16TH ANNUAL

2022 SURI RESEARCH SYMPOSIUM

SUMMER UNDERGRADUATE SURI RESEARCH INSTITUTE

UROC Undergraduate Research Opportunities Center
UC MERCED

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UROC RESEARCH SYMPOSIUM

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STUDENT ABSTRACTS

BENEDICT REU

The UC Merced - Benedict College Internship Program in Machine Learning and Modeling in Biology aims to provide an enriching research experience for Benedict College undergraduate students at UC Merced in Summer 2022. The program consists of 10 weeks in which the students will live on UC Merced's campus, attend professional development workshops via UC Merced's Undergraduate Research Opportunity Center (UROC), and use their mathematical and machine learning techniques to tackle real-world problems in biology. Interns will work alongside UC Merced faculty and graduate students. At the end of the program, students will present their research at the annual UROC Summer Research Symposium.

Metrid A. Okumu
Benedict REU

Using machine learning techniques in breast cancer prediction

By: Metrid. A. Okumu, Erica M. Rutter, Ph.D

Cancer is one of the leading health problems worldwide. Breast cancer is one of the frequent types of cancer affecting mostly women. Statistics show that at least 8% of women are affected by breast cancer in their lifetime, and it is currently the leading cause of death amongst women. Early detection of breast cancer improves the timely treatment of the affected individuals and, in most cases, increases the survival rate. This paper compares different machine learning techniques used in breast cancer tumor detection. In this study, the Wisconsin breast cancer data will be used. The dataset is classification data with 569 samples and 31 features which we will use to make the prediction. The machine learning models are logistic regression, random forests, decision trees, neural networks, and support vector machine (SVM). The machine learning model's performance is evaluated based on the test accuracy.

Gregory
Shipmon
Benedict REU

Using Machine Learning Models to predict the detection and different levels of dementia.

By:Gregory Shipmon, Erica M. Rutter, PhD, Suzanne S. Sindi, PhD

Alzheimer's disease is a progressive disease that slowly affects the memory and other important mental functions of a person. This disease does not usually tend to affect people until later in life, however, it is still a very common disease that eventually leads to death due to the fact that it is incurable. Even then, it is more unfortunate that most of the time the person would not even know they suffer from this disease. This poses a conflict for senior citizens all over the world. It is unclear whether there will ever be a cure for this disease, but I believe there is an efficient way that can predict whether a person has Alzhemer's or even more specifically, the levels of dementia for a person. In order to obtain this prediction, I will be working in Python with CT scan images of many different people's brains. I will be using conventional neural networks in order to enable the system to look at the CT scans and make a prediction on what level of dementia that a person has. With the levels being: No Dementia, Moderate Dementia, Mild Dementia, and Very Mild Dementia.

Ostonya K. Thomas Benedict REU

Using Machine Learning Models to Predict the Prices of Vehicles

By: Ostonya K. Thomas, Erica M. Rutter, PhD, Suzanne S. Sindi, PhD,

Recently, eCommerce (or online commercial activity) has become increasingly common in several economic sectors including the automotive industry. With the world becoming increasingly digitized, buying and selling vehicles online has become more popular. Now, there arises a need to improve the ease and legitimacy with which one can buy or sell a vehicle online. In this work, machine learning models were designed to predict the selling prices of vehicles based on their images. The dataset used for this project contained approximately 64,500 images of vehicles with their make, model, year, manufacturer suggested retail price (MSRP), front wheel size, horsepower, displacement, engine type, width, height, length, gas mileage, drivetrain, passenger capacity, number of passenger doors, and body style. The data was split into training, validation and testing sets which contained 70%, 10% and 20% of the data respectively. The algorithms produced have the potential to improve the online automotive industry by estimating a vehicle's value based on an image of the vehicle.

BRAAG

Geoscience is one of the least diverse fields in the United States, even within STEMM (Science, Technology, Engineering, Mathematics, and Medicine). The University of California (UC), Merced – Historically Black College and University (UCM-HBCU) partnership - "Boosting Representation of African-Americans in the Geosciences" (BRAAG) - aims to contribute to changing the trajectory of representation of African-Americans (AA) in the geosciences in the UC system and beyond.

The BRAAG partnership is a three-year program intended to improve the representation of Black people in the geosciences by recruiting students from three HBCUs - Kentucky State University, Tennessee State University, and Howard University. At UC Merced, we will provide HBCU students with an immersive and enriching research experience over eight weeks, along with multi-tiered mentoring and sponsoring of the students we recruit long after they complete their summer research at UC Merced.

Rania Jones
BRAAG

The Impact of Burning Incense on Indoor Air Quality

By: Rania Jones, Dr. Xuan Zhang, PhD, Zeyi Moo, PhD Candidate

Indoor air pollution is a significant issue found all across the globe when observing the ways human health can be affected negatively. Various human-related activities, such as cooking, smoking, and cleaning, can heighten the accumulation of air pollutants. Most of the common compounds found are dust, PM2.5, PM10, etc. The burning of incense has been around for centuries as people around the world use it for traditions, prayers, ceremonies, and aromatherapy purposes. Pollutants, which poorly influence human health systems, were observed from the conduction of incense burning. In this study, we utilize a suite of analytical techniques, including Particle-into-Liquid-Sampler [PILS], Air Particle Counter, and High-Performance Liquid Chromatography—Time of Flight—Mass Spectrometry [HPLC/TOF/MS], to measure the mass concentrations and chemical composition of particulate matters emitted from incense burning under a typical office space setting. We then compare the particle pollution level resulting from the incense burning with various air pollution episodes found in an outdoor environment and discuss the impact of incense burning on indoor air quality and human health. Future work will include observations regarding recovery time for normal air quality after incense-burning has taken place.

