregates within the cell. In our study we used *Drosophila melanogaster* specimens in order to study human neurodegenerative disease. *D. melanogaster* have been used in previous studies due to similarities at the genetic and cellular level with mammals. Nearly 75% of Human disease causing genes appears to have a working homolog in *D. melanogaster*. While some of the *D. melanogaster* stock was contaminated, some significant findings of research was dealing with our experiments with HTT and SCA, in which actin localization behaved in an unpredicted manner. Light independent degeneration shown by SCA and Huntington's models provided more questions than answers, which will need to be answered with further research.

Impossible Hierarchies with the Deegan-Packel Power Index

Samantha Armstrong, Danielle Riethmiller, Danielle Watson, Jane Friedman and Cameron Parker

A simple voting game is a collection of players along with a set of winning coalitions. The Deegan-Packel power index measures relative power in voting games based on inclusion in minimal winning coalitions. These are winning coalitions with the property that the deletion of any member results in a losing coalition. Unlike more well-known indices, the Deegan-Packel index is not always weakly transparent, meaning it is possible for a player to have less weight than another player in a weighted voting game, while still having more power than that player. This paper will look at the relative power of players with respect to this index, inspired by previous work with the Shapley-Shubik and Banzhaf power indices. In particular, we examine strict hierarchies of weakly transparent, proper simple voting games. We have shown that, similar to the Shapley-Shubik and Banzhaf indices, certain hierarchies are impossible with the Deegan-Packel power index under these restrictions.

Finding a Mechanism for Arsenic Enrichment in the Julian Schist

Thomas Robinson, Elizabeth Johnston, Eric Cathcart and Bethany O'Shea

Arsenic deposition is often associated with gold mineralization in hydrothermal quartz veins. Arsenic deposited along gold-bearing quartz veins can be further concentrated in mine tailings piles, and then leach into the groundwater. Recent findings suggest that historic gold mining operations have in some circumstances resulted in arsenic impacted groundwater (Fairbanks, Alaska), elevated arsenic mobility in ecosystems (Mojave Desert), and human exposure to arsenic via drinking water (Nova Scotia). In Julian California, gold mining operations have left behind various tailings piles composed of extracted quartz vein material. In an initial study, tailings deposits were found to contain arsenic concentrations as high as 2822 mg kg⁻¹. During rain events, arsenic can leach from tailings into surrounding groundwater resulting in concentrations toxic to human health above the EPA drinking water standard of 0.01 mg kg⁻¹. Understanding the mineral host for arsenic and the mechanism by which arsenic is deposited will help assess the possibility of arsenic groundwater contamination in Julian and other regions of similar geologic origin. A study was designed to determine the geologic source of arsenic in Julian mine tailings and whether other geologic features in the region should be a concern for arsenic leaching. Forty-five rock samples were collected from the Julian Region and elemental concentrations were measured using X-Ray Fluorescence Spectroscopy. Arsenic was found to be concentrated consistently among tailings samples but not among hard rock samples in the region. This suggests that arsenic forms in the gold-bearing quartz veins, which are the source rock for tailings deposits.

Theme of Exile and Displacement in Shakespeare's Plays

Eric Rosenberg and Maura Giles-Watson

For first year students, displacement plays a key role in college students' lives, and the feeling is surreal. We are all "displaced" from our homes, whether you're from California, or even as far as Maine. We all have to start fresh! When people told me that I'd be starting a new chapter in life, it didn't really set in my mind until a week went by. Just like our new journeys at USD, the characters from Shakespeare's plays experience new situations from the extravagant royal lifestyle to a nomadic life or being deserted on an island. Everyone experiences displacement differently. Last semester, I felt as if I took a huge leap in my life from one cliff, representing the old and home, to another cliff, representing the new and terrifying unknown. However, for a majority, we are still floating in between those two cliffs, that feeling of displacement and uncertainty in ourselves and of our surroundings, which is very relatable to how the characters feel about themselves and in their personal life situations in the plays. For example, Touchstone, a fool from one of Shakespeare's plays, goes to "Ardenne; the more fool I. When/ I was at home I was in a better place; but travellers must be content" (As You Like It 2.4.12-14). Like this quotation, my project will define and illustrate more scenarios of the theme of displacement and exile found in Shakespeare's various plays.

Exploring the Possibility of Bipartisanship in Congress: A Focus on Political Junkets

Sean Roth and Casey Dominguez

The level of bipartisanship in the current Congress is at an all-time low. Political scientists have multiple theories for why this is the case. A solution to the general problem is well beyond the scope of this paper. This investigation, however, will focus on the relational theory of governance, the theory that states the greater the personal relationships between Congressmen the more work there will be across party lines. In order to test this theory this paper seeks to explore the connection between political junkets and co-sponsorships of bills. Political junkets are trips where Congressmen travel together abroad for informational or governmental purposes. It has been observed that after these junkets, members often return with bipartisan compromises on bills. This paper seeks to test this relational hypothesis in the small scale which then can be extrapolated to a larger level to show the importance of relationships between members of Congress and provide a potential solution to Congressional gridlock.

