University Honors Program

Senior Research Booklet

2015-2016

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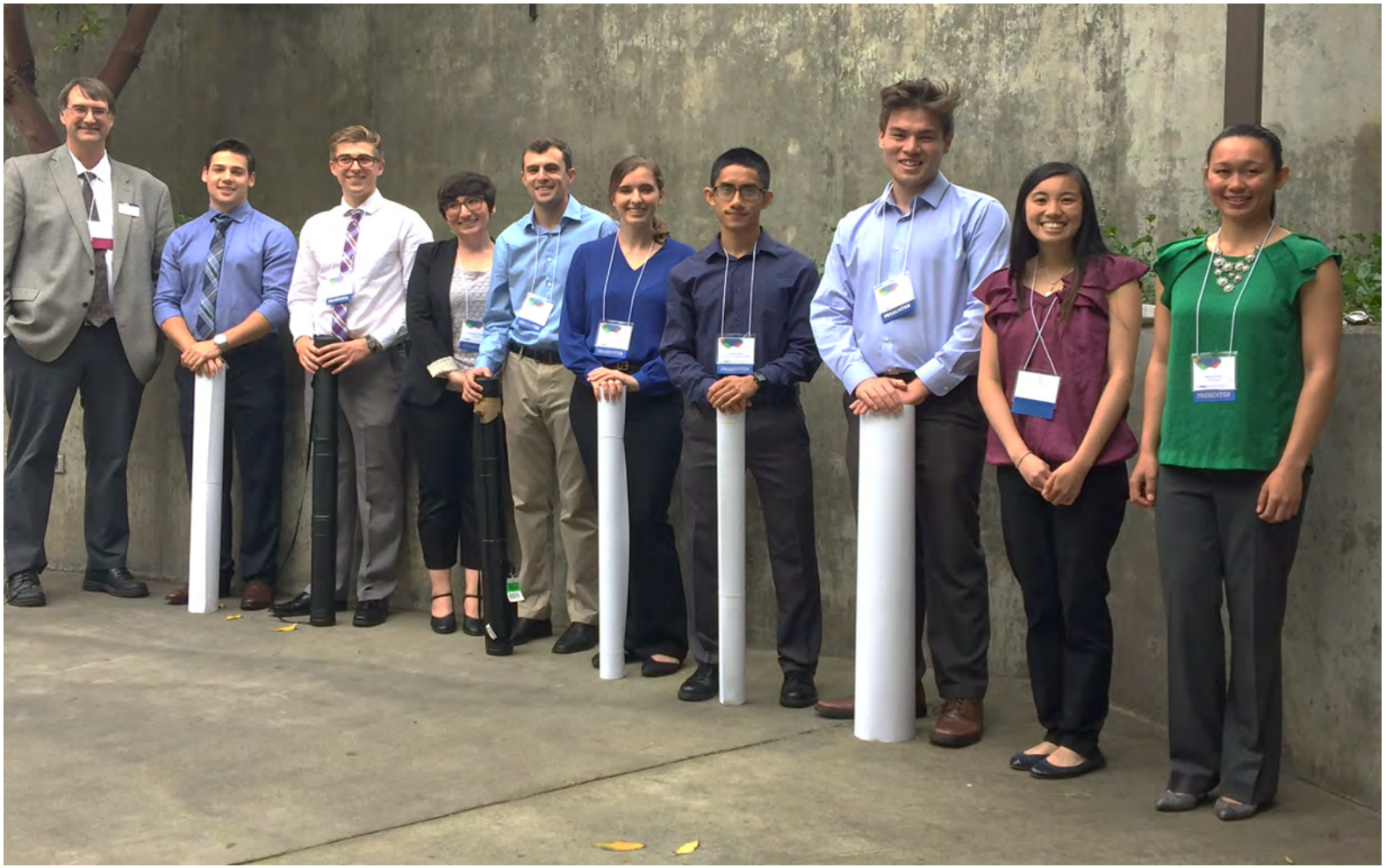
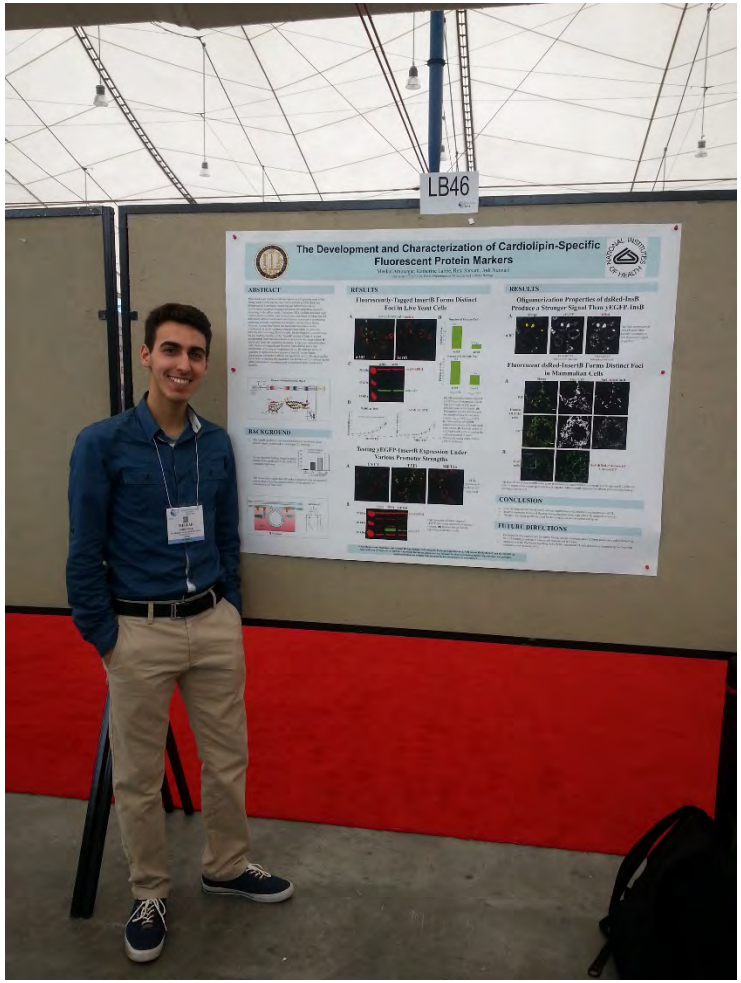


Meelad Amouzgar

Sponsor: Jodi Nunnari

The Development and Characterization of Cardiolipin-Specific Fluorescent Protein Markers

Abstract: Mitochondria are double-membrane organelles that generate most of the energy used by cells and play key roles in cellular growth, death and differentiation. Continuous remodeling and redistribution of the mitochondrial membrane structure are critical for integrating organelle physiology with cellular needs. Cardiolipin (CL) is a diphosphotidyl lipid found in bacteria and the mitochondrial inner membrane of eukaryotes. CL distribution within mitochondrial membranes is important in determining membrane structure, regulating bioenergetics, and recruiting factors. However, its exact distribution and functional localization within mitochondria is poorly understood because there exists no means for detecting and visualizing CL in live cells. We developed a CL sensor using the CL-binding properties of the Insert B domain of Mgm-1, a yeast mitochondrial inner membrane fusion protein. In in vitro assays, Insert B specifically binds CL-containing liposomes. In live yeast and mammalian cells, fluorescent-tagged Insert B protein forms distinct foci within mitochondria depending on the presence of CL. By making a series of mutations in highly conserved regions of Insert B, we are further characterizing the markers affinity and specificity for CL. We are using this tool to better understand the localization and behavior of CL-enriched regions within mitochondrial membranes and its association with mitochondrial function.



Nikhil Bellamkonda

Sponsor: Petr Janata

Effects of Lyrics and Song Melodies on Personal Nostalgia

Abstract: Music has been found to be an effective tool in evoking personal nostalgia complemented by music-evoked-autobiographical-memories. Greater familiarity with a song or its genre increases the possibility of experiencing nostalgia. While lyrics can effectively arouse nostalgic feelings, it is unknown whether the remaining components of a song: the instrumental tracks, devoid of the vocals, can do so to the same magnitude. This study investigates the effectiveness of instrumental auditory versions of songs in evoking nostalgia compared to that from reading the songs corresponding transcribed lyrics. Commercially popular songs across different genres, produced during the subjects mid-adolescence, are used. Subjects undergo a preliminary screening to survey their genre preferences and to assess their tendency to experience nostalgia. They are then surveyed following each stimulus to rate their response and elaborate on their perceived reaction to the stimulus. Both the magnitude of emotion experienced and the level of detail in recalled memories are evaluated.

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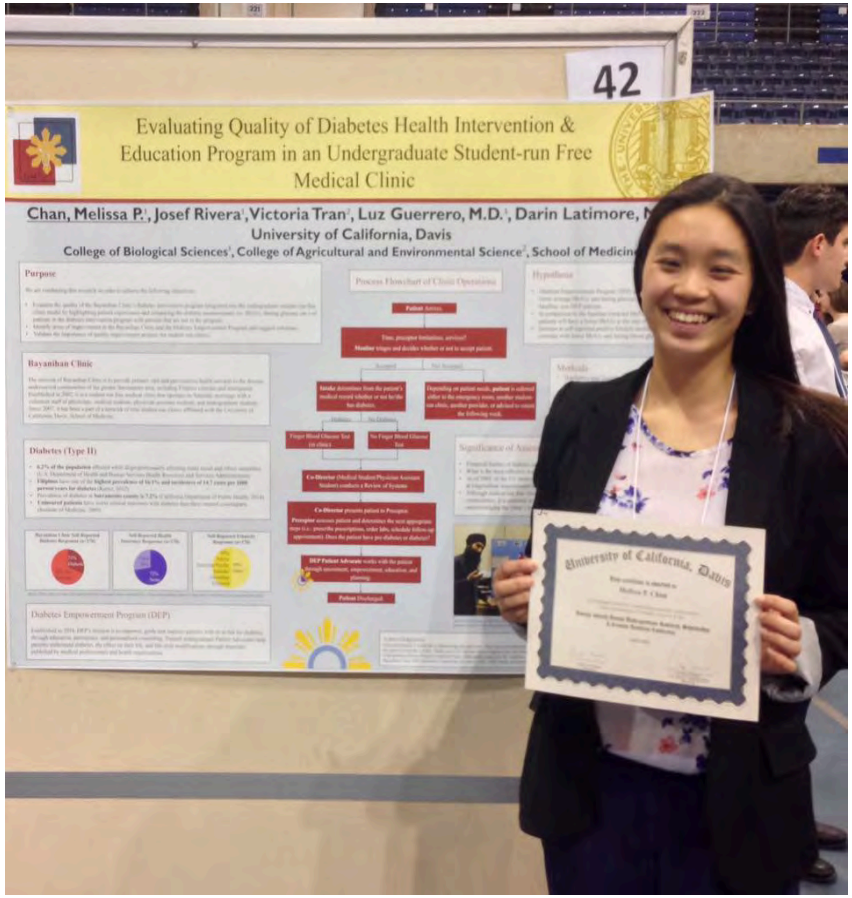
Melissa P. Chan

Sponsor: Luz Guerrero

Evaluating Quality of Diabetes Health Intervention and Education Program in an Undergraduate Student-Run Free Medical Clinic

Abstract: The purpose of this project is to evaluate the quality of health services provided to patients at Bayanihan Clinic, one of the UCDMC-affiliated student-run clinics especially in the treatment of diabetes and its comorbidities in underserved populations. Bayanihan Clinic developed the Diabetes Empowerment Program to specifically address diabetes in its patient population. Through literature reviews, quantitative surveys, qualitative surveys, and electronic medical record abstraction, we will compare the patient outcomes, patient experiences, and processes of care of our clinic patients and Diabetes Empowerment Program patients to published literature regarding uninsured and underinsured populations. Abstracted data include HbA1c, fasting blood glucose, LDL, HDL, and BMI. This research will add to the current literature of knowledge regarding student-run clinics and diabetes intervention programs and validate the importance of quality improvement projects. We hope that from the research, we will be able to highlight patient experience, identify areas of improvement, and suggest solutions.



Jenice X. Cheah

Sponsor: Aldrin V. Gomes

Characterization of a Troponin I Mouse Model of Restrictive Cardiomyopathy

Abstract: Cardiomyopathy is one of the leading causes of sudden cardiac death, especially in young adults. Of the different types of familial cardiomyopathies, studies on restrictive cardiomyopathy (RCM) are most limited. Diastolic dysfunction, poor ventricular filling, increased heart stiffness, and elevated end diastolic pressure are all characteristics of RCM. The prognosis for patients with RCM is poor and treatment for children often involves transplantation. The goal of this research is to investigate the signaling pathways involved in RCM using Tandem Mass Tag labelling and proteomics. By studying the relative amounts of proteins in transgenic RCM (R145W) and wild type models, we can identify signaling pathways that are downregulated and upregulated. The results from proteomics will be confirmed with Western blotting. I hypothesize that there will be significant differences in protein expression in a small but important group of signaling pathways. These results will help us understand the molecular changes occurring in RCM and provide further insight to investigate the pathways involved in RCM.