Zhaierra M. Love
BRAAG

Using The Application of Biochar Improves the Water Retention in Soil

By: Zhaierra M. Love, Touyee Thao PhD student, Teamrat A. Ghezzehei, PhD

California is the leading agricultural state for fruits, vegetables, and nuts which requires lots of water. The goal of farmers is to have their plants develop without the use of too much water. Biochar is produced from agricultural biomass waste such as almond-shell biochar (ACB), walnut-shell biochar (WSB), and almond clippings biochar (ACB) all are known to improve soil health and water retention. This summer research aims to test the effects of dairy manure compost versus the different biochar co-compost. The manure and biochar were added to tomato plants under full and reduced irrigation regimes. To test the biochar and dairy manure they were added to soil and placed in columns outside the UC Merced Greenhouse Unit. The columns were placed outside to receive the same weather conditions as agricultural fields. The tomatoes (Solanum Lycopersicum) were then transplanted into the varieties of soil. Height, width, canopy coverage, and Chlorophyll data of each plant were measured to track its development. Canopeo is the app used to determine canopy coverage and a SPAD 502 Plus Chlorophyll meter was used to track the amount of chlorophyll in the tomato plants' leaves. Tomatoes grown in soils mixed with compost and biochar will have higher chlorophyll content and leaf area. Adding biochar to soils will improve water retention allowing farmers to be sustainable planters.

Kennedy L. Williams
BRAAG

Microbial Controls on Methane Emissions from Dairy Manure Co-Composted with Different Biochars

By: Kennedy L. Williams, Brendan Harrison, Rebecca Ryals

Biochar is a sustainable soil amendment that can serve as a climate solution while offering several environmental benefits. Biochar emissions have been found to reduce greenhouse gas emissions and prevent the loss of nutrients when added to compost. This research aims to use quantitative polymerase chain reaction (qPCR) to calculate the abundance of genes coding for distinct microbes that produce or consume methane during biochar-composting. There has been research on how methane-producing bacteria respond to biochar during composting, however, previous studies have only tested one type of biochar applied at a single application rate. To address this knowledge gap, we investigated how these microbes in compost respond when distinct types and amounts of biochar are added to compost. We analyzed compost samples from four separate time points using qPCR to measure the relative abundance of methanotrophic (pmoA) and methanogenic (mcrA) genes. We expect that the treatment with the greatest concentration of biochar (20%) will demonstrate a higher proportion of methanogens, and methane-producing microbes as preliminary results show that, interestingly, biochar increased methane emissions during composting. In addition, we also expect that the treatment with the least concentration of biochar (5%) has a higher proportion of methanotrophs, methane-consuming microbes. This research has the potential to show researchers and farmers which specific type of biochar compost produces the least amount of methane.

CAMP

The following student scholars are participants in UC Merced's CAMP program. The Louis Stokes California Alliance for Minority Participation (CAMP) in Science, Technology, Engineering and Math, is a statewide initiative funded by the National Science Foundation (NSF) to strengthen the quality and quantity of underrepresented students receiving baccalaureate degrees in science, technology, engineering and mathematics studies at the University of California (UC). CAMP offers extensive resources and unique opportunities for students to excel in their respective fields of study. The CAMP program began at UC Irvine in 1991; currently, nine UC campuses participate in the program.

For more information, please visit http://uroc.ucmerced.edu/camp

Xavier Canas
CAMP

Subjective measure of perceived effort from Social Media Scrolling Feeds using NASA-Task Load Index (NASA-TLX)

By: Xavier Canas, Spencer Castro, PhD

With social media becoming a daily staple for many, it is crucial to understand how people process this new information feed. In our study, we assess how different formats of media affect perceived effort participants use to process information. Participants read sections of a climate change report by the Intergovernmental Panel on Climate Control (IPCC) in the PDF and scrolling feed format. After reading each of the formats' sections, participants answered multiple-choice recall questions based on the report content. To examine the perceived cognitive effort of each participant we used the NASA-TLX. The NASA-TLX is a series of six component scales meant to measure different aspects of mental effort involved with the task. Based on our online version of the study we hypothesize that the PDF format will require more perceived effort. If we discover that the current PDF format requires higher levels of perceived effort while resulting in lower levels of recall accuracy compared to the scrolling feed format, we may want to reconsider our presentation of crucial information. Further understanding of how scrolling feeds affect human perceived effort may lead to changes in the communication of serious topics in the field and the world.

Cassandra Cardenas-Rocha
CAMP

Identifying Germ-line Transmission of Knock-In Lines

By: Cassandra Cardenas-Rocha, Gloria Denise Ligunas, Stefan C. Materna, PhD

Fluorescent proteins are vastly used in biological research to visualize proteins of interest in living cells. Many fluorescent proteins, including GFP, fold into a β-barrel composed of 11 β-strands, which can be split into two components. Split-fluorescent proteins consist of two self-complementing components, the β-strands 1-10 (FP1-10) and β-strand 11 (FP11), that only fluoresce when bound to each other1. We have previously demonstrated that Split-mNeonGreen is functional in zebrafish as a tissue specific way of tagging proteins. We have created multiple NG11 knock-in lines using a CRISPR-Cas9 knock-in strategy to endogenously tag proteins. Here, we aimed to identify the germline transmission of NG11 knock-in within a nuclear protein, H2az2b. Our approach to do this has been to genotype 24 and 48 hours after fertilization zebrafish using polymerase chain reaction (PCR) and gel electrophoresis. We are currently analyzing our genotyping results. Once germline transmission is identified, we will use those fish to create stable lines for NG11 knock-ins.

Antonio Ceballos
CAMP

Temperature measuring methods of solar panels using NASA-Task Load Index (NASA-TLX)

By: Antonio Ceballos, Stanley Carhee, Aaron Wheeler, Sarah Kurtz, PhD

Within the solar energy world there is a new material, perovskite, being researched that has the ability to improve solar cells. Currently studies are going into tandem solar cells which are solar cells that have a layer of perovskite material over the layer of silicon material. The tandem cell allows for more efficiency because the band gaps of the two materials better match to the photon energies of the photon spectrum. Though perovskite is very sensitive to many conditions such as moisture, oxygen, extended periods of light, or high heat, there is research focusing on how to protect the material from these conditions. Through these testings on how the perovskite solar cells are operating there needs to be methods on how to measure the solar cells. One measurement researchers are looking into is how to measure the temperature of the perovskite material inside the solar cell. It is not ideal to cut into a solar cell or manufacture one with a thermocouple inside. So my project is about how to measure the perovskite material inside the solar cell while only taking measurements from the top and bottom of the solar cell. This is possible through the understanding of the heat transfer and the thermal properties of the materials inside the solar cell.