Capturing the War: Still Photography's Role in Influencing American Public Opinion of the Vietnam War

Sara Rowe and Kathryn Statler

The Vietnam War came to be known as the "Television War" as the gruesome sights of the battlefield were brought in to the living rooms of the American public. However, television was not the only visual source of the war that Americans received. Still photographs, often circulated in newspapers and magazines, were just as influential as television in shaping the view Americans had of the Vietnam War. I will focus on two of the most famous still images from the Vietnam War as case studies: Nick Ut's image of a young girl running down a road, burnt from napalm; and Eddie Adams' photograph of a Southern Vietnamese General executing a Viet Cong, taken the moment that the bullet entered the man's head. These photographs were widely circulated during the war and remain present in American consciousness of the war to this day. These two case studies provide powerful examples of still photography's tremendous influence throughout the course of the Vietnam War.

Children's Intern

Kristal Ruiz, Ryana King And Krista Brannon

In the Fall of 2014 I began an internship with La Jolla Community Church as a children's ministry intern. I have two supervisors at my internship: Krista Brannon, Director of Children and Family Ministries, and Ryana King, Children & Family Ministries Assistant. I also work alongside four other interns who are in charge of different age groups. As an intern my main duties include: managing a classroom of elementary children on Sunday mornings, teaching the bible lesson, engaging children in activities, leading small groups and mentoring children. I also assist with monthly children's ministry events, such as, Mom and Me programs, Family Dinners, Parents Nights Out, Girls sleepovers, and church camps. My overall mission as an intern is to engage children on Sunday mornings and help them experience God in their lives.

A Voxel-Based Game Engine

James Ruther and Lukasz Pruski

Nearly all existing video game engines are optimized to simulate worlds in which the environment is static. This puts limitations on game developers, leading to games in which structural objects and landscapes can never be created nor destroyed during gameplay. This project is a new type of video game engine, which is optimized for dynamically changing environments. Using this game engine, video game developers will be able to introduce a new level of interactivity in their worlds and push the boundaries of video game design, while all of the necessary optimizations are handled automatically.

The Nuremberg Trials vs. The Tokyo Major War Crimes Trials: The Cases of Joachim von Ribbentrop and Shigenori Togo

Jamie Santos and Colin Fisher

Following the horrors of World War II, the Nuremberg Trials were established by the Charter of the International Military Tribunal on August 8, 1945 to prosecute twenty-four members of the Nazi government of Germany for crimes against peace, war crimes, and crimes against humanity. Similarly, in Japan, the International Military Tribunal for the Far East created a trial at Tokyo, totaling to twenty-eight war crimes, crimes against humanity, and failure to prevent aggressive war. As the first two international military tribunals, the Nuremberg Trials and Tokyo Major War Crimes Trials set a significant precedent for the enforcement and execution of international law. This study compares the trials of Joachim von Ribbentrop, the Foreign Minister of Nazi Germany, and Shigenori Togo, the Foreign Minister of Japan, analyzes the evolutions of their charges and judgments, and shows how these two cases demonstrate the contrasting views of war crimes and crimes against humanity prior to and during wartime, coupled with the different atmospheres of war in Europe versus war in the Pacific affected the charges indicted, the judgments created, and the legacy each trial left on the international world.

Problem Solving in the Engineering Classroom: Peer Teaching at the Freshman Level

Anthony Shao, Nicholas Addiego, Michelle Fabian, Rachel Gledhill, Harrison Schmachtenberger, Felicia Wang and Frank Jacobitz

A group of honors freshman engineering students researched problem solving methods, prepared and delivered a presentation to peers on the topic, and assessed and evaluated knowledge of and attitudes of their peers towards problem solving. The lecture included hands-on challenges, a discussion on the importance of problem-solving in engineering, step-by-step strategies to approaching a problem, and famous problem-solvers in history. A short survey was distributed before and after the lecture to obtain quantitative and qualitative information on student knowledge of and attitude towards problem-solving. Quantitative statements were rated on a one-to-seven Likert scale. For example, the statement “I am familiar with problem-solving methods” had an average response increase from 3.93 to 5.76, which was statistically significant. One qualitative question asked students to list three problem-solving steps they know. Before the lecture, students answered with a variety of words including “analyze,” “define,” “think,” and “generate.” After the lecture, the results were more consistent and including “solutions,” “define,” and “brainstorm.” Overall, the study showed a significant increase in their scores when asked about their knowledge of problem-solving approaches.

The Biodiversity of Armored Scale Insects in the Bornean Rainforest

Hannah Shapiro, Shannon Trujillo and Geoffrey Morse

Armored scale insects (Hemiptera: Diaspididae) are some of the most invasive insects in the world. Most of the morphological features used for insect identification such as legs, eyes, antennae and wings have been lost in the most commonly encountered life stage (the adult female), which makes their taxonomy particularly difficult. In addition, these insects are extreme generalists, which is unique in the insect world where most are quite specialized. A recent hypothesis proposed that this is due in large part to their origins in tropical rainforests. However, this is also the area where their diversity is least known. As part of an extensive survey of armored scale insects on four continents, we have begun a molecular systematic survey of the scale insects collected in an intensive survey from a tropical rainforest canopy using a canopy access crane in Malaysian Borneo. This first pass allows us to characterize the standing biodiversity of armored scale insects. In addition, the molecular markers allow us to identify previously undescribed species and cryptic species (a task made difficult by their reduced morphology). Fragments from three different gene regions were used to produce a phylogeny of the subfamily Diaspidinae: elongation factor 1-alpha (EF1-alpha), the large ribosomal subunit rDNA (28s), and a mitochondrial region spanning parts of cytochrome oxidase I (COI) and cytochrome oxidase II (COII). These sequences were used to generate a phylogeny that can be used to examine patterns of host use in species collected from different hosts in the same geographic location.