Alexander Chiang

Sponsor: Robert F. Berman

Validation of the Vermicelli Task in Measuring Fine Motor Deficits for a Fragile X-Associated Tremor/Ataxia Syndrome Mouse Model

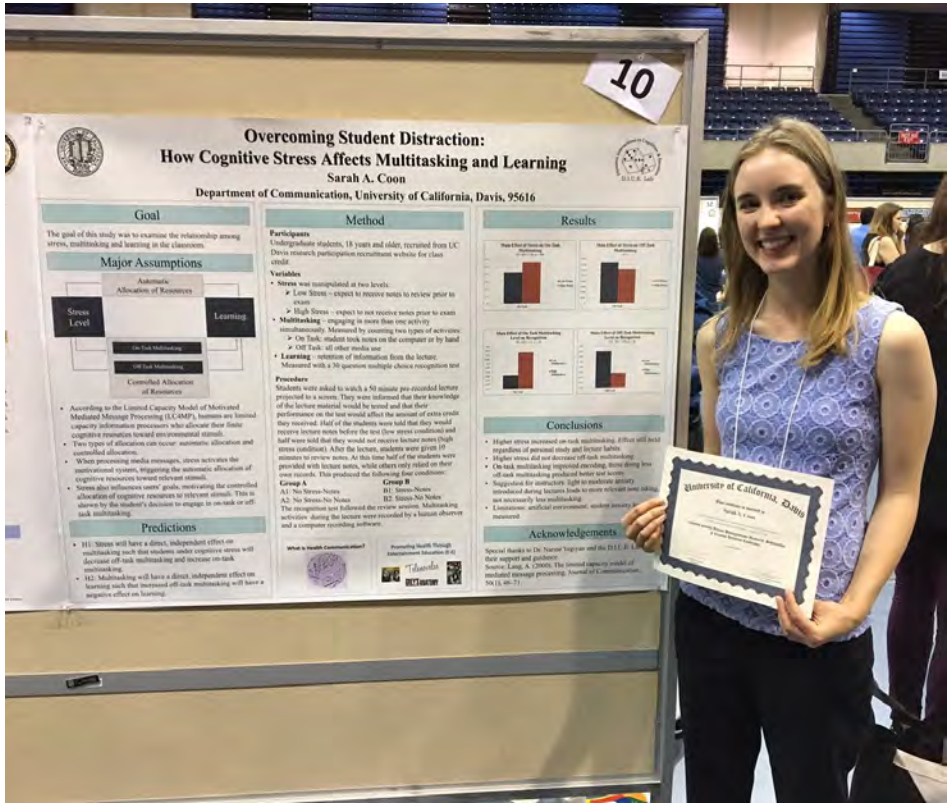
Abstract: The Fragile X-mental retardation gene (FMR1) has a CGG trinucleotide repeat segment in the 5 UTR that is between 5 and 54 in most individuals. Fragile X permutation carriers (PM) have an expanded CGG repeat of between 55 and 200, which puts them at risk of developing the late-onset neurodegenerative disorder Fragile X-associated Tremor/Ataxia Syndrome (FXTAS). We can model many of the characteristics of the PM and FXTAS, including the presence of intranuclear protein inclusions in neurons and astrocytes, as well as motor and cognitive impairments. However, motor impairments have been more difficult to model and require tests capable of accurately measuring fine motor skills. Therefore, we have adapted the Vermicelli test of fine forelimb motor skills for use in our mouse model of FXTAS. In this test mice are videotaped while consuming fixed lengths of vermicelli pasta. We then score the videos for motor performance of the forelimbs. Preliminary data show that the task can reliably quantify forelimb motor movements (Mean=16.33, Sd=4.58, C.V=25%), and we will be using this test to compare motor skills between our CGG mice and control mice.

Sarah A. Coon

Sponsor: Narine Yegiyan

Overcoming Student Distraction: How Cognitive Stress Affects Multitasking and Learning

Abstract: With the advent of mobile technology, off-task multitasking has become the norm in college classrooms. Previous research has shown that the prevalent choice of multitasking by students has a negative effect on their learning. Yet, little is known about factors that can discourage students from engaging in multitasking. The primary objective of this study was to address this question. Specifically, the effect of cognitive stress on students' goals and their decisions to multitask during lectures was explored. This study collected data on the multitasking activities of students during a pre-recorded lecture that was projected on a large classroom screen. Students were asked to attend to the lecture material under high and low stress conditions. In conditions where cognitive stress was high, the decision to multitask was expected to become less rewarding, incentivizing students to allocate cognitive resources toward relevant educational goals and away from off-task activities. In conditions where cognitive stress was low, students were expected to shift cognitive resources toward activities that met their personal goals (i.e. social interaction). The findings can help more efficiently control the amount of multitasking in classrooms by adjusting instructor teaching style, leading to improved learning outcomes.



Amber Derpinghaus

Sponsor: Russell Hovey

Effect of Estrous Cycle Stage on Mammary Gland Morphology in Pigs

Abstract: The mammary gland (MG) is important for animal production in that the milk it produces during lactation forms the cornerstone of animal growth. The MG develops during reproductive development prior to lactation in response to hormonal changes during the estrous cycle. Given the MGs of pigs are similar to the human breast, understanding how hormones affect MG development stands to provide insights regarding the origins of breast cancer. We hypothesize that the stage of the estrous cycle in female pigs will affect epithelial morphology similar to how stage of the menstrual cycle affects human breast morphology, where maximal epithelial proliferation occurs during the luteal phase. Mammary gland biopsy samples were taken from five nulliparous female pigs during each of the four stages of the estrous cycle and will be analyzed for cellular proliferation using immunohistochemical and histological analysis. In addition, changes in hormone levels will be evaluated using radioimmunoassays. These analyses will shed more light on MG development so that producers can better care for their animals and increase production efficiency, while also providing information about the factors regulating breast cancer progression.

Jacob J. Dinis

Sponsor: Enoch Baldwin

Kinetic Studies of Substrate Inhibition of E. coli CTP Synthetase (CTPS) and Its Interactions With Other Inhibitors

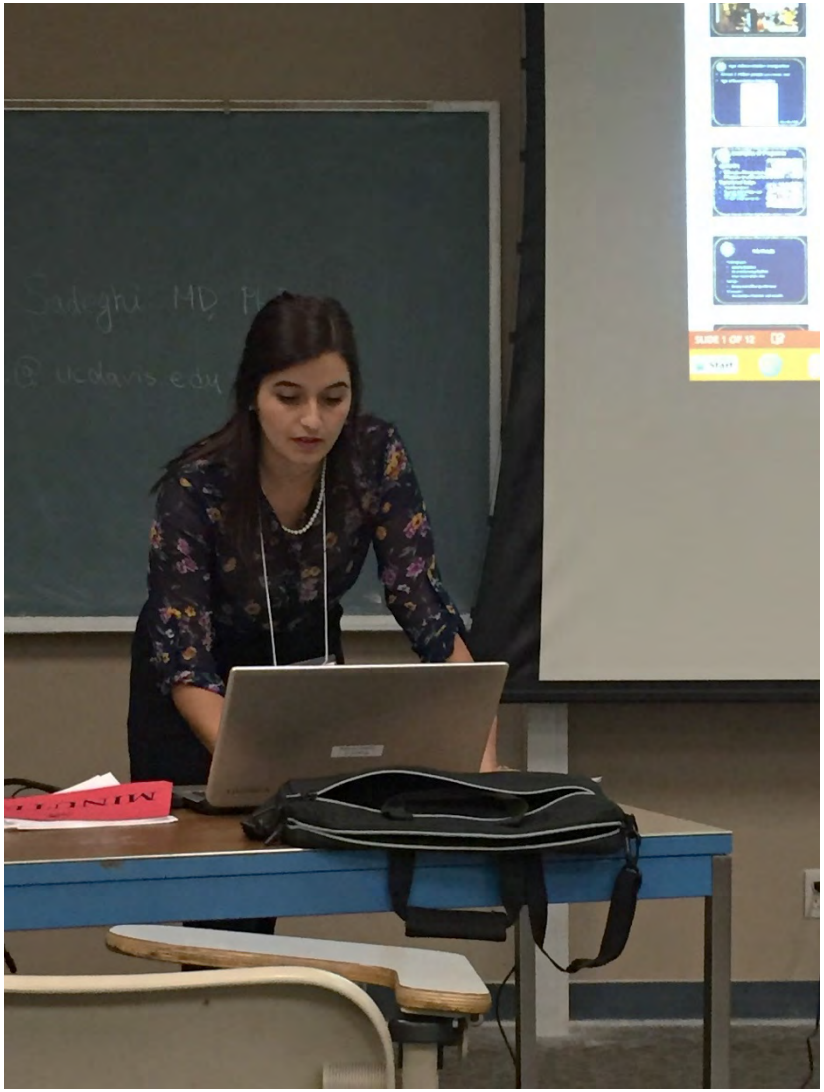
Abstract: CTPS enzymes produce CTP, often the limiting nucleotide for cell growth and function. CTPS enzymes are highly regulated by a multitude of metabolic inputs, including feedback inhibition by CTP which sets the upper limit for its cellular concentration. CTP further induces the formation of inhibited CTPS filaments which serve to provide a rapid activity switch. Both UTP and ATP are nucleotides necessary for the production of CTP, but I demonstrated that they also inhibit CTPS at higher concentrations. Down regulation of CTPS by high concentrations of substrates ATP and UTP and product CTP are additive. Both the wild-type enzyme and a mutant unable to form filaments were inhibited to the same extent by high concentrations of UTP, revealing that the mechanism is not directly related to filament formation. This result suggests that CTPS integrates the total nucleotide triphosphate concentration in determining its output. These discoveries add to the already complex and multifaceted regulation of CTPS.

Juliette N. Diveley

Sponsor: Enoch Baldwin, Lisa S. Miller

Intergenerational Engagement: Crossing Generational Divides via Intentional Interaction

Abstract: Modern, western countries have become increasingly age segregated, which may contribute to unnecessary isolation of older adults and negative age stereotypes. Intergenerational engagement, purposeful and intentional interaction that spans generational divides, could benefit the wellbeing of older adults as well as reduce age stereotypes. However, research examining the effects of intergenerational engagement on older adults' wellbeing is limited. Furthermore, very little is known about the types of programs in existence, particularly within assisted living facilities locations with the most homogeneous age distribution. The present study investigates intergenerational programs in assisted living facilities as well as attitudes of facility directors towards these types of programs. Ten assisted living directors in the Davis-Sacramento area will be interviewed to determine programs available and attitudes toward implementing a few example programs. Their responses will be coded and analyzed to provide valuable information that may help foster future programs and lead to research that examines the benefits of fostering intergenerational relationships



Ila Dwivedi

Sponsor: Lisa M. Oakes

Visual Search for Emotional Expressions and Directional Bias in the Visual Field in the First Year of Life

Abstract: During the first year of life, infants encounter diverse emotional stimuli, such as facial expressions. Theoretically, it is adaptive for infants to pay attention to all such emotional cues. In adults, there is a right hemisphere advantage in emotional processing, which results in a left visual field bias (Alpers, 2008). It is therefore apt to ask whether this directional bias in the visual field also exists in infants, and whether this bias is strengthened by the presence of salient emotional stimuli in the left visual field. In the lab, we are currently investigating the effects of emotional information and field of view on visual attention in four to eight month old infants. In this ongoing study, we present infants with arrays of two, four, or six faces. In each array, one face exhibits a happy or sad expression, while the others remain neutral. We will analyze the proportion looking time at salient faces, and the directional bias of initial looks in the visual field using newly defined analytical parameters. Based on evidence that initial preference for emotional expressions increases with age, it is possible that this left visual field bias will emerge with age in the first year of life.

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Azka Fayyaz

Sponsor: Omnia El Shakry

Deconstructing the Malala Paradigm: An Anti-Imperial Insight Into the Circulation of the Nobel Prize Winner's Narrative

Abstract: After being shot by the Tehrik-i-Taliban Pakistan (TTP) on October 9, 2012, Malala Yousafzai quickly emerged as a leading figure in the global campaign for women's education. In mainstream discourse, Yousufzai represents a beacon of progressive and liberal values. I place this pattern of representation within a broader historico-political context, and argue that it remains within the logic of an ongoing imperialist war, in which feminist discourse continues to serve as a basis for military operations including drone strikes in Northwest Pakistan. Although as an individual Malala has publicly critiqued these drone strikes, the figure of Malala continues to function as an ideological means of sustaining colonial relations both in Pakistan and the broader Muslim world. Moreover, her story upholds Orientalist assumptions, within which educated (Westernized) women are autonomous and strong, while women in the East who assume traditional roles in the home are docile, submissive, and needing (military) liberation from Western forces. By analyzing interviews and speeches featuring Malala, documents on the universal rights of individuals, and anthropological literature I argue that in the Malala narrative, the right to education exists in an ahistorical vacuum, while the right to read supersedes any right to national self-determination.