Julianna Chavez Hidalgo
CAMP

Impact of Dissolved Organic Matter (DOM) on Mercury (II) Sorption to Activated Carbon in the presence of divalent versus monovalent cations.

By: Jullianna Chavez Hidalgo, Danielle Jones, Peggy A. O'Day

In aquatic ecosystems, mercury (Hg) can be taken up from water and converted by anaerobic bacteria into methylmercury (MeHg), increasing its toxicity and ability to bioaccumulate. Removal of Hg from solution by sorbent media is one method to help reduce Hg concentrations and make it less bioavailable for conversion to MeHg. Studies suggest that calcium, a divalent cation, complexes with DOM and Hg. We hypothesize that Hg sorption onto activated carbon (AC) will be greater in a divalent cation solution as compared to a monovalent cation solution in the presence of dissolved organic matter (DOM). Hg sorption from aqueous solutions onto AC was compared in either a 1mmolar calcium chloride (CaCl2) solution or 1 mmolar sodium chloride (NaCl) solution and DOM. The solutions were incubated for 24 hours, and an automated Hg system for total mercury detection (MERX-M) was used to measure the amount of Hg absorbed to the solid. The concentration of Hg detected illustrated higher Hg sorption to AC for CaCl2 samples compared to NaCl solution. This study suggests that CaCl2 showed more potential in preventing DOM from interfering with Hg sorption, which contributes to determining optimum methods for mercury remediation.

Litzy I. Lemus
CAMP

Nfkbid depletion in CD4 lymphocytes correlates with decreased anti-Toxoplasma gondii responses

By: Litzy I. Lemus, Kirk Jensen, Juan Sánchez-Arcila, Ph.D

Toxoplasma gondii, a protozoan parasite, has shown concern to its zoonotic potential and its ability to cause issues in pregnant women and immunocompromised individuals. T cell responses are central for effective T. gondii control and a recent study from my group describes a correlation between Nfkbid and protection against T.gondii through B cell development mechanisms. B cell activation and B-1 development is done through the Nfkbid gene. We are using mice knockout for Nfkbid in CD4 cells because we think they are involved in helping B cells produce anti-T. gondii humoral responses. We hypothesize CD4 Nfkbid KO will have decreased antibody responses compared to C57BL/6 mice. To test this, we used a low virulent strain of T. gondii to infect C56BL/6, full Nfkbid knockout, and mice with no Nfkbid in CD4 T cells (CD4 Nfkbid KO). Blood samples from day 8 and 35 after infection were taken and plasma was collected. We detected anti-T. gondii antibody responses using a flow cytometer and tested the presence of mice with no Nfkbid using a PCR. We distinguished that CD4 Nfkbid KO does have decreased antibody responses compared to C57BL/6 mice. We observed differences in IgG subclasses between CD4 Nfkbid KO and C57BL/6 mice. This indicates that CD4 cells aid the anti-T. gondii humoral response using a mechanism dependent on Nfkbid.

Kristal E. Navarro
CAMP

Characterization of Bacterial Members within the Exaiptasia Microbiome

By: Kristal E Navarro, Sophia MacVittie, E. Maggie Sogin PhD

Exaiptasia are sea anemones used to model the symbiotic relationship between corals and their endosymbiont. Though it is important to understand the symbiotic relationship occurring with the host and its inner endosymbiont, it is also important to understand the symbiotic relationship between the host and its microbiome. We know aiptasia host a complex microbiome and the microbial members play an important role, but their functions are not fully understood. Understanding the metabolism of these bacterial members can help us address this question. This study focuses on the bacteria living within the Exaiptasia microbiome, which were isolated and grown in liquid media for nucleic acid and metabolite extraction, growth rate analysis, genome sequencing, polymerase chain reaction (PCR), and co-cultivation. The bacterial co-cultivation experiments are expected to show either inhibition or enhancement of one of the two strains due to competition, as well as show growth rates of singular versus combined strains of bacteria. The growth rates will be used to further understand interactions of bacterial members in the microbiome and will later be implemented in experiments with the host. We will also be using metabolomics to create metabolite profiles and further characterize these interactions.

Victoria C. Okafor
CAMP

Imaging Analysis of Blood Vessels in the Thymus of Mice

By: Victoria C. Okafor, Ruth Verrinder, Negar Seyedhassantehrani, Christian Burns, Joel A. Spencer, PhD

The thymus is the primary site of T cell development and a key organ in our adaptive immune system. However, the thymus shrinks as we age or when exposed to preconditioning treatments including radiation or chemotherapy through medical treatments for illnesses such as cancer. This causes a decrease in the number of T cells and diminishes the adaptive immune system. In our work, we seek to understand how these preconditioning treatments impact the blood vascular network in thymus microenvironment. To do so, Wild-type C57BL/6 mice were irradiated with a sub-lethal dose (4.5 Gy) of x-ray irradiation and one day after irradiation, the dissected thymus was cleared and imaged for 24 hours using a two-photon microscope to capture the whole thymus with subcellular resolution. After imaging, we quantify blood vessel diameter and density using ImageJ. Early results indicate an increase in blood vessel diameter and density one day after irradiation. Future work will help clarify whether these changes disrupt hemodynamics within the thymus.