Regulation of Growth and Chemotaxis by Diguanylate Cyclase PleD in *Rhodospirillum centenum*

Joseph Sheridan and Terry Bird

The purple alpha-proteobacterium, *Rhodospirillum centenum*, has a complex signal transduction system that allows it to respond quickly to environmental cues. The signal transduction systems of many prokaryotes, and even eukaryotes, rely on bis-(3'-5')-cyclic dimeric guanosine monophosphate (c-di-GMP) as a second messenger. Second messenger molecules in signal transduction systems are able to communicate various signals by altering concentration levels within the cell. This essential molecule is synthesized by a fairly recently discovered class of enzymes known as diguanylate cyclases. Deletion of a diguanylate cyclase called pleD from the *R. centenum* genome resulted in a hypermotile phenotype characterized by two distinct chemotactic events not observed in wild type. pleD overexpression in both wild type and pleD deletion strains reduced both motility and growth rates significantly. These data suggest that normal cell proliferation and motility are dependent upon PleD function.

Istanbul: A Case Study of Re-Development Methods

Paul Short and Daniel Lopez-Perez

Gentrification, urbanization, and globalization are all words that can be associated with the city of Istanbul. As a city undergoing development at phenomenal rate, Istanbul is able to function as a laboratory; offering insight for the rest of the developing worlds. Construction and destruction are happening simultaneously to allow for the old city to rapidly gentrify into mass housing and westernized style living. The emerging metropolis offers to the world a case study of the dealing with rapid urbanization. The district of Gaziosmanpasa, a recent project area designated by the Istanbul Municipality through the Law on the Transformation of Areas under Disaster Risk, is a condensed view of the city and the site for my project. Within the district exist three forms of developments: gecekondu-like spread, apartment blocks, and mass housing towers. The towers represent the new, the gecekondu the old, and the apartment blocks the present. Utilizing the district of Gaziosmanpasa for its current situation and diverse existing conditions, this project seeks to offer an interpretation of re-development strategies. Working within the existing context to preserve rather than destroy.

Frustration is Relieved Upon Binding of NHE with its Natural Partners CHP1 and CHP2

Daniela Silva, Joseph J. Provost and Joachim Latzer

An important target for anti-lung cancer drug design is the binding of calcineurin homologous protein isoform 1 (CHP1) and 2 (CHP2) binding to, and regulating, the Na⁺/H⁺ exchanger 1 (NHE1). NHE1 plays a key role in intracellular pH homeostasis, motility, and invasion. Understanding the activation of NHE1 by CHP1 and CHP2 is relatively unknown and is a promising target to disrupt NHE1 function. We performed molecular dynamics simulations with a coarse-grained funneled energy function that provided an atomic level picture of the association of NHE1 with CHP1 and CHP2. In these simulations NHE1 collaboratively folds and binds correctly to both CHP proteins lowering the overall binding free energy. The molecular detail of the simulations helped identify "hot-spot" residues involved in the encounter complex and in the binding interface that can guide the design of non-binding mutants. To understand the association of NHE1 on a residue level, frustrated (residues unlikely to bind) and minimally frustrated (residues that bind strongly) contacts of NHE1 residues were computed for bound structures and also their encounter complexes. The single residue frustration results suggest, for example, that locally at position 536 a mutation to glycine in NHE1 should result in reduced binding to CHP1 but no noticeable change in binding to CHP2. Eight of the proposed mutants have been expressed and purified in the laboratory for experimental testing and verification of the proposed simulation results. Circular dichroism studies revealed altered thermodynamic association for the designed mutants as predicted. The nature of the interactions probed

served to understand, in molecular detail, the activation of NHE1 and could serve as input for pharmacomodeling to design a therapeutic drugs that fights lung cancer growth.

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Copyright Law and Jazz, 1917-1930

Andrew Smith and Colin Fisher

My senior thesis project explores the effect that copyright law, as established by the Copyright Act of 1909, had on the development of jazz music between 1917-1930. Many historians have extensively researched the many facets of jazz's development from 1917, when the first jazz record was produced, to the end of the 1920's. However, there is a lack of scholarship that has specifically focused on the role of copyright in the development of jazz. Copyright law had an impact on the production and performance of jazz music in the latter half of the twentieth century, but almost little if any during its development in the early twentieth century. This discrepancy can be attributed to economic inequities, the difference in the production and performance of jazz music to other forms of music, and the fact that the genre was seen as illicit and marginal due to racism. Due to these factors, the Copyright Act of 1909 had a very limited impact on the development and growth of jazz music between 1917-1930.