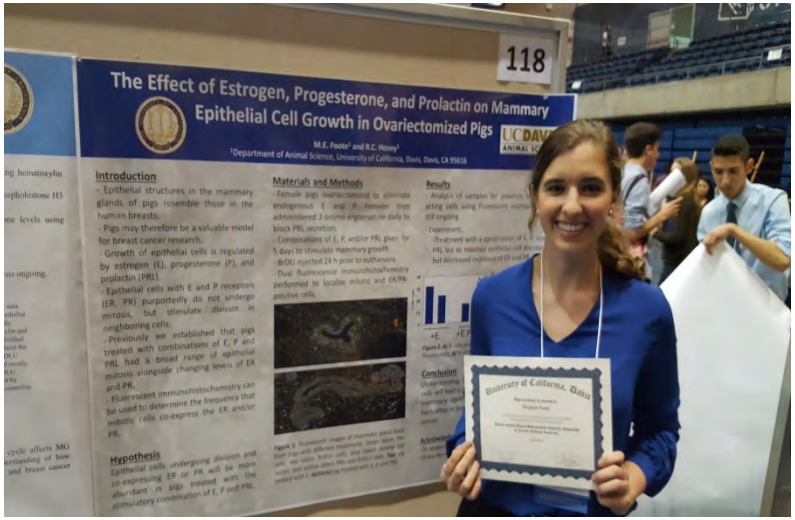
Nabila Rehman, 9, holds up a picture she drew depicting the US drone strike on her Pakistan village which killed her grandmother.
Photograph: Jason Reed/Reuters

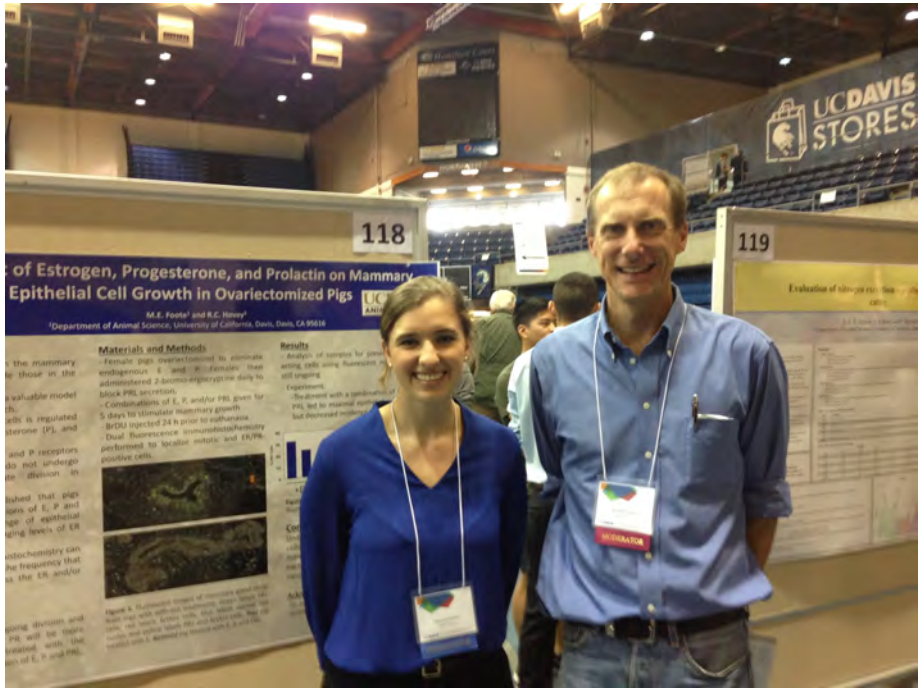
Meghan Foote

Sponsor: Russell Hovey

Effect of Estrogen, Progesterone, and Prolactin on Mammary Epithelial Cell Growth in Ovariectomized Pigs

Abstract: Development of the mammary gland (MG) is regulated by hormones including estrogen (E), progesterone (P), and prolactin (PRL). Dogma suggests that E and P act on epithelial cells possessing estrogen and progesterone receptors (ER, PR respectively), which stimulate neighboring cells to undergo mitosis, while not dividing themselves. The MGs of pigs are similar to human breasts and are valuable models for researching hormonal regulation. In a previous study, 32 nulliparous female pigs were ovariectomized and given 2-bromo-ergocryptine to block prolactin secretion before receiving different combinations of E, P, and/or PRL for 5 days to stimulate mammary growth. Proliferating cells were labeled with BrDU, injected 24 hours prior to euthanasia. Treatment with a combination of E, P, and PRL led to maximal epithelial cell division, but decreased incidence of ER and PR. Fluorescent immunohistochemistry for ER, PR, and BrDU was performed, allowing for the co-localization of cells that are steroid receptor positive and mitotic. We hypothesize that cells expressing both these characteristics will be more abundant in pigs treated with all three hormones. Understanding regulation in these cells will lead to a greater understanding of how mammary epithelial cells communicate with each other in normal development and breast cancer.



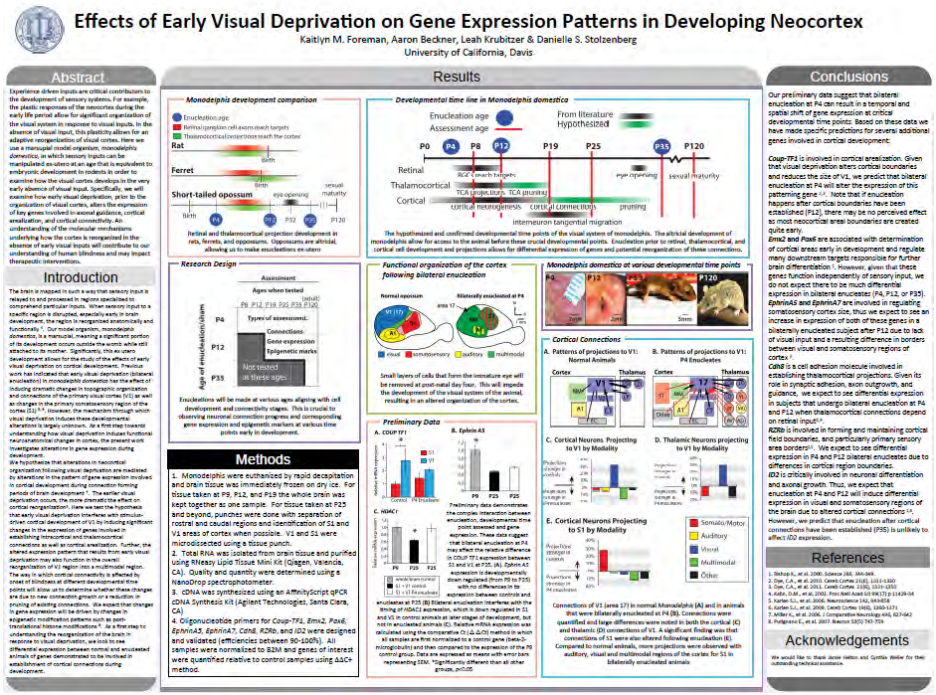


Kaitlyn M. Foreman

Sponsor: Danielle Stolzenberg

Effects of Early Visual Deprivation on Gene Expression Patterns in Developing Neocortex

Abstract: Experience driven inputs are critical contributors to the development of sensory systems. For example, the plastic responses of the neocortex during the early life period allow for significant organization of the visual system in response to visual inputs. In the absence of visual input, this plasticity allows for an adaptive reorganization of visual cortex. Here we use a marsupial model organism, monodelphis domestica, in which sensory inputs can be manipulated ex-utero at an age that is equivalent to embryonic development in rodents in order to examine how the visual cortex develops in the very early absence of visual input. Specifically, we will examine how early visual deprivation, prior to the organization of visual cortex, alters the expression of key genes involved in axonal guidance, cortical arealization, and cortical connectivity. An understanding of the molecular mechanisms underlying how the cortex is reorganized in the absence of early visual inputs will contribute to our understanding of human blindness and may impact therapeutic interventions.



Lara M. France

Sponsor: Susan G. Miller

Neither This nor That: French Women in Liberation and Postwar France

Abstract: From 1943 until 1947 nearly 20,000 French women, accused of collaboration with the retreating German forces, were publicly punished and humiliated in a series of extrajudicial, ritualized attacks which included: head shaving, marking of the body with ink and mercurochrome, and public nakedness which was often the focus of lurid and widely publicized photographs. These are the *femmes tondues*, forgotten completely, or until recently, remembered only as sexual collaborators. New scholarship, of which this research will be a part, has begun to challenge traditional binary narratives of collaboration and resistance; guilt and innocence; and voyeurism and neglect that has influenced the portrayals of postwar French women. I will seek to synthesize considerations of sexuality, class, and race into the account of these women while addressing the problematic way that their memory has been preserved. Through my research I hope to build on the works of Robert Paxton, Henry Rousso, Fabrice Virgili, Hanna Diamond, Alain Brossat and Miranda Pollard. I will do so by consulting contemporary testimony, memoirs, photographs and films, and recorded interviews, recently released, with women who survived the purge.

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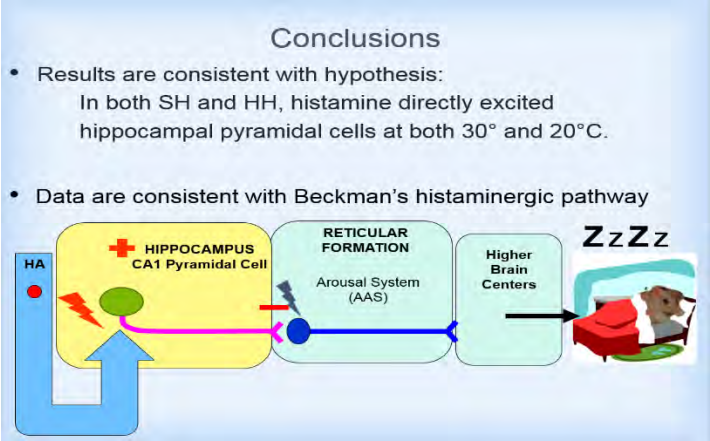
Shadeh Ghaffari-Rafi

Sponsor: Barbara A. Horwitz

Histamine Enhances Excitability in Hippocampal Neural Networks of Hibernating and Winter-Acclimated Non-Hibernating Syrian Hamsters

Abstract: We previously showed that the neuromodulator histamine, acting on H2 receptors, increased excitability of CA1 pyramidal neurons of summer-acclimated Syrian hamsters (14:10 hr light:dark; 22 + 2°C,), making them more responsive to low amplitude afferent signals from CA3 neurons. This increased excitability, coupled with the report that micro-infusion of histamine into hippocampi of hamsters in hibernation delayed arousal, suggests that in vivo, histamine enhances hippocampal CA1 neural suppression of the ascending arousal system. Because direct measurement of neuronal excitability in response to histamine applied to hippocampal slices from hibernating hamsters had not yet been evaluated, I tested the hypotheses that: (1) in such slices, histamine would enhance signaling over the CA3 to CA1 neural circuit at low excitation levels (comparable to what is likely present during hibernation) and low temperature (20oC); and (2) exposure of hamsters to "winter like" conditions (8:16 hr light:dark; 6 + 1oC) that prepare them for hibernation is sufficient to induce this enhancement. Preliminary results indicate that at low excitation levels, histamine did in fact increase responsiveness of population spike amplitudes, a measure of neuronal activity, in slices from hamsters in hibernation and in those from hamsters acclimated to winter-like conditions, consistent with my hypotheses.

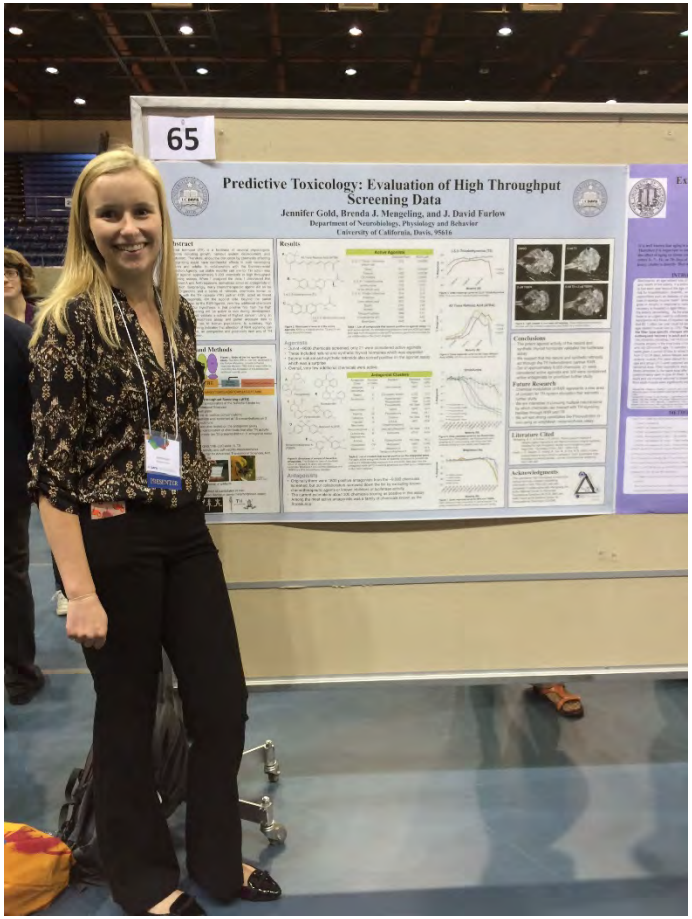


Jennifer Gold

Sponsor: J. David Furlow

Predictive Toxicology: Evaluation of High Throughput Screening Data for Thyroid Hormone Receptor Activity

Abstract: Thyroid hormone (TH) is a facilitator of several physiological functions including growth, nervous system development, and metabolism. Therefore, endocrine disruption by chemicals affecting TH signaling could have detrimental effects in both developing children and adults. In collaboration with the Environmental Protection Agency, our stable reporter cell line for TH action was tested against approximately 9,000 chemicals in high throughput screening assays. When I analyzed the data, I discovered that Bisphenol A and Anthraquinone derivatives acted as antagonists of TH action. Surprisingly, many chemotherapeutic agents did so as well. Organotins and a series of retinoids, chemicals known to interact with the TH receptor (TR) partner RXR, acted as mixed agonists/antagonists. On the agonist side, beyond the partial agonism shown by the RXR ligands, very few additional chemicals were active. Our hypothesis is that positive hits from the high throughput screening will be active in vivo during development. Therefore, we will validate a subset of highest concern using an amphibian metamorphosis assay, and gather exposure data to predict potential risk to human populations. In summary, high throughput screening indicates that alteration of RXR signaling can impact TH action, an unexpected and potentially new way of TH endocrine disruption.