Karla Torres
CAMP

Synthesis of Manganese-based bidentate imidazole NHC complex

By: Karla R. Torres, Victor Duran, Rebeca Arevalo, PhD

In the pharmaceutical industry there are special metals, such as gold and platinum, being used to create medication. These special metals are difficult to find within the earth's crust, making them expensive to use and environmentally hazardous. Using more common metal, like Manganese, would be more efficient for these industries and environmentally friendlier. Manganese is the third most common metal, making this metal the cheapest to find and the by-products are nontoxic for the environment. These findings can aid the pharmaceutical industry to create better and safer medication, not just for the environment, but making medication economical as well. To begin to work with Mn in this way, it was necessary to create precursor materials for subsequent reactions utilizing techniques such as operating the Schlenk Line, cannula transferring, and decanting to synthesize ligands to Manganese to observe if any reaction that can be successfully catalyzed. By creating ligands with Manganese, which are the catalyst, there can be a potential revolutionary era for the pharmaceutical industry, the environment, and the population's health.

CCBM

The Center for Cellular and Biomolecular Machines (CCBM) is a National Science Foundation (NSF) Center of Research Excellence in Science and Technology (CREST) at the University of California, Merced. The NSF-CREST CCBM uses an interdisciplinary approach cutting across scientific and engineering methodologies to: 1) Pursue a fundamental understanding of the structure, dynamics and functioning of multi-scale biomolecular and cellular assemblies with the goal of enabling control of function in vivo; 2) Use these fundamental principles to design and develop novel bio-inspired functioning machines ranging from designer cells and tissue to diagnostic and therapeutic devices, and 3) Host an integrated, interdisciplinary training program for graduate students that uniquely emphasizes both physical and biological components and provides research and training experiences for undergraduate and high school students that will enhance the recruitment of those traditionally underrepresented in STEM research.

Jessalyn R. Arteta
CCBM

Synthesis of Manganese-based bidentate imidazole NHC complex

By: Jessalyn R. Arteta, Jose E. Zamora, Kara E. McCloskey

A goal of tissue engineers is to generate tissues and/or organs to replace diseased or damaged ones. However, this goal hinges on our understanding of the microvascular microenvironment. Specifically, what factors will lead to long-term microvascular network integrity. Recently, our lab discovered a unique combination of microvascular cells (human umbilical vein endothelial cells, human aortic smooth muscle cells, and microvascular pericytes) that would lead to long-term stability within our microfluidic devices. Additionally, we showed that these three cell types, when cultured together within a fibrin matrix, would reorganize and initiate network formation within 7 days, and could remain stable for upwards of two months. Now, we are aiming to explore the cellular communications within these the ECs of these cultures by isolating and analyzing their mRNA. Our first challenge was developing a method for network degradation. We explored the degradation potential of three common proteases (Trypsin, Accutase, and Nattokinase) and found nattokinase to be the most effective protease at detaching and compacting the networks at early (7 days) and late time-points (14 days). However, it was the introduction of mechanical stimuli that finally produced single cells. Our next step is to collect and process the mRNA. Acknowledgement: This work was funded by the NSF-CREST Center for Cellular and Biomolecular Machines #1547848.

Laura Gonzalez
CCBM

A Method for Assessing the Cell Compatibility of Protein-Based Hydrogels by Flow Cytometry

By: Laura Gonzalez, Anthony Waterston, Eduardo Gaspar-Morales, David Gravano, Eva de Alba

Protein-based hydrogels can be characterized as colloidal gels formed in oligomeric protein networks swollen with water. Biological hydrogels may be ideally suited for biomedical applications including controlled drug delivery and wound-healing due to their compatible building blocks and the potential to leverage protein or peptide function. Our lab has recently created hydrogels composed of proteins involved in the inflammatory response by capitalizing on our understandings of the self-association properties typical of these proteins. Our hydrogels are pH-responsive and concentration-dependent, thus potentially allowing to tune viscoelastic properties. Here, we aim to determine cell viability in the presence of hydrogels of various composition by methods that consider differences in hydrogel stiffness. During the Summer 2022 research period, we have made progress towards optimizing a cytotoxicity assay using flow cytometry to test 25% mixtures of hydrogels in solution with THP-1 human monocytes. The proposed method provides important information to efficiently test hydrogels in future cell experiments.

Shane E. Holmes
CCBM

Synovial fluid adsorption on functionalized collagen and fibronectin quartz crystal

By: Shane E. Holmes, Syeda Tajin Ahmed, PhD, and Roberto Andresen Eguiluz, PhD

Synovial fluid (SF), a lubricate found in articulated joints, is known to play a key role in forming lubricated surfaces to prevent wear and tear of joints. Articular cartilage (AC) is a specialized connective tissue that is comprised of collagen and elastic fibers. It assists the synovial fluid in the development of lubricate films at the interface of articulating bones. Although fibronectin is identified in the extracellular matrix of articular cartilage, its role in formation of the lubricating film is not known. Thus, in this project we focused on fibronectin adsorption on functionalized gold surface, and compared with Collagen (type 1 and 2) in retention or adsorption of synovial fluid components. The aim of this project is to elucidate the role of precursor films consisting of collagen type 2 and fibronectin in formation and retention of synovial fluid film. We hypothesize that synovial fluid will adsorb to collagen more than fibronectin. For this purpose, we used quartz crystal microbalance with dissipation (QCM-D) technology to measure hydrated mass adsorbed on functionalized gold surface. Understanding how synovial fluid collects onto functionalized gold surface with collagen and fibronectin could reveal important properties of fibronectin in comparison with collagen in the development of load-bearing films. This is important as it may advance biomedical technology and innovate on conditions like arthritis.

Artury Ramirez
CCBM

Determining if the curvature of nanocellulose paper can enhance the yield of polymersomes.