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Statistical Analysis of Wage Discrimination

Morgan Smith, Spencer Fowler, Ani Velo, Steven Sumner and Philip Lau

As a new generation of young people leave school and enter the workforce, wage becomes a key consideration. Many young people obtain a college degree, participate in internships, or acquire skills in hopes of attaining higher wages. However, the compensation one receives varies due to different social factors. For example, is there wage discrimination based on gender, political party, sexual orientation, and so forth in any given field? These are important issues to everyone who enters the workforce. This project seeks to answer such questions, by examining and comparing the differences in the wage gap between individuals across different career paths. Using data from the General Social Survey, we will statistically analyze the presence of wage discrimination.

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Analysis of the Effects of Lysophosphatidic Acid on the Activity of the Sodium-Hydrogen Exchanger

Ramon Solis and Joseph J. Provost

The Sodium-Hydrogen Exchanger (NHE) is a membrane protein that exchanges an extracellular sodium ion for an intracellular hydrogen ion. This protein helps regulate cell processes including transport activity and membrane targeting. This protein binds together the internal cellular structure and secures the internal signaling components of the cell. The exchanger influences the acidity and basicity within a cell, known as the intracellular pH (pHi). The exchanger regulates pHi through the molecular exchange that occurs. The activity of NHE and pHi influence how cells move out of acidic conditions. The transport activity regulates pHi and serves as an anchor for intracellular proteins at the membrane. These factors are known to significantly contribute the metastasis of cancerous cells. Lysophosphatidic Acid (LPA) is a phospholipid that activates cell signaling. Its structure contains a long hydrocarbon chain on a three-carbon backbone with a phosphate group. Its role is to promote cell growth, movement, and division resulting from its activation of different G protein-coupled receptors. This research aimed to discover if different fatty acids on LPA, known as Palmitoyl and Myristoyl, would turn on NHE, and if so, which of these activated NHE more effectively. We developed a pH calibration assay to create a standard curve to compare known ratios of cell signal and pH to our unknown ratios. We found that a higher pH yielded a stronger signal. We then conducted the assay using the LPA fatty acids to assess their influence on NHE activity. The results suggest that Palmitoyl activated NHE more effectively. Understanding the activity and behavior of NHE and how it can be manipulated by introducing different factors could potentially lead us to prevent the metastasis of cancer cells.

San Diego County's Forensic Psychiatry Clinic Internship

Rachel Spaulding and Nadav Goldschmied

The San Diego County's Forensic Psychiatry Clinic Internship provides undergraduate psychology students the opportunity to observe how forensic psychiatrists and psychologists function within the legal system. The clinic is a unique neutral and objective entity carrying out Court ordered evaluations. Throughout the semester, students shadow forensic psychologists in their daily tasks, including mental competency evaluations, sentencing assessments, conservatorship interviews and expert testimony. Students gain insight into how forensic assessments are conducted, the required interviewing skills and the type of questions needed to evaluate mental health in the legal system. Interns split their time between the clinic, the San Diego Central Jail and Mental Health Court. The goal of this exceptional internship experience is for students to learn about forensic psychology and to understand how mental health issues are resolved within the legal system.

James Watt: A Cultural and Technical Biography

Rachel E. Stein, Nicholas D. Addiego, Esther K. Cho, Mei-Li M. Hey, Harrison S. Schmachtenberger and Frank Jacobtiz

The beginning of the Industrial Revolution is often associated with James Watt's creation of an improved version of the Newcomen steam engine in the late 18th century by the addition of a secondary condensation chamber and his subsequent patenting of numerous mechanical designs that increased the efficiency of steam power by over fifty percent. The Industrial Revolution started in London and spread to the rest of the Western world, utilizing steam power and modern machinery to create the industrial production society that we know of today. Because of this event, products became cheaper and were able to be sold to clients all over the world with the help of new steam powered transportation methods, allowing for a higher standard of living for those who could afford these new luxuries as well as a new sector of jobs. By the middle of the 19th century, about half of London's population was employed by this new industrial world. The Industrial Revolution saw the creation and growth of a new middle class, centered around the economic hubs created by this event, but also created a new set of societal issues including a poor working class and child labor. This event also marks the beginning of massive economic based pollution, since many factories were based on or near rivers, some of which became too polluted for other uses. This contribution examines James Watt, his influence on the Industrial Revolution, and his contributions to the development of an improved steam engine.

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WanderLink

Molly Strasser and Eric Jiang

Traveling by yourself is both lonely and freeing. WanderLink helps alleviate the problem of wanting the freedom to do what you want, when you want, but also wanting friends to go with. WanderLink gives people the freedom of traveling alone without actually having to be alone. WanderLink is an iPhone app that provides a platform for travelers to meet each other and see other travelers in their area who would like to make new “links”. It allows people to post what they want to do, how much it will cost, and how many people can join. Users can then scroll through what others are doing and if she finds something that calls to her, she can get in contact with the person and set up the excursion. Some potential features future versions may implement are: user ratings which allow people to rate each other on certain factors, a female’s only section, and location travel suggestions.