Grace Gordon

Sponsor: Colin Milburn

Mathematics in Gertrude Stein's "Q.E.D." and "Melanctha"

Abstract: What do a modernist writer and a mathematical philosopher have in common? Gertrude Stein (1874-1946), known for her many feminist works, utilizes mathematical concepts such as repetition, patterns, sequences, and abstraction in her writing. The mathematician and philosopher Alfred North Whitehead (1861-1947), an acquaintance of Stein's, philosophizes on the importance of abstract mathematics in his book An Introduction to Mathematics (1911). Stein reinforces Whitehead's views on the intricacies of abstract math in her short story "Q.E.D."(1903). The story describes a love triangle between three women, and serves as a verbal proof of the inadequacies of love. Many of the plot points and characters of "Q.E.D." reemerge in Stein's later short story entitled "Melanctha," from Three Lives (1906). In "Melanctha," mathematical structures, such as "fractals" (Guerra de la Torre, 1995), take the place of the explicit math references from "Q.E.D." My project will examine the differences between "Q.E.D." and "Melanctha," with regard to the mathematical concepts and structures in each text. By invoking Whitehead's mathematical philosophy as a lens for interpreting Stein's writing, I hope to analyze the stories as two different parts of a series, and unpack the significance of mathematics in Stein's feminist texts.

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Sydney M. Heifler

Sponsor: Kathryn Olmsted

Romance Comic Books and Magazines: The Cold War, Anti-Feminism, and Teaching Women Their Place

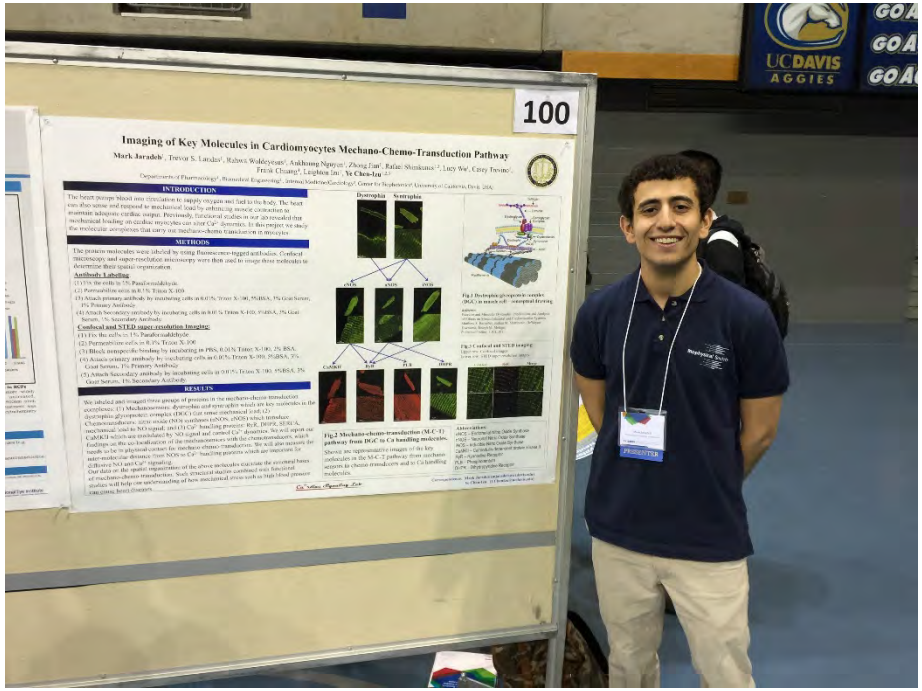
Abstract: In 1947, Prize Comics published Captain American creators Joe Simon and Jack Kirby's first issue of Young Romance. Young Romance established romance comic books as a popular genre in the early Cold War era. The African American publishing industry took notice of the increasing prevalent topic of romance in popular print. In 1950, African American entrepreneur John Harold Johnson published the first issue of Tan Confessions. Tan Confessions established the African American romance magazine in popular print. Current scholarship ignores to what extent governmental and professional influence and social pressures affected the creation of these publications. Despite the belief that publishers created these comics and magazines to entertain and reflect real struggles of their intended demographics, both romantic subgenres became propaganda that targeted women to shape their viewpoints about their role in society. Through plotlines, romance comic books instructed young white women about their sexual and social roles in America by reflecting anti-feminist commentary. Through supposed true stories, African American romance magazines conveyed that minority women possessed an inherent, unfit nature rendering them unable to participate in the American domestic ideal. This evidence redefines current discourse concerning these publications and emphasizes their role in influencing social norms.

Mark Jaradeh

Sponsor: Ye Chen-Izu

Imaging of Key Molecules in Cardiomyocyte Mechano-Chemo-Transduction Pathway

Abstract: The heart pumps blood into circulation to supply oxygen and fuel the body. The heart also senses and responds to mechanical load by enhancing muscle contraction to maintain adequate cardiac output. Our previous studies revealed that mechanical loading on cardiac myocytes can alter Ca2+ dynamics. In this project, we study the molecular complexes in the cardiac myocyte that carry out mechano-chemo-transduction. The protein molecules were labeled with fluorescence-tagged antibodies. Confocal microscopy and super-resolution microscopy were then used to image these molecules to determine their spatial organization. We studied three groups of proteins in the mechano-chemo-transduction complexes: (1) Mechanosensors: dystrophin and syntrophin, which are key molecules in the dystrophin glycoprotein complex (DGC); (2) Chemotransducers: nitric oxide (NO) synthases (nNOS, eNOS), which transduce mechanical load to NO signal; and (3) Ca2+ handling proteins: RyR, DHPR, SERCA, CaMKII, which are modulated by NO and control Ca2+ dynamics. We will report our findings on the co-localization of the mechanosensors with the chemotransducers as well as the inter-molecular distances from NOS to Ca2+ handling proteins. The spatial organization data of the above molecules elucidate the structural bases of mechano-chemo-transduction. Such structural studies, combined with functional studies, will help our understanding of how mechanical stress can cause heart diseases.



Alexandra N. Jennings

Sponsor: Lisa M. Oakes

The Effect of Parental Scaffolding on Infant Behavior During Independent Play

Abstract: As they play with their infants, parents demonstrate advanced play behaviors that expose infants to information beyond what they could learn on their own a concept known as scaffolding. This experiment examines the effect of parental scaffolding on infants' play behaviors. Six-month old infants first played with a parent, or they played alone with a parent nearby, but not interacting with the infant. In this project, we are analyzing infants' play in a subsequent session, in which all infants played alone with a parent nearby. We ask whether infants' play behaviors differ as a function of whether or not they played alone or with parental scaffolding during the first session. We are analyzing specific infant behaviors, such as grasping or mouthing of the toys, and comparing the frequency of those behaviors between infants who first played with their parent versus infants who first played alone. This will provide deeper understanding into the effects of parental scaffolding during play, which is important in not only better understanding how infants learn, but also in teaching parents how to best assist their infants' acquisition of knowledge.

Tynisha Koenigsaecker

Sponsor: Jonathan Eisen

Microbial Diversity in the Built Environment: Growth Following Terminal Cleaning of an Ambulatory Surgery Center

Abstract: In the heavily regulated ambulatory surgery center (ASC) environment there is a wide variety of environmental cleaning agents to choose from. While their composition may vary, efficacy claims are virtually the same; they kill highly pathogenic organisms in a short period of time. This project looks at the diversity of organisms left behind on surgery center surfaces following terminal environmental cleaning with an agent that has a 1-minute kill claim list of 26 pathogenic organisms including well-known antibiotic resistant species, such as methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant Enterococcus faecalis (VRE). Samples were collected from various locations in an ASC and swabbed onto both lysogeny broth (LB) agar and Columbia Blood agar. Colonies were streaked for isolation and then used to make liquid overnight cultures. DNA was extracted from each liquid culture and the 16S rRNA sequence was amplified using polymerase chain reaction (PCR). This sequence was used to identify the isolates, and to choose isolates for further characterization, including genome sequencing.

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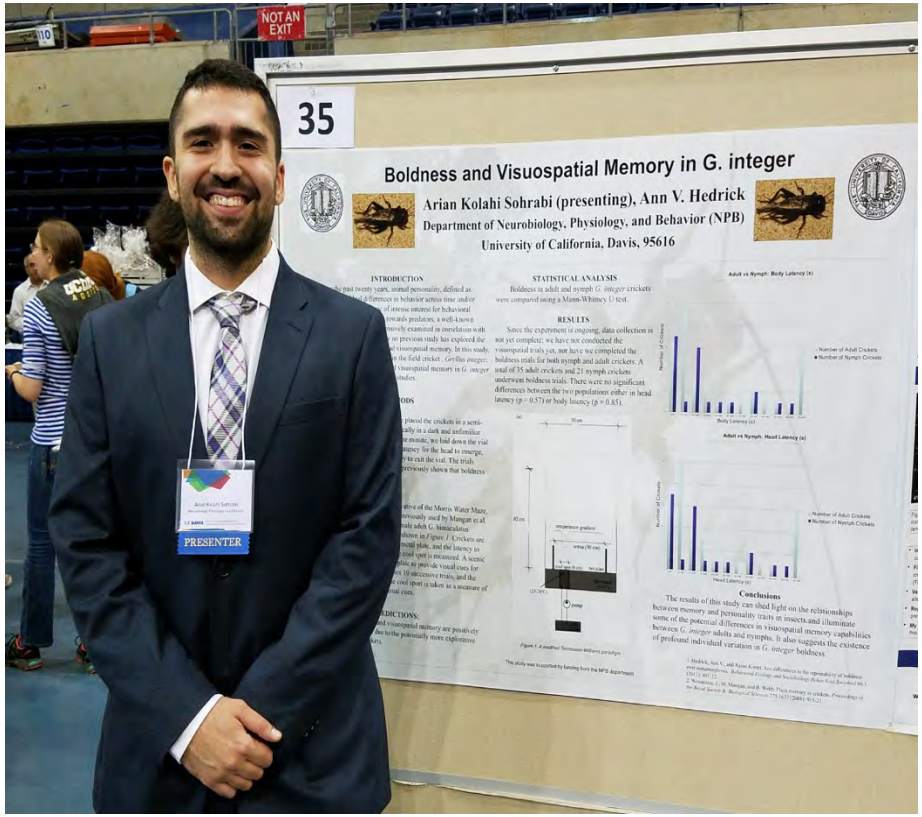
Arian Kolahi Sohrabi

Sponsor: Ann Hedrick

Boldness and Visuospatial Memory in *G. integer*

Abstract: In a previous study, it was shown that female adult *G. bimaculatus* crickets are capable of using visual cues to improve their performance in locating a visually hidden target. In a different study involving male and female adult G. integer crickets, emergence latency duration, the time lapsed before emergence from a safe refuge, was established as a quantitative measure of boldness towards predators. In this study, the link between boldness and visuospatial memory of adult male and female *G. integer* crickets will be explored. I will assess the cricket's relocation capability using the Tennessee Williams paradigm, a circular arena located above and in contact with a water tank. The water is heated to an aversive temperature, and with the exception of a small, circular surface of the arena with its own insulated cool water circulation, the rest of the arena is heated to the aversive temperature. The success of the crickets will be determined by how fast, in each successive trial, they locate the cool spot. I hypothesize that in *G. integer* crickets, boldness and visuospatial memory are positively correlated. The results of this study can shed light on the relationships between memory and personality traits in insects.



Randall L. Kuffel

Sponsor: Jay A. Rosenheim

Impact of a Viral Pathogen on a Biological Control Agent: Population and Community Surveys

Abstract: Geocoris pallens is a beneficial insect present throughout the California Central Valley. A decade ago, local Geocoris levels plummeted, and in recent years, virally induced cannibalistic behavior has arisen in many of these decimated populations. This project surveys local insect communities throughout 2015 and transects California from Sisikyou County to Kern County. To quantify the makeup of insect communities and the prevalence of cannibalism in Gecoris pallens, sweep samples were recorded, and a laboratory assay for cannibalism was conducted on all female individuals. Paired with historical data collected from the 1990s and 2000s, this project is able to comprehend the role a fluctuating insect predator population has in cotton plant herbivore communities. Furthermore, research on the cannibalistic behavior will help us understand the pathogens position in shaping insect communities throughout the years and help us determine the future of Geocoris pallens as a beneficial insect in both cotton and alfalfa plants throughout California.