By: Artury Ramirez, Alexis Cooper, Alexander Li, Dr. Subramaniam

All cells have a membrane separating themselves from their environment. Forming a simplified model of this fundamental component is crucial in creating controlled cellular models. One method of forming these membranes is with phospholipids creating a bilayer. These enclosed bilayers are called vesicles and if these vesicles are formed synthetically with phospholipids it is known as a liposome. However, utilizing polymers with the properties of a phospholipid creates a polymersome. A polymersomes offers many advantages over liposomes, control over the packing parameter, lower membrane permeability, and membrane thickness. Their thicker membranes result in higher bending rigidity and toughness compared to liposomes. Their customizability potentially allowing the targeting of various sections of the body for release of the encapsuled material within the polymersomes. Finding an effective high yield method of formation would increase the viability of polymersomes as a solution for drug delivery and synthetic cells. The implementation of Paper -Abetted amPhiphile hYdRation in aqUeous Solutions (PAPYRUS), has resulted in liposome formation becoming significantly cheaper due to use of filter paper as a substrate rather than relying on glass or an electric field. Comparing the yields and size distribution of polymersomes to these other methods may reveal a similar effect to that observed in liposome formation. Therefore, our goal is to determine if the curvature of nanocellulose paper can enhance the yields of polymersomes.

Karen Russell
CCBM

Benzoyl Pyrazinium Compounds as functional QLEDs]
By: Karen M. Russell, Ryan D. Baxter, PhD.
Efficient photoluminescent materials, specifically quantum dot light-emitting diodes (QLEDs), are highly sought after for use as active components in displays and solar cells. This is largely due to the fact that QLEDs tend to have longer lifespans and lower production costs than other alternatives. Our goal is to develop a series of organic molecules that function as highly efficient LEDs without the need for supporting quantum dots. This has led to the design of a four-step synthesis to create benzoyl pyrazinium compounds that have shown promising applications as LEDs in solar cell material, high end display technologies, and medical imaging tools. A huge advantage of this material is that, unlike other readily available materials, our organic compounds do not contain harmful metals that impact the environment. The photoluminescent properties exhibited by these compounds are usually only seen in materials that contain a supporting metal or mixture of metals. Due to the lack of metal contaminants, our material will be less expensive and potentially much more sustainable.

Alianna S. Torres
CCBM

Real-time Tracking of Individual Endothelial Cells during VasculogenesBy: Alianna S. Torres, Jose E. Zamora, Kara E. McCloskey, PhD
Blood vessel formation, known as vasculogenesis, is a complex process by which endothelial cells (ECs) proliferate, elongate, migrate, and interact with each other leading to the emergence of structurally sound three-dimensional (3D) networks. However, the complex chemical, mechanical, and cell-to-cell signaling over time are poorly understood. Here, we explored the vasculogenic process by developing a pipeline for the collection and analysis of time-lapse videos of network formation. Using human umbilical vein endothelial cells (HUVECs) dyed with Hoechst, prior to network formation, allowed for the fluorescent identification of the cell's nucleus during migration and proliferation. Fluorescent and brightfield images of the network formation process were collected and processed using the Fiji plugin TrackMate, which facilitated the tracking of individual ECs. The results show that the individual ECs migrate into vascular structures initially (from day 0 to day 7) and can exhibit angiogenesis later (after ~21 days) under the right conditions. This research provided insight into the dynamics of ECs before and after forming blood vessel networks and aid in the development of a predictive vasculogenic computational model. Acknowledgements: NSF-CREST: Center for Cellular and Bio-molecular Machines #1547848

JOINT GENOME INSTITUTE

The following student scholars are participants in UC Merced's NSF CAMP partnership with the Joint Genome Institute, located at the Lawrence Berkeley National Lab in Berkeley, CA. The Department of Energy's Joint Genome Institute (DOE JGI) is managed by the Department of Energy's Office of Biological and Environment Research (OBER) to produce high-throughput DNA sequencing and analysis in support of its missions in alternative energy, global carbon cycling, and biogeochemistry. the NSF CAMP Program offers extensive resources and unique opportunities for students to excel in their respective fields of study. This valuable partnership provides UC Merced students with the opportunity to experience research in a national laboratory setting.

Edward Lu
JGI

Data Warehouse Pipeline Software System

By: Eric Wu, Atif Shahab, Joint Genome Institute; Lakshmi Vishwas, Joint Genome Institute

Data Warehouse Pipeline System consolidates data from multiple systems into one database. The current Software System uses a polling strategy, pulling data from various systems periodically. With this poll strategy, some time delay was introduced. The Software System captures a snapshot of the systems, prior to consolidating the data,,creating data redundancy.
The Software System will switch from the pull strategy and be modified to an event based system. The databases will be responsible for sending updates to the event bus, along with data manipulation. The data will then be retrieved by the program and uploaded to a database for our consumers. To develop this software system, the following technologies will be used: Spring Framework, JAVA 17, Kafka, Sql.

Sean Saki
JGI

A Scalable Metagenomics Library Based on Apache Spark

By: Sean Saki, Zhong Wang PhD, School of Natural Sciences; Brian Bushnell, MD,

With the development of the Next-Gen sequencing technique, genomic data size from a single project is growing to over TB level. Most existing bioinformatics toolkits were designed for a single computer/node purpose. We are developing Axolotl, a scalable library based on Apache Spark, which enables users to develop parallel algorithms with little software engineering knowledge. Core components of the Axolotl library are built with Java functions to allow Apache Spark to achieve native performance. The Java functions once loaded onto the Databricks platform can still be called using Python like code which still allows our users to have access to a programming language that they are more familiar with. When we register Java functions to Databricks and Spark the code can run up to seventeen times as quickly compared to if an equivalent function was run with python for a simple function. Furthermore this speed can be increased by increasing the number of nodes that Databricks runs the code on making this solution highly scalable.

Sivagunalan Thamilarasan
JGI

Documentation for Axolotl: A Scalable Metagenomics Library
By: Sivagunalan Thamilarasan, Sean Saki, Feng Yu, Bryce Foster, Zhong Wang, PhD

Metagenomic datasets and their intermediate results from a typical project are measured to the order of terabytes up to the petabyte scale. We deal with supercomputers like NERSC and Perlmutter, which give us the computing power that we need to do our research, but supercomputer resources cost time, money, and programming. The majority of existing bioinformatics toolkits are designed for a single computer/node. So, the goal of my team's project is to port our existing single-machine-based software algorithms onto the Spark platform and add them to a scalable metagenomics library named Axolotl. Our library provides a platform for biologists using Python to develop parallel algorithms with little prior software engineering knowledge required. For this project, I will be creating documentation for a scalable metagenomics library based on Apache Spark. It is necessary to document it to help users understand the functions as well as help them use it. I am creating a documentation website where everyone will be able to see how our metagenomic library works and will also help users understand functions when they're accessing our library. This documentation is very user-friendly as it's created using plain text and keeps it simple and concise.