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Female Pursuit of Advanced History Scholarship and Careers

Elizabeth Szewczyk and Colin Fisher

The focus of my research is upon capturing the experience of the pioneering women who sought graduate education and careers in history during the 1960s and 1970s. While evidence reveals that there was a significant increase in women pursuing history degrees and professions within these decades (due to the Second Wave of Feminism), these statistics do not convey the many difficulties women faced within their scholarship, departments and universities. To gain a detailed yet broad assessment of the experiences women faced, I focused my research upon several biographical short essays written by women reflecting upon their experiences of pursuing their history degree or profession within these select decades. These biographical essays reveal that women faced a general notion of gender bias enforced by societal norms (enforced by men) and male historians viewed women as inferior scholars who lacked objectivity. Ultimately, women historians were viewed as tokens of diversity.

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Mediating Variables of Stress Hormones in College Students

Cori Tergesen and Veronica Galvan

The purpose of study was to investigate correlations between psychological and biological variables pertaining to stress. Variables of interest included adaptive and maladaptive perfectionism, academic entitlement, nutritional and physical self-efficacy, and the stress hormones of salivary cortisol and DHEA. These variables were correlated with level of perceived stress. Participants were college students in Introduction to Psychology courses at the University of San Diego. Data was collected from multiple psychological questionnaires and saliva samples. Strict criteria were utilized to obtain the most valid baseline salivary hormone samples. ELISA assays were used to measure cortisol and DHEA baseline levels in each participant. The raw values were transformed into a cortisol to DHEA ratio variable, which was correlated with the psychological variables. It was hypothesized that perceived stress would have significant positive correlations with maladaptive perfectionism, academic entitlement, and cortisol to DHEA ratio while exhibiting significant negative correlations with nutritional and physical self-efficacy. The results showed the opposite of many of the predictions. The findings suggested that the ratio of cortisol to DHEA has a negative correlation with perceived stress and academic entitlement while demonstrating a positive correlation with reported GPA, which rejected some of the hypotheses. A significant positive correlation existed between perceived stress and maladaptive perfectionism, which supported the hypothesis. There were also significant differences between ethnicities and psychological variables. Caucasians reported higher in nutritional and physical self- efficacy compared to ethnic minorities, but ethnic minorities had higher levels of maladaptive perfectionism than Caucasians.

Graffiti in the House of the Telephus Relief in Herculaneum

Brooke Thayer and Colin Fisher

This case-study examination of the ancient Latin graffiti inscribed on the walls of the House of the Telephus Relief in Herculaneum explores Roman writing culture in domestic space in the 1st century CE and draws comparisons between the graffiti writing in Herculaneum and Pompeii. By examining non-Pompeian graffiti from Herculaneum, contextualizing graffiti within the built structure and within extant scholarship on Roman domestic space and social theory, and drawing comparisons between the graffiti evidence at the two prominent sites, this research demonstrates the importance and effectiveness of using graffiti as primary source evidence and begins to fill the existing gaps in Roman studies. The case-study illustrates how domestic space and architecture influenced graffiti locations, authorship, and viewership. The tendency for graffiti to cluster in areas of social interaction and conformity proves that domestic graffiti writing was both visible and socially acceptable. The case-study also confirms that domestic graffiti writing was a diverse phenomenon that lacked standardization, but that both common people and elite members of society engaged in the practice. Furthermore, despite the broad spectrum of graffiti types and forms, Herculaneum and Pompeii still exhibited similar graffiti themes and content and therefore seem to have had very similar domestic writing cultures.

Determination of Citrate Synthase and Phosphoenolpyruvate Carboxykinase Expression in Eared Grebes (*Podiceps nigricollis*) Preparing for Migration

Valerie Thorngren, Brent Allman, Sylvester Luu, Amy Bergen, Chyna Grey, Hugh Ellis and Joseph J. Provost

Citrate Synthase (CS), a key regulatory enzyme in the Krebs cycle, and phosphoenolpyruvate carboxykinase (PEPCK), a critical marker enzyme of gluconeogenesis, are used as quantitative indicators of metabolic activity. The eared grebe (*Podiceps nigricollis*) prepares to migrate on a few select lakes in the western United States. Studies showing basal metabolic rate in grebes seems unaffected by changes in organ size as grebes switch from a non-migratory to a migratory mode. However, the metabolic intensity of these organs seems to change as grebes prepare to depart. CS activity has been found to increase from $110.96 \pm 26.18 \text{ } \mu\text{mol g}^{-1} \text{ min}^{-1}$ to $169.92 \pm 31.24 \text{ } \mu\text{mol g}^{-1} \text{ min}^{-1}$ in grebes shortly before migratory departure, an increase exceeding 50%. We are interested in how CS increases rapidly in these birds, whether it is achieved by increasing activity, mitochondrial density, or CS expression in existing mitochondria. We are also interested in the extent to which these pre-migratory birds might be increasing gluconeogenesis prior to flight. We identify changes in overall CS expression using immunoanalysis in homogenized tissue and quantitatively measure the level of mitochondrial and cytosolic markers in each bird. We also determine PEPCK specific activity in liver of these birds to identify potential gluconeogenic shifts in preparation for migration. This evidence suggests that either mitochondrial density or mitochondrial expression in organs increases in preparation for migration.