Matthew Laurie

Sponsor: Jorge Peña

Online Dating Platforms: Effects of Extroversion on Self-Disclosure and Relational Goals

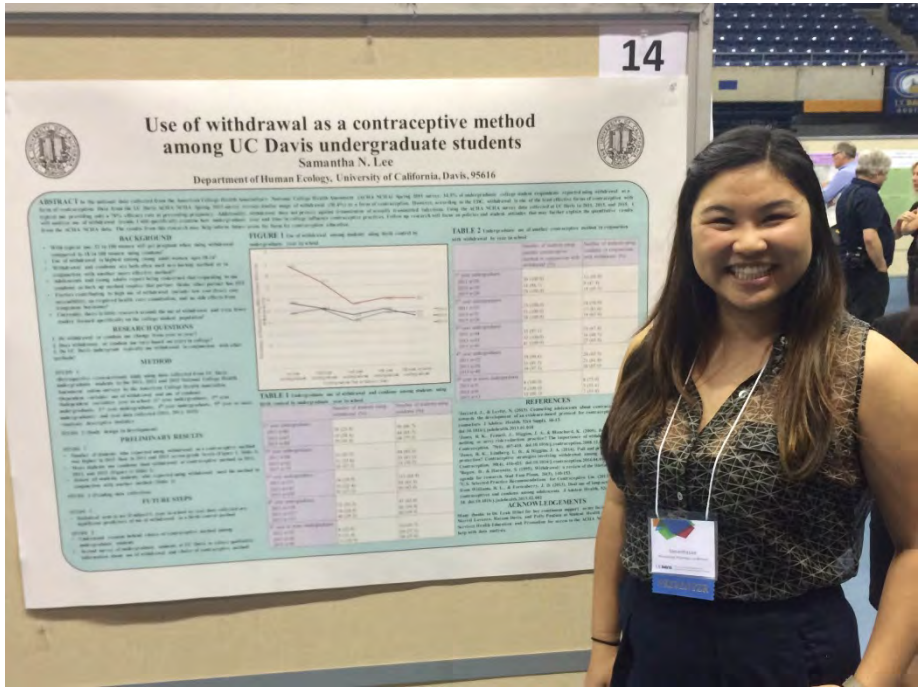
Abstract: A plethora of research exists surrounding the modern online dating experience and subsequent offline relational behaviors. However, there is a lack of research examining Tinder, the popular smartphone dating app. Consider that Tinder creates 9 billion matches per day worldwide (Tinder 2016). The present study replicates prior research on online dating sites behavior and expands upon it by examining Tinder users by means of pre-tested survey questions. We investigate the relationship between self-disclosure, relational success, relational goals, as well as the personality and demographics of Tinder users in comparison with other popular online dating sites. The results are based on a sample of approximately 1,000 UC Davis students, and the findings are linked to computer-mediated communication theories in order to shed light on how people manage their romantic relationships by means of mobile apps. Our study findings may prove interesting to UC Davis students as 83% of Tinder users are under 34 years of age.

Samantha Lee

Sponsor: Leah Hibel

Use of Withdrawal as a Contraceptive Method Amongst UC Davis Undergraduate Students

Abstract: In the national data collected from the American College Health Associations National College Health Assessment (ACHA NCHA) Spring 2015 survey, 34.5% of undergraduate college student respondents reported using withdrawal as a form of contraception. In the data collected from the ACHA NCHA Spring 2015 survey at UC Davis, there was similar use of withdrawal with 30.4% of UC Davis undergraduate student respondents reporting use of withdrawal as a form of contraception. However, according to the CDC, withdrawal is one of the least effective forms of contraception with a 78% efficacy rate at preventing pregnancy with typical use. Additionally, withdrawal does not protect against transmission sexually transmitted infections. In my research, I will be using data collected from the ACHA NCHA surveys at UC Davis in 2011, 2013, and 2015. I will be analyzing trends in use of withdrawal as a contraceptive method within the UC Davis population, specifically how undergraduate year and time in college influence contraceptive practices. Follow up research will focus on policies and student attitudes that may further explain the quantitative results from the ACHA NCHA data. The results from this research may help inform future areas for focus for contraception education.



Amy E. Leong

Sponsor: Melissa Chandon

The Notion of Memory and Its Role in Quantifying Life Values

Abstract: An unknown author once said, “A moment lasts all of a second, but a memory lives on forever.” The role of memory and what is remembered becomes valuable to one’s life experiences and perspectives. These memories create one’s identity. The song “Seasons of Love” from the musical *Rent* illuminates the variety of ways for measuring a year in a life. My artwork emulates the design of Chris Jordan’s *Running the Numbers* exhibition to examine how individuals value their lives, what drives humans to live each day, and suggest for viewers to measure their lives in love. For example, T. S. Eliot claims, “I have known the evenings, mornings, afternoons, I have measured out my life with coffee spoons.” My art consists of gathering the number of objects used in a year (e.g. 365 coffee spoons representing how people count each day) and creating a multimedia mosaic from the objects (e.g. old man drinking coffee at home). The spoons are markers that represent a moment in time, a memory that lived on. My exhibition represents how we measure each day between social status, generations, and culture. An interactive element asks viewers, What do you value in life?

!

Rachel P. Levin

Sponsor: Julie Sze

Feminist Punk Rockers and New Media Fan Communities: How Patti Smith and Carrie Brownstein's Music and Memoirs Kindle a Generation of Music Rebels

Abstract: In the past three decades, women in punk rock music propose a critique of rock's tradition and masculinity. How do iconic women punk rockers use punk as a platform for gender identity formation and how do they shape a new generation of activist fans? In both Patti Smith's Just Kids and Carrie Brownstein's Hunger Makes Me a Modern Girl, these artists use memoir to define the gendered oppressions and triumphs of women in the music industry, and their experiences of riot grrrl and feminist punk. How have gendered experiences shaped the narratives of these two women rockers and their contemporaries? Using a close reading of the lyrics and music videos of Smith and Brownstein, and analysis of the work of bloggers and musicians in feminist artistic spaces, I examine how the artists and fans contribute to contemporary sexual liberation debates. Platforms include Kate Nash's Girl Gang Movement, in which Nash encourages young adults to participate in intersectional fourth wave feminist discourse. I argue that the relationships between Smith and Brownstein and their fans resist the division between artist and audience, and instead construct a collaborative effort in search of gender equality in the industry

Austin B. Lim

Sponsor: Kathleen Frederickson

Victorian Women and Their Collaborations With the Foreign and Forbidden in the Beetle

Abstract: Published at the tail end of the Victorian era, Richard Marsh's horror novel *The Beetle* is superficially an account of a diametric supernatural conflict which pits the titular Egyptian monster against London, the civilized imperial city. Many critics, however, agree that *The Beetle* also catalogs decay within London itself through representations of urban breakdown and disruptions of class and gender. To reorient previous analyses of this sort, I examine two marginal female characters who have received little critical attention even though they rent their living quarters to the beetle, inadvertently implicating themselves in its plot. Arguably, their collusion with the monster evidences the text's simultaneous recognition and vilification of economically autonomous women. They are aligned with a Victorian iconography of crime as their premises shelter the beetle and enable it to kidnap and maltreat vulnerable characters. In addition, by entering into consensual economic relationships with the foreign monster and by giving it access to domestic space, they not only facilitate its scheme and jeopardize femininity; they also unsettle the boundary between invader and immigrant. Scrutinizing their place in *The Beetle* reveals that the novel coordinates its judgments about gender and class with its concerns about nationhood.

Michelle Livingstone

Sponsor: Erik Engstrom

Follow the Money or the (Party) Leader: The Effects of Yes and No Spending on California Citizen Initiative Outcomes

Abstract: Research has shown that parties and interest groups exert influence over initiative election outcomes in California through position-taking and campaign spending, defying the intentions of Progressive reformers who instituted direct democracy so that voters could bypass the influence of party and business elites to enact laws. An update by de Figueiredo, Ji, and Kousser (2011) to the conventional wisdom that opposition spending had a significant effect on California initiative outcomes, while support spending did not, applied advanced techniques and found symmetrical effects of support and opposition spending on initiative outcomes from 1976 to 2004. However, their research failed to consider the influence of party support or opposition positions on California voters decision-making. This research updates the model employed by de Figueiredo et al. (2011) by collecting data on California citizen initiatives from 2005 to 2014, including a measurement for the presence of party positions. I find higher levels of spending and increased marginal effects of support and opposition spending on initiative outcomes compared to previous years. The presence of party positions decreased these effects. These findings provide further evidence that on some issues, parties and interest groups' positions and spending on California initiatives can influence election outcomes.

Janel Merkel

Sponsor: Meaghan O'Keefe

Unethical Silence: Analyzing the Catholic Church's Ambiguity Toward Intersex Bodies

Abstract: New medical technologies that alter the human body, such as sex reassignment surgery (SRS), challenge Catholic medical ethics and notions of sex and gender. Although the Catholic Church has made explicit arguments against SRS for transgender individuals, the Church has remained silent in the case of intersexed individuals, initially following current medical protocol rather than developing ethical claims based on Catholic doctrine. Over time, however, medical professionals have revised the protocol: recent studies reveal that intersexed individuals did not benefit from the "optimal gender policy," which rushed infants with ambiguous genitalia into surgeries that assigned a definitive gender. Now, healthcare professionals are beginning to postpone surgery and other treatments until the patient identifies with a particular gender and can assist in choosing treatment plans. Despite this modification in medical protocol, the Catholic Church has not made a clear ethical stance regarding either treatment option, although both treatment plans intersect with Catholic ideologies of sex, gender, and genetics. Ultimately, the Church's silence reflects larger issues about religious ethics of the human body. To understand the Church's silence, I compare the ethics of sex reassignment surgery for intersex and transgender individuals to reveal the ethical disparities in treatment between the two conditions; then, using the Church's medical directives, I argue that the Church's silence has actually allowed for unethical treatment of intersex bodies. Additionally, I analyze whether transgendered or intersexed persons can enter a valid Christian marriage, which identifies a precedence of gender over sterility. The integration of these issues with our increasing knowledge of genetics clearly complicates the determination of sex and gender, raising the question of whether the Church may need to alter ethical arguments about the human body in light of new scientific information.

Louis T. Lubow

Sponsor: Mark Lubell

An Ego-Network's Influence on Transportation Mode Choice Conformity

Abstract: In our society, individuals form relationships with one another. The strength of these relationships, hereon referred to as tie strength, vary person to person. There are a number of potential indicators of tie strength including closeness, multiplexity, duration, and frequency of contact in a relationship (Marsden and Campbell 1984). The decision making of an individual, the ego, may be influenced by the choices made by those whom they have relationships with, the alters. We expect the decision making of the ego to correlate with the decisions made by the alters with whom the ego has the strongest relationships with. Specifically, we will use survey data from Davis, California to explore how an individual's mode of transportation is influenced by the mode choice of others in their social network. This study investigates both the impact of the strongest dyad relationship on the mode choice of the ego as well as the ego network's overall influence on ego choice. The four indicators listed above will be used as measures of tie strength.

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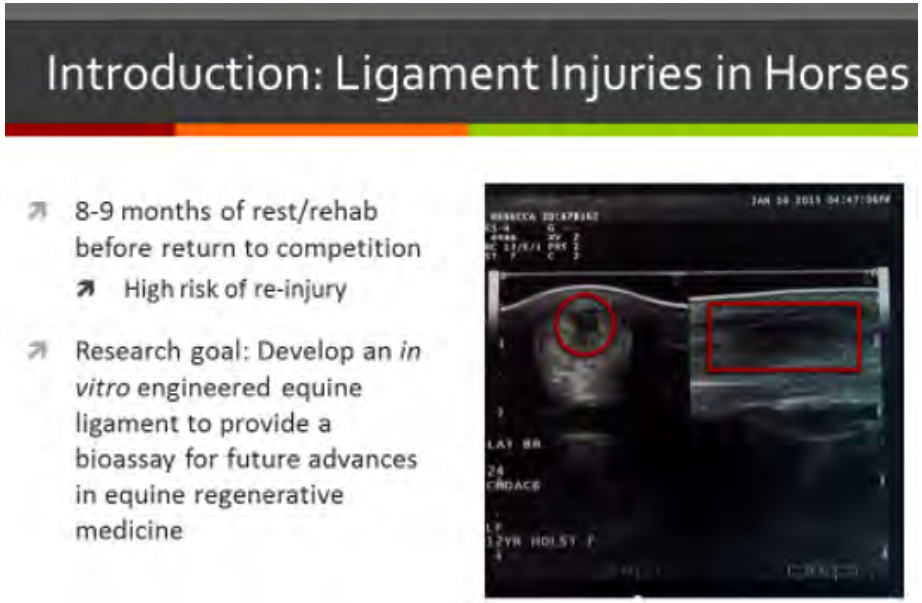
Rebecca A. Miller

Sponsor: Keith Baar

A Successful In Vitro Model of an Engineered Equine Ligament

Abstract: Ligament injuries are common causes of lameness in horses, often preventing a return to competition and eventual euthanasia. Further exploration of the tissue's capacity to heal and the effectiveness of current regenerative therapies is warranted. Our lab has previously generated bone-ligament-bone grafts from human ligament remnants and used them to understand physiology. To achieve this, a fibrin gel embedded with human fibroblasts is set between two calcium-phosphate anchors. The constructs form within seven days and are mechanically tested at 14 days. This study aims to develop a similar model for equine ligament constructs in vitro. To achieve this goal, eight different equine cell types were chosen, and cells from these tissues were embedded in the fibrin gel. Constructs from skin, adipose, and umbilical cord failed before 14d, whereas bone marrow (bMSC), muscle (MFB) and the superficial digital flexor tendon (SDFT) cells made robust constructs. Of these, the SDFT were the strongest (SDFT=0.59±0.02; MFB=0.56±0.02; bMSC=0.44±0.003 N) ligaments. We then determined that the variability in SDFT constructs among five donors was 47%. Therefore, this work describes the successful engineering of equine ligaments in vitro and provides a model for future advances in the field of equine regenerative medicine.