Eric Wu
JGI

Data Warehouse Pipeline Software System
By: Eric Wu, Atif Shahab, Joint Genome Institute; Lakshmi Vishwas, Joint Genome Institute

Data Warehouse Pipeline System consolidates data from multiple systems into one database. The current Software System uses a polling strategy, pulling data from various systems periodically. With this poll strategy, some time delay was introduced. The Software System captures a snapshot of the systems, prior to consolidating the data, creating data redundancy. The Software System will switch from the pull strategy and be modified to an event based system. The databases will be responsible for sending updates to the event bus, along with data manipulation. The data will then be retrieved by the program and uploaded to a database for our consumers. To develop this software system, the following technologies will be used: Spring Framework, JAVA 17, Kafka, Sql.

Ruoxi Zhao
JGI

Integrating Single Cell Data with Spatial Transcriptomics of the Medicago Roots Interacting with Rhizophagus Using Tangram

By: Ruoxi Zhao, Margot Bezrutczyk, PhD, Benjamin Cole, PhD, Joint Genome Institute, Berkeley National Laboratory

The goal of this project is to integrate single-cell data with spatial transcriptomics of the Medicago roots interacting symbiotically with Rhizophagus at cellular level. This project is interesting because plant roots are not only organs to get water from the soil, they also interact with the microbes to get key nutrients such as nitrogen and phosphorus. Rhizophagus or the Arbuscular Mycorrhizal Fungi (AMF) supply the plants with phosphorus, and the genome of Rhizophagus irregularis was recently sequenced. We are trying to study and understand this plant-microbe interaction, because it can be a sustainable biological source of the nutrients, whereas phosphate rocks only come from mining and they are limited non-renewable resources. This term, I am using Tangram which is a machine-learning Python package, to help me map the single-cell gene expression data onto spatial gene expression data using cosine similarity loss function. I was able to train the model to predict the spatial location of different cell types. In the future, we wish to decompose the voxels into multiple cell types using cell segmentation.

IOT4AG

Our Mission is to create and translate to practice Internet of Thing (IoT) technologies for precision agriculture and to train and educate a diverse workforce that will address the societal grand challenge of food, energy, and water security for decades to come.

Monitoring of agricultural crops is still accomplished primarily through the expensive, labor-intensive, and time-consuming process of crop scouting, by manual sampling and documenting the state of the field. Precision agriculture involves the use of technology to acquire and analyze data from the field. While the concept of precision agriculture has existed for 30 years, the exponential growth in information technology and data science and the reduction in their cost is setting the stage for the next revolution in agricultural practices.

IoT4Ag projects in the Yeo and Keske labs examine the socio-economic impacts and opportunities of physical and cyber-physical system enabled precision agriculture. For more info visit https://iot4ag.us

Juan Hernandez
IoT4AG

Analysis of Effects of Vehicle Automation and Implementation of IoT in the Agricultural Space

By: Juan Hernandez, Lisa Yeo, PhD

With a world population projected to exceed 9 billion by 2040 and increasing pressures on food production posed by factors such as climate change and overpopulation, there is an urgent need to develop and adopt new methods of crop cultivation and food production. Farm cultivation must be at optimal levels of operation in order to meet these constantly rising exigencies. Through analysis and synthesis of current research, it's been demonstrated that a significant portion of the implemented advancements in the agriculture industry revolve around the automation of vehicles, and the data collection enabled by these connected vehicles. These tools aid in the proper management and control of all farm operations in a given space. The literature also shows that these systems and technologies pose the additional risks of potential cyber attacks, uncertainty of human employment availability in cultivation, and the need to strike balance between human and machine interaction. This scoping literature review documents and identifies these current gaps in the research field in order to propose solutions in the advancement of vehicle automation and vehicle-assisted data collection, in the agricultural space. The ultimate objective is to formulate viable methods through which considerable progress can be made in what has become a necessary adaptation in farms for sufficient global crop production.

Alisha Nesslage
IoT4AG

Ethically Assessing Development and Deployment Risk in IoT Technologies

By: Alisha Nesslage, Lisa Yeo, Ph.D.

The growing scholarship on precision agriculture suggests that cyber-agroterrorism presents a global challenge to food production, food security, and the adoption of smart farming technologies worldwide. Farmers invest in precision farming hoping to maximize profits, minimize their ecological footprint, and obtain real-time data analytics through management frameworks that amplify cyber risk. While improvements to network security and updates of deployed sensors have been proposed to minimize this problem, I contend the Botnet of Things will improve in pace with the Internet of Things, leaving opportunities for cyber exploitation open. The Belmont Report of 1979 identifies three basic ethical principles: (i) respect for persons, (ii) benevolence, and (iii) justice. While this set of ethical principles was proposed to generate a theoretical and comprehensive framework to underlie all conduct involving human subjects in biomedical and behavioral research, these principles offer new insights when applied to the development and deployment of IoT technologies. Through a critical analysis of cyber-agroterrorism, I argue the gateway between cloud services and smart devices will continue to present the risk of breaches. However, when weighed against the ethical principles identified in the Belmont Report, the social and environmental harms of such risks can be mitigated.