The Natural Type

Kean Tom and Daniel Perez-Lopez

The man-made urban landscape is a testament of human ingenuity, engineering efficiency, and resilience. Though these concrete and steel jungles are an invaluable asset to the facilitation of daily life, one must question architecture's role and influence on nature. Architecture often conflicts with the natural environment (such as water cycles, air quality, as well as plant and animal ecosystems) in favor of built environments that primarily accommodate humans lifestyle. With 56% percentage of the world population living in urban areas "and steadily growing", the very natural systems that we rely on for resources are steadily being dominated and harvested to the point of scarcity. Architecture's unnatural nature communicates and perpetuates consumption. It is proposed that gardens should be integrated to be a major factor of an urban fabric to communicate the scarcity and fragility of nature-which cannot be understood from an artificial environment that separates itself from it. Plant cycles are the quintessential microcosm for the ephemeral, cyclic realities of nature. Emphasizing gardening in urban environments yields community connectivity, a realistic sense of food, and questions real estate value versus use value. Most importantly, the logistical challenges of integrating gardens into a rigid, dense landscape is a dialogue of how far from natural a city's function truly is. This project aims to question whether architecture can be built to allow or support natural systems rather than impede on them.

Expression Levels of Calcineurin Homologous Protein 2 in Non-Small Cell Lung Cancer

Michelle Tran, MJ Cain, Mark Wallert and Joseph J. Provost

Calcineurin Homologous Protein (CHP) is a Ca^{2+} binding protein that functions as an essential cofactor in pH regulation by directing the plasma membrane's Na^+/H^+ exchanger (NHE) activity. Both CHP1 and CHP2 bind to NHE in an unknown manner; however, CHP2 was previously identified to be expressed in select malignant cell lines (not determined in lung) while remaining below detection in non-transformed cells. The relationship between CHP2 expression and function is still unknown. To better define a role of CHP2 in lung cancer, we examine the expression of CHP2 in both cultured cells and human lung tissues of Non-Small Cell Lung Cancer (NSCLC) patients using two different detection methods. We first identified appropriate isotope specific CHP antibodies using recombinant CHP1 and CHP2 purified protein and then probed normal and malignant cultured cell lines using each CHP antibody. CHP1 was expressed in each cell line (normal or transformed) while CHP2 was not detected in normal cell cultured lysate. CHP2 expression was detected in adenocarcinoma, squamous cell carcinoma and malignant cultured lysates. Similar results were observed when blotting adjacent malignant/normal human lung tissue from NSCLC patients. We then used real-time PCR (RT-PCR) to quantify the expression levels of the same NSCLC cultured cell lines and human lung tissues. In both methods, all cultured cell lines and human lung tissues were analyzed again to confirm the expression of the house-keeping gene Beta-actin. This provides the first evidence of CHP2 expression in cultured human lung cells and in diseased tissues from NSCLC patients.

An Analysis of Armored Scale Insect Taxonomy Using a Combination of Morphological Identification and Molecular Phylogenetic Techniques

Shannon Trujillo, Hannah Shapiro and Geoffrey Morse

Armored scale insects (Hemiptera: Diaspididae) are anomalous, cosmopolitan plant associates found throughout the world. However, little is known about their life histories beyond the taxa most commonly associated with agricultural crops. Furthermore, their small size and cryptic morphology makes discovering them and differentiating between taxa difficult. However, advances in modern molecular genetic techniques have made it possible to rapidly distinguish taxa based on various gene regions. In this study, we surveyed three tropical rainforest canopy sites in Malaysia, Australia and Panama. Armored scale insects were collected by hand and transported back to USD where they were photographed and slide mounted for morphological association with DNA sequences extracted from the specimens. To date we have generated significant DNA sequence data for samples from a rainforest in Malaysian Borneo. I will present our most up-to-date phylogeny of tropical armored scale insects in the subfamily Aspidiotinae based on the alignment of these sequences, and discuss the evolutionary and ecological implications of my findings.

Internship with the Office of Councilmember Todd Gloria

Anna Vacchi and Gary Gray

I will be presenting on my internship in the Office of San Diego City Councilmember (and USD alumnus) Todd Gloria. The internship is a great environment to learn about the issues facing our city and the legislative process. My focus is on community outreach, constituent correspondence and homeless issues. I attend council and committee meetings, write letters to community groups, prepare talking points for events and work with constituents to resolve issues. The current ongoing project I am focusing on is the overhaul of the San Diego Regional Continuum of Care Council website. The Continuum of Care program is a federal grant from the U.S. Dept. of Housing and Urban Development. The San Diego Regional CoC Council consists of representatives from the 18 cities in the county and establishes funding priorities for homeless services, with the aim to pursue an overall systemic approach to addressing homelessness in the region. Councilmember Gloria is the chair of the board as well as the representative for the City of San Diego. My ongoing project has been to create a new San Diego CoC website.