Debadrita Mondal

Sponsor: Lenna Ontai

Under Pressure: Effects of Parental Pressure on Children's Fruit and Vegetable Consumption and the Energy Density of Their Diets

Abstract: In a national survey, Ogden et al. (2015) reported 26.4% of children aged 2-11 years were obese. Parental feeding practices may be associated with child BMI. Pressure to eat, a mealtime behavior in which parents urge children to increase overall food or specifically healthy food consumption (Gregory et al., 2010), has been negatively associated with BMI in preschool- and early elementary school-aged children (Hurley et al. 2011). Articles investigating pressure to eat in association with food consumption largely only examine fruit and vegetable consumption (FVC) in preschoolers (Blisset, 2011). This study aims to explore the effect of pressure to eat on FVC relative specifically to the energy density the children consumed. We hypothesize that pressure to eat may be positively associated with FVC and negatively associated with energy density consumed. Controlling for energy density, a multiple regression model was used with pressure to eat predicting FVC. 130 parent-child pairs, all from the Head Start or WIC programs in the Sacramento area, took the My Child At Mealtime questionnaire (Ontai et al., 2010). Items on the questionnaire reflecting pressure to eat were aggregated into a scale. FVC (cups) and energy density were recorded using 24-hour dietary recall.

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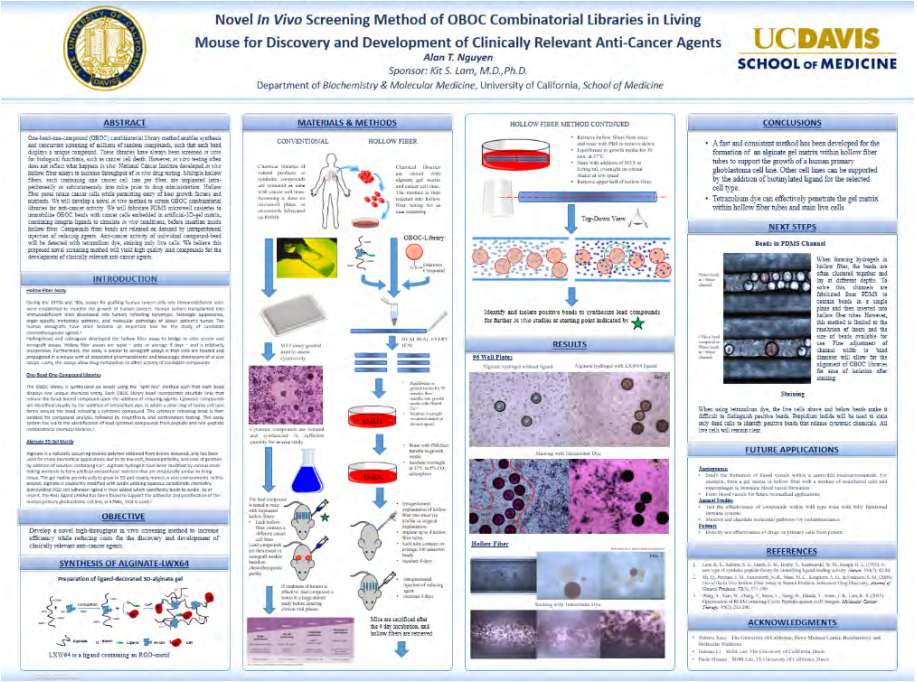
Alan T. Nguyen

Sponsor: Kit S. Lam

Novel In Vivo Screening Method of OBOC Combinatorial Libraries in Living Mouse for Discovery and Development of Clinically Relevant Anti-Cancer Agents

Abstract: One-bead-one-compound (OBOC) combinatorial library method enables synthesis and concurrent screening of millions of random compounds, such that each bead displays a unique compound. These libraries have always been screened in vitro for biological functions, such as cancer cell death. However, in vitro testing often does not reflect what happens in vivo. National Cancer Institute developed in vivo hollow fiber assays to increase throughput of in vivo drug testing. Multiple hollow fibers, each containing one cancer cell line per fiber, are implanted intra-peritoneally or subcutaneously into mice prior to drug administration. Hollow fiber pores retain cancer cells while permitting entry of host growth factors and nutrients. We will develop a novel in vivo method to screen OBOC combinatorial libraries for anti-cancer activity. We will fabricate PDMS microwell cassettes to immobilize OBOC beads with cancer cells embedded in artificial-3D-gel matrix, containing integrin-ligands to simulate in vivo conditions, before insertion inside hollow fiber. Compounds from beads are released on demand by intraperitoneal injection of reducing agents. Anti-cancer activity of individual compound-bead will be detected with tetrazolium dye, staining only live cells. We believe this proposed novel screening method will yield high quality lead compounds for the development of clinically relevant anti-cancer agents.



Ashley B. Nola

Sponsor: Susan Stover

Effects of Silicate-Associated Osteoporosis and Age on the Equine Cervical Spine (Neck)

Abstract: Silicate-Associated Osteoporosis (SAO) is a progressively debilitating condition of horses that concurrently suffer from pulmonary silicosis and osteoporosis. Through an unknown mechanism, horses with silicosis lose bone density and become susceptible to painful deformities and catastrophic fractures. Neck stiffness is a prominent clinical feature in these horses. We hypothesized that the SAO- affected cervical spine is less mobile than a normal spine due to degenerative changes exacerbated by osteoporosis. The objective of this study was to differentiate the cervical vertebral changes due to SAO from natural, age-related changes. The cervical vertebrae of SAO horses with neck stiffness were compared to those of age- and sex -matched control horses without neck stiffness using post-mortem gross examination and computed tomography (CT) imaging. Preliminary findings show that the cervical vertebrae of SAO horses have diffuse and regional bone loss. Additionally, more so than in the matched control horses, joint congruity in the SAO cervical spine progressively declines as the vertebrae get further away from the head. These preliminary findings support our hypotheses that SAO horses have significantly accelerated degeneration of cervical vertebrae and more disintegration of the intervertebral connections than that explained by age alone.

Eric Olsen

Sponsor: Jeanette B. Ruiz

Tracking the Historical Trajectory of Chinese-American Relations Through Media Representations

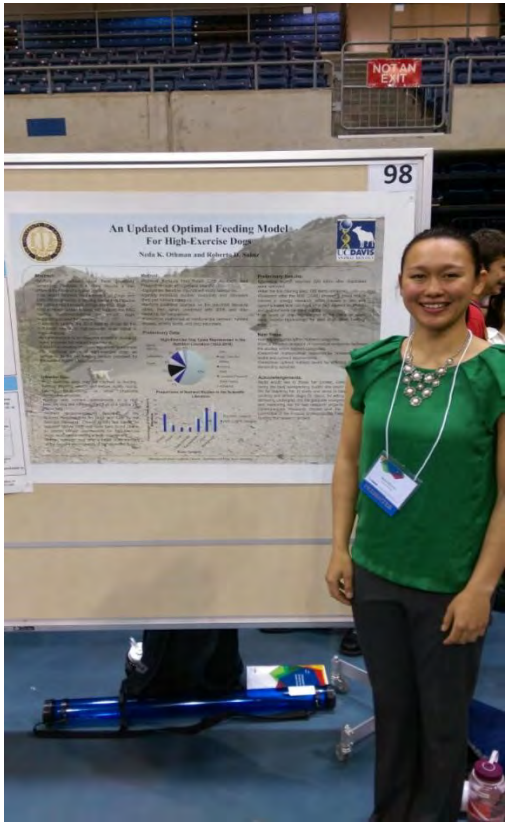
Abstract: Significant knowledge gaps exist in the historical trajectory of how China and the United States portray each other through media. No relevant studies exist that track the valence of each medias prose at the aggregate level. Moreover, adequate research depicting the trends in media representations over a significant span of time is lacking. In order to fill these gaps, I have conducted a sentiment analyses of 350 American and Chinese newspaper headlines spanning from 1975-2015. The newspaper article headlines are broken down by categories (culture, political institutions, and economics) and then analyzed based on the rhetorical tone. Initial findings from analyzing rhetorical valence shows that both Chinese and American portrayals of one another have become more negative over time in each of the aforementioned categories. Examining this research can produce informed conjectures about the future cultural and geopolitical relations between these two nations, and serve to highlight any inherent cultural differences.

Neda K. Othman

Sponsor: Roberto D. Sainz

An Updated Optimal Feeding Model for High-Exercise Dogs

Abstract: Working or otherwise athletic dogs have physically demanding lifestyles that certainly require a diet different than that of a typical pet dog. The most recently published *Nutrient Requirements of Dogs and Cats* (2006) provides a feeding model that may be used to find the nutrient requirements of high-exercise dogs. However, some research performed later than its 2006 publication does not support its feeding model recommendations for athletic dogs, suggesting a need for revision. I intend to update the 2006 feeding model for the nutritional needs of high-exercise dogs using a meta-analysis like that described by animal nutritionists Sauvant et. al. (2008). A meta-analysis is an objective statistical review of many separate but related experiments. It can identify correlations between high levels of physical activity and certain dietary nutrients suggested by recent research. Thus far, I have collected 54 post-2006 papers using an organized search of one scientific database, demonstrating that our knowledge of physically active dogs nutritional needs has progressed, and I am searching two other databases to compile a more comprehensive collection. I expect to develop improved equations to estimate nutritional needs of high-exercise dogs, as compared to the old feeding models proposed by the current Nutrient Requirements.



Anna L. Peare

Sponsor: Luis E. Guarnizo

The Latin American Child Migration Crisis and Mental Health Implications

Abstract: Between 2014 and present-day, thousands of unaccompanied child migrants have fled gang-related violence and economic hardships in Central America, making the harrowing journey north to the United States. Once in the United States, the majority of these unaccompanied minors are detained in family detention facilities around the country for upwards of two years before they are granted asylum or deported back to their country of origin. I am investigating the mental health issues that these child migrants endure, both while on their journey north as well as during their time in detention centers. I will examine the likelihood of certain illnesses, including depression and anxiety, as well as the impact of migration on child development. I will be using existing literature on migration, mental health, and child development, while also conducting interviews with employees of the Department of Homeland Security, detention facility workers, and child migrants. I hope my research will bring more light to the Latin American child migration crisis, while also delving deeper into the mental health of child migrants.

Sarah M. Pearson

Sponsor: Jeff Fort

Français de Souche, Français de Sol: National Identity and Immigration in Contemporary France

Abstract: In 2010, French Prime Minister François Fillon asked the French citizens: What is the French national identity? In my research, I explore this question by studying recent immigration policies and reactions to these policies. I used Patrick Weil's *Le sens de la république (The Sense of the Republic)*, a collection of essays regarding the future of France, and Alain Minc's *Un français de tant de souches (A Frenchman of Many Origins),* a study of the existential problems facing France today; both of which were published last year and describe the French nationality. I am also using articles and essays on national identity and immigration written by well-known politicians and authors in France, such as Emmanuel Todd, a political scientist from Paris, Eric Zemmour, a political journalist, and Alain Finkielkraut, a philosopher. For decades, France has struggled to define itself. From unrest in the suburbs of Paris to the terrorist attacks last year, how France decides to address these issues is rooted in how they see themselves as a nation. Studying the definition and perception of a French citizen through immigration laws and the Constitution reveals what constitutes a French citizen and France as a whole.

Sara Z. Phelps

Sponsor: Michael J. Lazzara

Dreams, Children, and Ghosts: The Works of Nona Fern·ndez

Abstract: Memory and forgetting are key issues in societies grappling with the consequences of state violence. In recent years, a generation of Chilean authors and artists that grew up during the Pinochet dictatorship has created work that offers new paradigms about childhood, memory, and state violence. In this paper, I analyze the work of Chilean author, playwright, actress, and director, Nona Fern·ndez. I am interested in tracing the recurrence and evolution of motifs, structures, and narratives throughout Fern·ndezs novels and plays. Through her use of postmodern literary techniques that break with linear conceptualizations of space and time, I argue that Fern·ndezs texts, with their admixture of images and temporalities, function as a series of societal dreams whose intent is to critique and interrupt the neoliberal structures of Chilean society. The authors deployment of dream signs critiques the postdictatorial culture of forgetting and galvanizes audiences to examine the ghosts of the dictatorial past that continue to haunt Chiles present. My analysis hopes to raise provocative questions about the potential and limitations of political art as a disruptive practice in neoliberal societies.