MACES

MACES Summer Undergraduate Research Fellowship Program: MACES (Merced Nanomaterials Center for Energy and Sensing) was established with support from NASA in the fall of 2015. Our educational mission is to establish a vertically integrated STEM program that will produce a highly skilled and diverse workforce for NASA missions and beyond. One of the key components of the program is a 9-week long summer undergraduate research program that recruits students from local community colleges and nearby CSU campuses. Students will work side by side with UC Merced graduate students and faculty. Through structured mentoring and intensive hands-on training, students in the program will gain the experimental skills that allow them to effectively and safely work in a laboratory setting. This will be complemented by a weekly seminar series that introduces students to different research topics conducted in MACES and at NASA. Upon completion, students will be able to demonstrate basic knowledge of their research area and to summarize their own research.

Joshua F. Ancheta
MACES

Comparative Nanotribological Properties of MoS2 and (HEA)S2 Thin Films

By: Joshua F. Ancheta and Gokay Adabasi

Friction is known as a force that resists lateral motion due to its surface texture. Researchers indicate that friction force is a result of interactions of Coulombic Forces, Covalent Bonding, and van der Waals forces which are observed at the atomic level. The process of studying the nanotribology of MoS2 and (HEA)S2 will consist of thin sample films of the metal alloy. Utilizing Gwyddion to examine the height and friction of the scanned image. A common finding with the (HEA)S 2 samples were that the bumpy regions showed less friction than lower regions of the scan. In future plans, we will pay attention to whether we can establish a relationship in connection with their implementation periods.

Alexis Frias
MACES

MD simulations of nanoscale models

By: Alexis Frias, Karen Mohammadtabar, Ashlie Martini, PhD

Molecular dynamic is a computer simulation method for analyzing the physical movement of atoms and molecules. As computing power increases, molecular dynamic simulations are becoming more useful as computing time decreases. The importance of MD is to see how molecules and atoms will respond to set conditions. This is especially important with drug discovery, protein folding and much more. Advancement in MD will also reduce time and cost for nano experimentation as it's more readily available virtually. An issue presented by MD is accurately making force fields that represent real life conditions. My research is to simulate different customized applications of a nanoscale model and test force fields to see if it accurately represents the behavior in a non simulated state. The steps taken during research includes creating an input script by using the nanostructures data created in nanoLabs, applying the appropriate conditions/force field and running the script on lammps. The output would give statistical information and would then use ovito to see the simulation of how the atoms behaved. If statistical data is not accurate, then there would need to be refinement on the input script. Currently dealing with the Reactive MD-force field on a 40 butyl molecule structure. Research isstill inclusive at the moment, but will contribute to the field greatly by helping with simulation accuracy. Simulation is the future as resources become scarce.

Luke T. Jackson
MACES

Utilization of a copolymer for the detection of methylmercury via chemically amplified binding between methyl mercury and thiol through acid promoted deprotect

By: Luke T. Jackson, Dr. Jennifer Q. Lu, William Spalle

Methyl Mercury pollution is a critical issue affecting both the environment and society. High concentration of methylmercury has been found in aquatic organisms, which inevitably leads to high concentrations in humans due to consumption of contaminated organisms. Current research has been focused on detecting as well as purifying methylmercury in the environment. With the former being critical, as it is challenging to develop a detection method that is both fast and sensitive in purely aqueous environments. This new research hopes to utilize a copolymer poly [(vinyl methyl thiol)-co-(4-Ethylphenol-tetrahydropyrane (THP)-ether] with a thiol group and a tetrahydropyrane group acting as a deprotection group, where the thiol group binds to methyl mercury releasing a proton. The released proton then subsequently catalyzes the deprotection of THPE, which releases an additional proton leading to a cascade of deprotonation reactions. By simply identifying the pH of the solution after addition of the copolymer, it can be identified whether methyl mercury is present, even in minimal concentrations. However, synthesis the copolymer was first done, and utilizing NMR, IR, and Mass Spectrometry, the copolymer was successfully detected. With future goals of identifying whether this new copolymer is capable of such cascading affects with the binding of methyl mercury.

Nolan A. Kelly
MACES

Geometry, electronic structure, and magneto-anisotropy energy of WS2 with a cobalt-at-sulfur-site substitutional defect

By: Nolan A. Kelly, David A. Strubbe Ph.D., Bradford A. Barker Ph.D.

We investigated the magneto-anisotropy energy (MAE) of a quasi-two-dimensional tungsten disulfide (WS2) monolayer with a cobalt atom substituted for sulfur, in order to determine the material's suitability for use in next-generation electronic devices for high-density magnetic storage. Calculations on the electronic structure of the material were performed using density functional theory ("DFT"), with and without a Hubbard U correction. The geometric coordinates of atoms in the defected WS2 system were relaxed in supercells sized from 1×1 to 5×5, each supercell containing a single cobalt atom. A possible Jahn-Teller distortion was found in the relaxed structure which is being investigating by looking at the symmetrized 5x5 PBE+U supercell. The PDOS shows a strong dependence on the use or neglect of the Hubbard U correction: With Hubbard U, defect states in the bulk bandgap are primarily from cobalt d-orbitals, while without, the states were primarily a combination of W and S orbitals. We compare to experimental measurements of the in-gap states by scanning tunneling spectroscopy, which show varying results. We investigate possible explanations based on charge transfer with the substrate or magnetic interactions between the dopant and the STM tip. The highest absolute value of MAE was shown to be roughly 3 meV for the 4×4 PBE+U supercell, insufficient for use as a magnetic storage device.

Erika Toriz Madera
MACES

Pin-on-disk Lubricant Chamber

By: Erika P. Toriz-Madera, Eddie Santiago B.S.,and Ashlie Martini Ph.D

The Falex tribometer is a device that is used to simulate friction and wear between surfaces under controlled conditions. The pin-on-disk is a method using the tribometer that contains a ball pin perpendicular to a steel disk. The pin-on-disk method can improve frictional behaviors in vehicle drivetrains, wear in rails under environmental conditions, and predict the polyethylene wear rate of prosthetic hip implants. This is done by understanding the coefficient of friction and wear scars under different lubrication and environmental conditions. Minor wear scars and coefficient of friction implies that the lubrication is effective under its tested environment. In Tribology, there are three types of lubrication that are studied: solid, semi-solid, and liquid. There are no direct standards for pin-on-disk testing, therefore it is vital for the testing apparatus that holds the sample and lubricant to be versatile in order to meet various conditions. A lubricant chamber was designed and printed to satisfy all conditions during pin-on-disk testing. To determine the accuracy of the lubricant chamber, pin-on-disk testing was run using semi-solids, PAO6 and S5T100 2, and compared results using a reliable Rtec tribometer. The success of the lubricant chamber will allow for future studies to be made.