Mobile Moment

Angela Vanella and Daniel Lopez-Perez

Because suburban cities like Temecula, California, were developed to quickly address immediate demand during the housing boom of the 1990s, they tend to lack the complexities required to be able to change with the needs of their residents over time. Temecula's stand-alone single-family houses were distributed on a massive scale across the landscape, aggregating outward from Interstate 15. This resulted in wide expanses of land that consist of solely residential land usage. Not only does this create visual homogeneity, but it also makes walkable access to work and leisure activities difficult for those who live amongst the suburban sprawl. In my previous research, I was able to prove that, while the houses in Temecula and their winding patterns may appear very similar, the routes that connect them compose a range of street types. This project seeks to design a mobile unit that can use the streets of the suburb to bring programs other than housing into the residential fabric. The unit would be driven into a neighborhood and would unfold to create a moment that is unique to that locale for a short time, and, later, quickly pack up and move to a different location. This project promises to create an informal, temporary node of activity that operates outside of the slow-moving city planning approval process. These moments, anything from concert venues to shading structures, would morph alongside the wants of those who live in Temecula. This project seeks to produce a mobile prototype that contributes spontaneity to the suburb.

Who Gets the Parties' Goodies? An Analysis of How Political Parties in the U.S. Choose Their Policies

Bridget Vuona and Casey Dominquez

This research project addresses the question of how political parties in the U.S. decide which groups of voters to target when formulating their issue stances. The goal is to test the validity of the theory that political parties adhere more to the policy demands of large non-partisan interest groups with the ability to mobilize voters than to the demands of their traditionally loyal core constituents. This has been done by creating an original dataset for both of the variables in my hypothesis: degree of non-partisanship of an interest group and amount of priority received from the party. The dataset consists of interest group campaign contribution percentages to either party and the number of times an interest group's "list of demands" are referenced in a given presidential convention speech. Multiple regression analysis results show that while the candidates have not acted in line with my theory in the past, it is a good model for explaining the issue stance decision making behavior of Democratic candidates in recent years (2008-2012). This information indicates that it is worth testing my theory in future election years to determine whether the trend will continue.

Antenna Boresight Calibration

Allyson Ward, Brendan Gee, Erica Mayer

A calibration device is being designed to provide antenna alignment, which is crucial for measuring the exact position data for military aircrafts. The aligning technique for the antenna is referred to as antenna boresighting. Boresight occurs when the antenna is perfectly aligned, meaning the mounting offsets are measured to be zero degrees with respect to the face of the antenna along the x, y, and z axes. Cubic Defense Applications has requested a calibration device to accurately measure the mounting offsets of their antennas located on aircrafts. These offsets will be used to assist Cubic in aligning their antennas boresight. The design will result in a low cost, accurate, and wireless device that will efficiently calibrate the roll, pitch, and yaw offsets within an hour. The antenna will be calibrated one time while the aircraft is stationary and not transmitting. This device will incorporate a sensor board that is interfaced with an Arduino to measure and calculate the mounting offsets. The calculated offsets will be sent wirelessly to a computer and displayed using an interactive wizard.

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The Role of Surface Groups in Catalytic Reactions over ZIF-8 Films

Elizabeth R. Webster, Fangyuan Tian and Lauren Benz

Zeolitic Imidazolate Frameworks (ZIF) have gained notoriety of late for catalytic activity in reactions such as cycloaddition, transesterification, Knoevenagel reactions, and Friedel Crafts acylations. However, the exact role of Lewis acidic and basic surface groups in these reactions remains unclear. In this study, direct characterization of surface groups of ZIF-8 was employed during the adsorption and reaction of gases involved in the above reactions with a specific emphasis on the cycloaddition of epichlorohydrin and CO₂. Using a combination of X-ray photoelectric spectroscopy (XPS) and temperature programmed reaction spectroscopy (TPRS), the role of outer surface groups of ZIF-8 was compared to that of inner pore sites during the aforementioned reactions. ZIF-8 nanoparticle films were mounted in a UHV chamber in these studies to facilitate the study of surface group interactions. An understanding of the role of the surface groups in catalysis is important in developing ZIFs as more effective and efficient catalysts.

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Modernizing Android Parcel Tracking Applications with Material Tracker

Traylor Weiten and Eric Jiang

Ever wondered where that package you ordered on Amazon was? Material Tracker is an Android-based mobile application to answer just that. Material Tracker takes basic tracking information from a user, such as a USPS tracking number, and notifies the user each time their package moves to a new location--allowing the user to be fully aware of where their packages are at all times. Users will receive a notification when a change to the status of the package's tracking is detected along with a forecasted delivery date, if available. Material Tracker supports all packages from the USPS, FedEx, or UPS, ensuring you never lose track of your packages. This project aims to be the first parcel tracking application to utilize Google's new Material Design visual language, delivering a user interface that is rich and intuitive.