Yaquelin Ruiz

Sponsor: Amber Boydstun

State Sanctioned Attitudes and Actions: Prejudice and Violence Against the Lesbian, Gay, Bisexual, and Transgender People of Russia

Abstract: Increasingly, countries around the world are becoming more tolerant of minorities, particularly the lesbian, gay, bisexual, and transgender community. However, as some countries become more accepting, the developed country of Russia has taken steps to alienate this segment of their population. What has caused a shift not only in attitudes but also in actions toward the LGBT community in Russia? By collecting and examining original datasets, I present several interacting features that illustrate that there has been an increase in not only interest but also negative opinion in the LGBT community. And, due to the state's actions and the media's negative representation of LGBT topics, this negative opinion has translated into increased violence for the LGBT people of Russia. This work is significant as it brings attention to the need for distinct data on minorities around the world and it illustrates the interacting forces that have created a negative situation for the LGBT people of Russia.

Estevan M. Sanchez

Sponsor: Magid Shihade

Looking for the Perfect Beat: Hip-Hop Culture in the Middle East

Abstract: Hip-Hop culture through its four elements, Graffiti, Rapping, Break Dancing, and Deejaying has become an outlet for youth to organize politically and express their thoughts in the Middle East. This research showcases the complexity of Hip-Hop culture by incorporating interviews, news articles, and original works. In order to understand how a cultural movement which started in the US has become global, Halifu Osumare's book *The Africanist Aesthetic in Global Hip-Hop: Power Moves* is used. The theoretical approach from the The Africanist Aesthetic is comprised of three connective marginalities which explain the global spread of Hip-Hop culture in their given contexts. Deejaying and sampling are understudied areas of Hip-Hop culture in the US, but deserve much attention as they are the backbone of Hip-Hop. This work aims to expand Joseph Schloss' *Making Beats: The Art of Sample Based Hip Hop* to the international level as sampling in the Middle East has become an important component of Hip-Hop culture. By combining original resources, theoretical approaches, and previous work done on the topic, this research aims to expand the understanding of Hip-Hop culture in the Middle East.

Ashley P. Shepard

Sponsor: Jacob Hibel

Assessing Knowledge and Public Perceptions of Foster Youth and the Foster Care System in California

Abstract: California's welfare system is currently in the process of undergoing a period of comprehensive reform, which will impact over 50,000 youth in the foster care system. This reform will increase the already existing need for foster families. The goal of this research project is to collect and analyze data gathered from a survey we created that is intended to measure California adults' awareness of and orientations toward foster parenting, foster youth, and the foster care system. No survey exist today that directly address adults knowledge and perceptions of foster you and the foster care system. By collecting high-quality data from this unique survey, we hope to discover impactful information to disseminate amongst target populations that may have misconceptions about foster youth or the foster care system. To address these misconceptions we will create an outreach campaign. The survey will be key in the development of an awareness campaign geared towards the recruitment of foster families and addressing misconceptions that potential families may have.

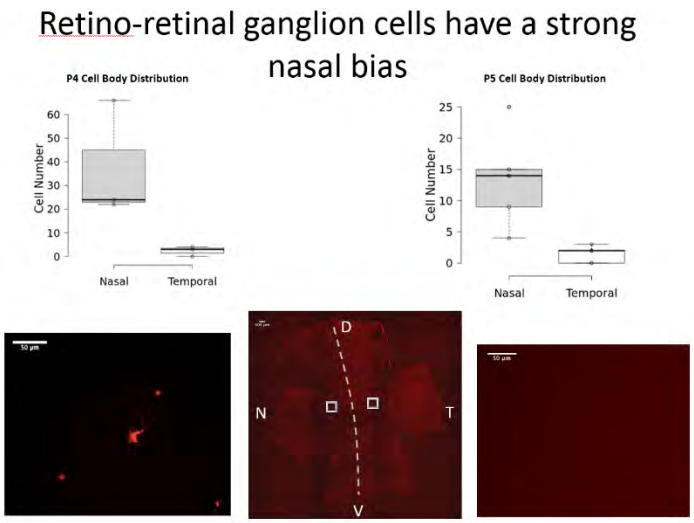
!

Ana Marija Sola

Sponsor: Hwai-Jong Cheng

Retino-Retinal Projections in Development of Ferret

Abstract: Past literature has shown that various animal species exhibit a divergence from the canonical pathway of visual sensory input in the form of retino-retinal projections. These retino-retinal projections extend between the two eyes, primarily during embryonic development, and may be implicated in the development of early retinal waves and inter-eye competition. Despite characterizations of these retino-retinal projections in various species, it is unknown whether these projections serve a specific function, such as those proposed earlier, or whether they are aberrant misguidances. In order to address these questions, characterization studies were conducted in the ferret, which is born with a relatively premature visual system, allowing for postnatal studies. Unilateral intraocular injections of fluorescent choleratoxin subunit B (CT-B 594) tracer resulted in anterograde labeling of axons and retrograde labeling of retino-retinal retinal ganglion cells (rrRGCs) in the eye contralateral of the injection site. Our preliminary results suggest that the cell bodies of the rrRGCs on the contralateral eye predominantly occupied the nasal side, and the labeled retino-retinal axons projected to the temporal side. These results will provide a ground work for our future studies of the functional role of retino-retinal projection.

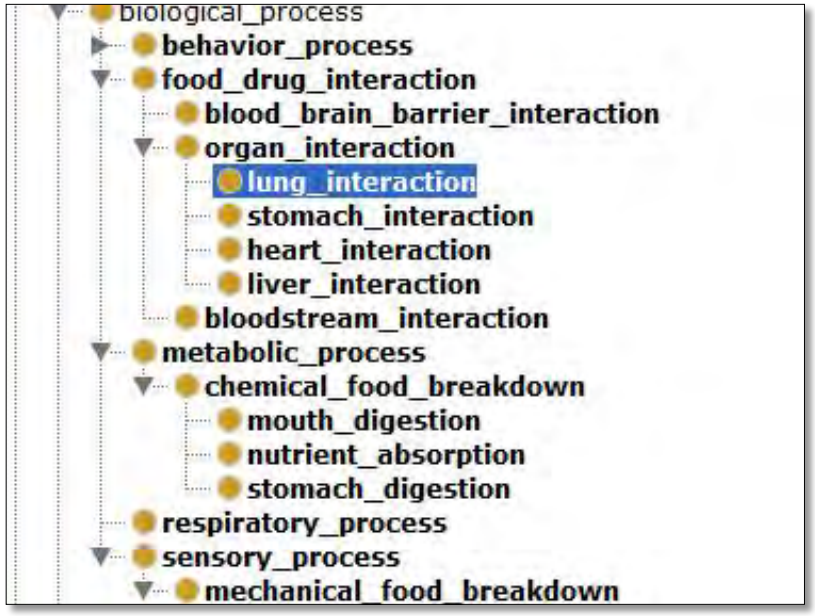


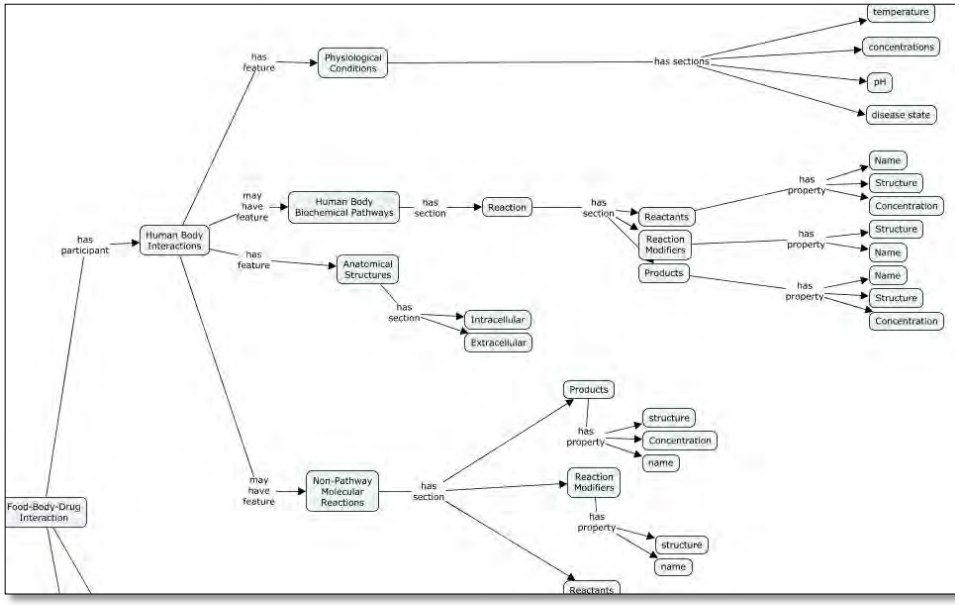
Constantine W. Spyrou

Sponsor: Matthew C. Lange, Ph.D.

uc_FIDO: unambiguous characterization of food interactions with drugs ontology

Abstract: An ontology to describe the interactions between bioactive compounds in foods and active ingredients in medicine in the human body is being developed (uc_FIDO). This ontology is part of a group of food ontologies describing food and the human experience. The first of its kind, uc_FIDO characterizes relations between food, medicine, and health related to humans. uc_FIDO brings together existing human biological pathway ontologies as well as drug ingredient ontologies, in order to make them available to annotate of interactions with food. The current dearth of ontologies for characterizing foods limits advancement of informatics solutions for improving health. As ontologies of foods are developed, it becomes necessary to describe ingredients, chemicals, potential toxins, and other molecules in food interacting with drugs and the human body.





Shubhangi Srivastava

Sponsor: Jacob Hibel

Assessing Knowledge and Public Perceptions of Foster Youth and the Foster Care System in California

Abstract: The California child welfare system is currently in the process of undergoing a period of comprehensive reform which will ultimately phase out long-term group home placements for youth in foster care. These reforms are anticipated to increase the already growing need for foster families in California. The goal of this research project is to analyze data gathered from a survey intended to measure California adults' awareness of and orientations toward foster parenting, foster youth, and the foster care system. Information gathered from the survey will help to formulate conclusions regarding, for example, whether adults who perceive financial concerns as the biggest obstacle to fostering would be less likely to report an interest in fostering than adults who report other types of obstacles. The survey findings will be disseminated amongst key target populations that may have misconceptions about foster youth or the foster care system. In order to address these misconceptions, the survey findings and previous academic research will be utilized to develop an outreach campaign geared towards: reducing the stigma that currently surrounds foster youth and families, increasing awareness of the growing need of foster families in California, recruiting additional foster families, and addressing misconceptions that potential families may have.

Phillip Tan

Sponsor: Brian C. Trainor

The Effects of Oxytocin on Stress Regulation

Abstract: Oxytocin (OT) has emerged as a potential new treatment for stress induced psychiatric disorders like anxiety and depression, but the specific involvement of OT circuitry remains to be studied. Although anxiety and depression are twice as common in women than men, most preclinical studies only use males. By using the California mouse *(Peromyscus californicus),* our lab has found that only females display long term social withdrawal after being exposed to stress, and that this is associated with sex-specific changes in OT signaling. For example, females show increased OT activity in a brain region associated with anxiety. We also found that intranasal OT results in social withdrawal in females but not males who were naive to stress. These findings led to the hypothesis that the activation of OT receptors (OTR) may contribute to stress-induced social withdrawal. We conducted a study in which stressed and naive females received OTR antagonist before behavioral testing. Stress significantly reduced social behavior in females, and in support of our hypothesis, the administration of OTR antagonist reversed this effect of stress. By using molecular techniques, we are currently assessing which specific brain areas change in its activity with response to social stress and OTR antagonist.

Naoto Tanaka

Sponsor: Katharine Burnett

Japanese Plant Imagery in the West, Late 19th to Early 20th Century

Abstract: After Japan ended its isolationist policies and opened up ports for international trade in the 1850s, the collection of Japanese objects became a trend in the West, especially with artists. This led to a major movement in Western art of incorporating visual influences from Japanese goods, which was termed "Japonisme" by French art critic Philippe Burty in 1872. Though Japonisme is often attributed to artists "discovering" objects and visual culture from Japan, there were also conscious efforts by the Japanese that responded to the popularity of certain objects and imagery in the West. This was especially true for plant images, which connected with the movement by the Japanese government, industry, and individuals to make Japanese plants a major export item. Plants that the Japanese promoted through trade and World Fairs are found in many Western artworks, showing how the dynamics of the Japonisme movement had to do not only with art and artists in the Western world but also industries and policies of Meiji-era Japan, and trade between the two regions.

Mikaela N. Tenner

Sponsor: Heather McKibben

Democracy and Intervention: An Analysis of Collective Military Intervention Under the European Union's Common Security and Defense Policy

Abstract: Since 2003, the European Union (EU) has had the ability to initiate collective military intervention through the Common Security and Defense Policy (CSDP). This study analyzes the driving forces behind the EU's likeliness to initiate such an intervention. Specifically, I examine the impact that the level of democracy in a country has on the EUs likeliness to intervene when a military conflict arises in that country. For the purposes of my study, Polity IV variables are used to measure a country's level of democracy. I analyze this variable against intervention, which I consider as cases in which the EU initiates a military or civilian mission in which they commit at least 30 personnel on the ground of the conflict. My statistical analysis reveals that there is a significant negative correlation between the two variables. Therefore, it should follow that there is a statistically significant negative relationship between a country's level of democracy and the EU's likeliness to intervene when conflict arises in that country.

Audrey Torrest

Sponsor: Jan Nolta

Biomarkers of Mitochondrial Dysfunction in Huntington's Disease Fibroblasts

Abstract: Huntington's disease (HD) is a fatal autosomal dominant neurodegenerative disorder caused by an abnormal expansion of CAG repeats in the huntingtin gene. When this region contains more than 38 repeats, translation of the gene results in the formation of a protein known as mutant huntingtin, which is responsible for the disease. However, the exact function of the normal and mutant forms of the protein have not yet been fully elucidated. Nonetheless, it has become increasingly clear that altered mitochondrial function plays a key role in HD pathogenesis. This study examined mitochondrial dysfunction in human HD fibroblast cell lines through quantification of reactive oxygen species (ROS) by flow cytometry, ROS-induced DNA damage in the mitochondrial genome by qPCR, and gene expression implicated in energy metabolism and mitochondrial functioning by RT-PCR. These biomarkers were used to establish baseline differences in mitochondrial function of HD gene carrier and non-gene carrier cell lines to determine whether these biomarkers could be used for the evaluation of gene modification strategies that silence the mutant huntington allele.

Joshua T. Wild

Sponsor: Giovanni Peri

Effect of the Business Cycle on Postsecondary Decision-Making

Abstract: Each year, thousands of undergraduates across the United States are confronted with the decision of what academic field to pursue. They are often influenced by a variety of extrinsic factors, such as family pressures, quality of faculty, and research opportunities. However, one of the most glaring considerations for students is the likelihood of obtaining a career after graduation. Rather than examining which majors tend to lead to more lucrative labor market outcomes, which has been researched extensively, this study attempts to look at how fluctuations in the business cycle affect studentsí decisions regarding their majors. To achieve this, the analysis focuses on degrees awarded in each state over a 14-year span. The primary explanatory variable is a set of lagged state-level unemployment rates, which reflect the status of the economy at the time when students were making their decisions. When facing less opportune economic times, undergraduates tend to lean towards applied sciences, specifically engineering. More recently however, with a greater amount of academic options available than ever before, students are generally becoming more diverse in their decision-making.

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Philip Domondon, Marc Durocher, Sean Hongo, Gabriel Jagoe-Siedl and Kevin Yamayoshi

Biomedical Engineering

A Wearable Device to Alleviate Drop Foot

Client: Dr. Tracy Basso, DPM, Davis Foot and Ankle Center

Abstract: Drop Foot is an unfortunate symptom of various diseases (stroke, ALS, MS, cerebral palsy and more), characterized by the inability to lift the foot. Drop foot comes in varying severities and hinders a person's quality of life. Current treatments range from the cheap but ineffective passive braces to highly expensive electrical stimulation devices with varying efficacy. Our solution is a smart orthotic that uses inertial sensors coupled with mechanical retraction to automatically lift the foot during the walking cycle. The device offers an affordable, effective and discreet alternative to medical device options for users.

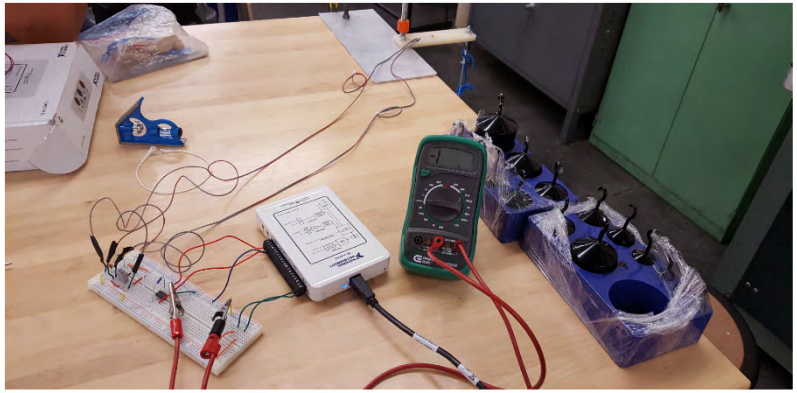
Scott Kresie, Dominique True, Jeronimo Mora

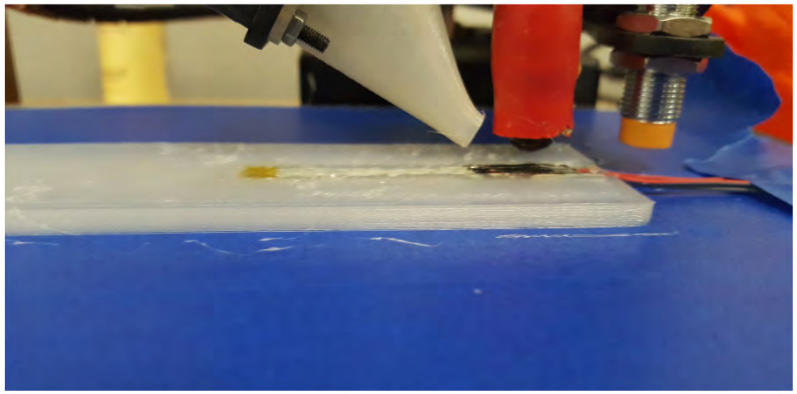
Mechanical Engineering

Project title: The Effect of Embedded Sensors on Strain Measurements in 3D Printed Parts

Client: Lawrence Livermore National Laboratory

Abstract: Lawrence Livermore National Laboratory (LLNL) has tasked us with investigating the effects of embedding a strain gauge into a 3D printed part. Strain gauges are conventionally used on the surface of structures to measure strain. Embedding these sensors requires special internal geometry for their seamless placement. Our goal is to determine an embedding process as well as experimental evidence to show that an embedded strain gauge can accurately sense strain within a structure. Due to the nature of the embedding process, embedded sensors may not provide an accurate depiction of strain within a 3D printed part. By comparing our experimental results to a theoretical model we can determine the validity of the data received from the embedded strain gauges. We can also compare the effect embedding has on strain measurements by comparing our embedded sensor data to data from beams that have conventional surface mounted sensors. We are also providing the groundwork for future research LLNL plans to do in the area of embedded sensors.





Top: Our experimental setup for loading the end of a cantilever beam with weights and measuring strain from a voltage output by the gauges. Bottom: The 3D printer prints over the embedded strain gauge until the part is complete and the gauge is fully embedded.

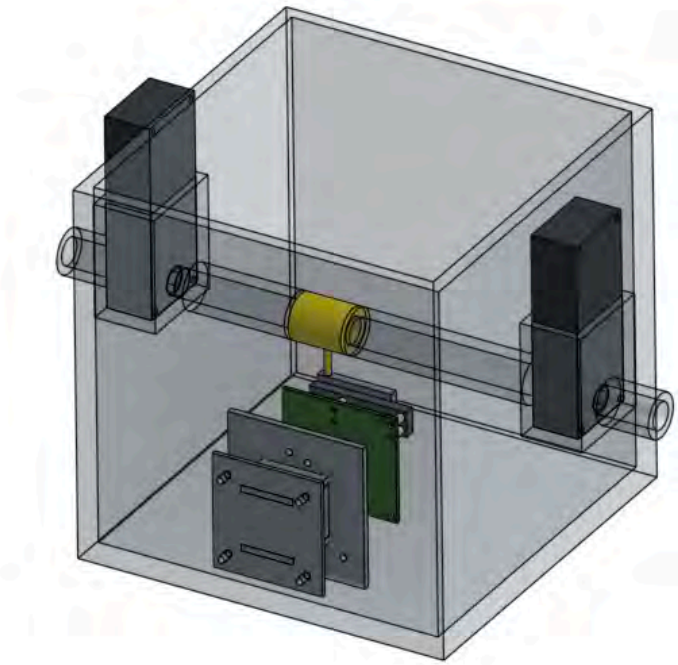
Laurel Salinas, Lillian Gibbons, Ryan Tucci

Mechanical Engineering

Project title: Integrating a Load Cell into Bee Colonies

Client: UC Davis Entomology Department: Neal Williams and Rosemary Malfi

Abstract: In order to better understand the behavior of bee colonies, UC Davis entomologists want to be able track the weights of bees, and their pollen loads, as they enter and exit the hive. In order to accomplish this, we will make use of a load cell sensitive enough to register these very small weights and incorporate the load cell into the preexisting hive. The load cell will integrate with an electronics system to record and store the collected data designed by UC Davis Electrical Engineering students. The bees are currently equipped with sensors that are read by RFID readers so that each bee can be tracked individually. Our design will accommodate the RFID readers, include the load cell, an enclosure for it and its electronics, and a base that will mate with the load cell enclosure and the hive, ensuring modularity of design.



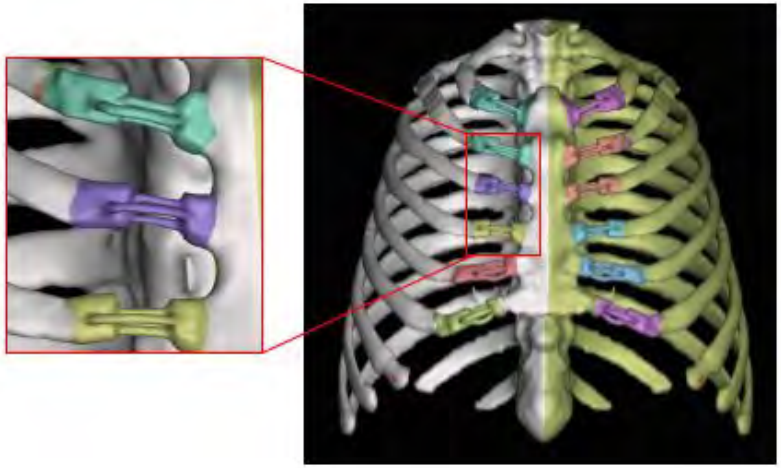
Mason Becker, Lauren Damian, Hailey Hinkle, Matthew Kennedy

Biomedical Engineering

A Customized Approach to Chest Wall Reconstruction

Client: Dr. Elizabeth David

Abstract: Current methods utilized for chest wall reconstruction lack a customizable implant when dealing with reconstruction due to tumor removal. Contemporary chest wall prostheses do not provide anatomical isometry for the patient, which results in chronic complications such as respiratory failure, infection, and severe pain [1,2]. Implants are sized and shaped during surgery, not before, which is problematic to the patient's postoperative well-being. If every diagnosis requiring chest wall reconstruction was able to integrate a custom prosthetic, thousands of patients across the world would be able to continue their lives with minimal pain [3]. Therefore, our objective for this project is to design an individualized prosthetic for mature adults that can provide long term patient viability. In order to achieve this, the implant is customized in accordance to the patient's defect by processing the patient's raw CT scan data and converting it into a 3D printed prosthetic. The custom 3D printed implant is produced by the aforementioned process and integrates a novel sternum to rib interface to reduce physical stress and maximize chest wall flexibility. Ideally we would incorporate the biocompatible material PEEK (polyetheretherketone) to minimize the inflammatory response upon in vivo integration, but due to fiscal constraints, we use other various plastics available on campus to demonstrate a proof-of-concept. The use of an alternate material is acceptable because it is still able to demonstrate if the use of a flexible hinge interface provides a difference in flexibility. Overall, we found that a design that incorporates a natural hinge at the interface between the rib and sternum responds to forces much faster than a completely rigid design but does not significantly alter the overall displacement. By increasing the rate of displacement in response to a sudden force, such as a phrenic cough, we are able to reduce the pressure on the patient's native bone. This in turn will reduce postoperative pain. It is this demonstration of the conservation of geometry and the force reduction due to our flexible interface that will shed more light onto the benefits of a patient specific approach to reconstructive chest wall surgery.



[1] M. W. Clemens, K. K. Evans, S. Mardini, and P. G. Arnold, "Introduction to chest wall reconstruction: anatomy and physiology of the chest and indications for chest wall reconstruction," Semin Plast Surg, vol. 25, pp. 5-15, Feb 2011.

[2] (2015, Cancer Facts and Figures 2015). Available: http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc-˜044552.pdf

[3] M. Weyant, MD, M. Bains, MD, E. Venkatraman, PhD, R. Downey, MD, B. Park, MD, and R. Flores, MD. (2006, Results of Chest Wall Resection and Reconstruction With and Without Rigid Prosthesis).

Kelley Drechsler, Channing Ko-Madden, Alexander Schramm

Biological Systems Engineering

Project Title: Remote Crop Water Stress Monitor

Client: Verizon

Abstract: Many advanced crop cultivation systems incorporate plant water stress measurements into irrigation decision-making to save water by irrigating only the areas with the greatest need. We have adapted an existing perennial crop water stress sensor suite for use in annual field crops, such as tomatoes. Our system has great potential for improving water use efficiency in one of California's highest production crops, cutting the costs for food production, and increasing agricultural sustainability. Our design integrates a digital camera into the apparatus that, in conjunction with image processing software, estimates the canopy coverage of the studied area and allows manipulation of the thermal infrared sensor data to determine average leaf temperature from average field temperature. The system also includes an adjustable mount for the digital camera to alter its position and angle of view in the field. The system is integrated with a suite of other sensors, measuring wind speed, air temperature, relative humidity, and light radiation, in order to form a field-ready unit capable of uploading data to the internet in real-time. An algorithm processes the data to calculate the Crop Water Stress Index (CWSI) to determine when to irrigate the plants. We have also added weather resistant housing to all of the equipment that would be left out in the field. Mounted at the edge of a tomato field, this device will allow farmers to remotely monitor crop response to irrigation, in order to manage water use.