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Engine Dynamometer Test Cell

Josh Williams, Troy Zawlacki, Khaled Alwehaib, Yash Goenka, Kyle Jensen and David Malicky

Accurately tuning and diagnosing engines has been out of reach for most automotive enthusiasts and mechanics for years due to cost and spatial factors. Dynamometers, "dynos", or engine test cells, range in cost from \$7000 to \$40000 and usually require a large dedicated space. In addition, many engine dynamometers are specialized for different engines and applications. Our senior design team addresses these needs by designing a small compact engine dynamometer which can accommodate most automotive engines, assuming the operator can build custom engine mounts. Our universal compact engine dynamometer uses a fluid absorber with an 11 in impeller to maximize the load capacity and minimize cost and size. This design solves many problems experienced with conventional dynamometers such as external exhaust management and cooling. The dynamometer will handle an engine that produces 300 hp and 300 ft-lb of torque at speeds up to 8000 RPM. It is mobile, on a 54 in by 34 in frame, and all the systems are self-contained.

Bitcoin: Currency of the Future or Investment Property

Kelly Yu and Tom Dalton

We live in a digital age where almost every aspect of our lives is based on computerized information. In 2009, currency became digital in the form of Bitcoin. The existence of Bitcoin has brought a variety of obstacles to government agencies and regulators. Specifically, the Internal Revenue Service (IRS) has been debating the treatment of virtual currencies such as Bitcoin for tax reporting purposes. In March 2014, the IRS issued a notice classifying Bitcoin and other convertible virtual currencies as investment property, similar to stocks and bonds. The notice from the IRS provoked outrage from the Bitcoin community. This project analyzes the current tax rules for investment property as well as the rules for foreign currency to determine whether or not the IRS decision will stand if appealed. Additionally, this project focuses on the mysterious and complex nature of Bitcoin to better understand what Bitcoin is and how the IRS arrived at their position.

Designing Experiments that can be Achieved at Home to Allow for Greater Access of Chemistry and Biology to Students

Andrea B. Zammit and Joseph J. Provost

Teaching non-science majors science is a fundamental requirement in most universities. Many universities include a laboratory or experiential experience for each student as part of their science course. The Science of cooking (biology, chemistry and biochemistry) style course is becoming a popular method to bring science theory, laboratory experience and inquiry to these students. One of the challenges to teach such a course is a lack of laboratory experiments appropriate for entry-level students that integrate science, food and inquiry. We have created three laboratories that meet these goals and use inexpensive and safe chemistry techniques so that experiments can even be performed in a student's own kitchen. Each lab will be presented in three parts. First is a traditional, directed approach where students will be guided through procedural steps and observations. Each laboratory will also include an inquiry portion where they can form their own hypothesis based on background information and results of the first portion of the experiment. A third component for each lab will integrate food and cooking or baking to bring the scientific foundations to a fun and meaningful application. Some of the basic science concepts that will be examined are reaction kinetics, pH and buffers, macromolecule structure and function, and chemical vs. physical changes. We have prepared three such labs: Browning (Maillard) Reactions, Science of Spherification, and Baking Cookies. From these experiments, more students can learn the fundamental concepts of biology, chemistry and biochemistry and relate it to their daily activities.

Planar Six Bar Linkage Analysis

Troy Zawlacki and Ming Huang

The purpose of this research is to investigate a six bar mechanism. This mechanism in particular is a closed configuration, three degree of freedom, planar mechanism. One important aspect when considering a linkage system for a machine or robotic mechanism is the workspace, or the area in which a prescribed point on the mechanism can reach throughout its full range of motion. This linkage has four variable lengths, a , b , d , and z . Changing these lengths with respect to one another changes the motion of the prescribed point, therefore changing the workspace. Although increasing the area of the workspace may seem trivial by simply increasing the link lengths, it is not so simple. When the proportions of the links change drastically, certain links are no longer able to rotate fully, and the workspace is constrained. In addition, accessing the same point in the workspace with different link length configurations presents the mechanism with different stiffness characteristics which is a critical aspect of robotic design. This research analyzes how variable link lengths affect the workspace and stiffness of the mechanism.

Making the Vision a Reality: Staging the Unreal in Realist Theatre

Sarah Zentner and Fred Robinson

Realism and visionary theatre are two distinct types of modern drama. In realism, the audience observes ordinary situations that could reasonably occur in their own lives. A fixed, box set that remains in place for the duration of the play keeps the characters confined in a room or rooms, and reinforces common realist themes of entrapment, the imprisoning impact of the past on the present, and the characters' longing for escape. In many plays deemed realist works, however, visionary elements intrude. These unreal components can include just about anything that would not be found in ordinary life, from ghosts and apparitions, to staged memory and dream sequences. What happens to the piece of realism at hand when this happens? Are the characters able to escape in ways they could not before? Ultimately, how does the introduction of the unreal make realism more real? These are all questions this project seeks to answer.

The Localized Efforts of the NAACP Concerning Capital Sentencing

Michael Zimmermann and Del Dickson

Since the first executions in the 17th century, African-Americans were disproportionately sentenced to capital punishment relative to their white peers. Beginning in the 1930s, African-American lawyers associated with the NAACP worked throughout the Southern States to exonerate defendants sentenced to death. Their arguments played a significant role in the victories of the NAACP and the eventual federal moratorium on capital punishment occurring from 1972-1976. Through a consideration of the arguments of these lawyers in front of local appellate courts and the Supreme Court, the importance of their efforts for the national movement that ensued decades later will be shown.

With Gratitude

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