Elsa B. Vazquez
MACES

Mapping 2D Sliding Mechanisms of Ni-doped MoS2 from First Principles

By: Elsa B. Vazquez, Enrique Guerrero MS, David A. Strubbe PhD

Molybdenum disulfide (MoS2) is a two-dimensional material with applications as a dry lubricant in the space industry. Introducing Ni to the MoS2 structure can improve the tribological qualities by reducing wear. The MoS2 layer is just three atoms thick, and its frictional effects at the interface between sliding layers can be deduced by examining potential energy surfaces. Several studies present models for the frictional mechanisms of 2D pristine materials but less do for doped materials. We use density functional theory to find the potential energy surfaces in two dimensions of four Ni-doped MoS2 structures and study the properties of these structures whilesliding. Additionally, we explore the effect of different sliding schemes. The four structures are substitutions of Mo or S and insertion of Ni between layers (intercalation). For an octahedral intercalated structure, we find points of structural transitions in the sliding landscape. A significant reduction of interlayer distance occurs for an S-substituted structure. As NASA plans more long-duration space exploration, it needs to reduce power requirements with higher mechanical efficiency. Characterizing the sliding potentials of these materials contributes to our understanding of friction in doped 2D materials. This work was supported by the Merced nAnomaterials Center for Energy and Sensing (MACES), award NNX15AQ01. Computational time comes from the Multi-Environment Computer for Exploration and Discovery (MERCED) cluster, NSF Grant no. ACI-1429783.

Riley J. Whitmer
MACES

Quantifying the Size-Dependent Standard Reduction Potential of Colloidal Gold Nanoparticles

By: Riley J. Whitmer, Randy Espinoza, (SNS); Daniel Valenzuela, (SNS)

The chemical and physical properties of metals in bulk form are well known. At nanometer sizes, many properties change as a function of size. Gold nanoparticles (AuNP) are of interest in catalysis due to their excellent stability and size-dependent electrochemical properties. Establishing an equilibrium in the reduction of iron(III)/iron(II) by colloidal AuNP allowed the calculation of standard reduction potential for particles sized 4-74 nm using the Nernst equation. The standard reduction potential of macroscopic gold is 1.83 V, but our experiments reveal an unexpectedly high drop in potential proportional to the colloidal AuNP radius greater than predicted values from equations accounting for bare nanoparticles. Our evidence indicates the need for a slight correction in the Plieth equation, and potentially the Nernst equation, to fully account for the complexity of the particle surface in colloidal conditions. We hypothesize the diffusion layers of the electrostatic environment significantly contribute to the drop in reduction potential. To determine the exact origin of the calculated standard reduction potential, we must quantify the reduction potential contribution from each component of the AuNP's diffusion layers. I contributed to this project by synthesizing 21 nm and 60 nm AuNP and performing size analysis using UV-Vis spectroscopy and TEM.

NASA KELPFIRE

Wildfire Impacts on Watershed Transport of Carbon to Coasts
This project aims to quantify how wildfires alter particulate organic carbon and sediment fluxes to the California coast, and how these fluxes impact coastal kelp forest distributions and productivity along the California Current system for the 2000-2020 study period.

NASA's Minority University Research and Education Project (MUREP) Ocean Biology and Biogeochemistry, or OCEAN, has awarded grants to 10 universities for projects that will support NASA's Science Mission Directorate in seeking a better understanding of the ocean's role in the Earth system.

Sierra J. Lema
NASA MUREP
Kelpfire

Modeling the Effects of Wildfires on California Coastal Water Quality Using SWAT

By:Sierra J. Lema, Amanda M. Lopez, PhD; NASA JPL

With the ever-increasing frequency and severity of wildfires in California, it is important now more than ever to develop a better understanding of their impacts on natural systems. Vegetation loss and reduced infiltration due to wildfires can greatly affect surface runoff from terrestrial watersheds into coastal waters. The Soil and Water Assessment Tool (SWAT) watershed model will be used to assess wildfire-induced changes in stream discharge and sediment loads from watersheds to the Pacific Coast. Coastal-draining watersheds located along the California coast that have experienced wildfire(s) between the years 2000 and 2020 will be selected as case studies for SWAT model development. It is anticipated that wildfire impacts on watershed hydrology can be simulated within SWAT by altering soil parameters in burned areas (Havel et al., 2018; Basso et al., 2019). Peer-reviewed literature, soil burn severity maps, and land cover datasets will be used to guide the modification of select SWAT model parameters to model burned area land cover changes within the watersheds. Model accuracy will be assessed using the Nash-Sutcliffe efficiency (NS), model percent bias (PBIAS), and coefficient of determination (R2) objective function statistics. Thresholds for acceptable model performance are NS values greater than 0.5, PBIAS values within ±10%, and R2 values greater than 0.5. This approach to wildfire simulation will advance SWAT model capabilities and contribute a richer understanding of hydrological responses to wildfires in coastal areas.

Louis Perez
NASA MUREP
Kelpfire

Wildfire Impacts on Sediment Plumes in Coastal Watersheds

By: Louis F. Perez, Dulcinea Avouris, PhD; Amanda Lopez, PhD

Streams and rivers in coastal watersheds connect land and the coast. Wildfires have been occurring more frequently and influence these watersheds. This project looks at the temporal relationship between coastal watershed wildfire occurrence and coastal water clarity. To find a correlation between the two, three coastal watersheds will be observed from different regions in California (north, central, south) that have a history of wildfire occurrence. Satellite-based remote sensing imagery of the watershed discharge plume acquired before and after wildfire occurrence in the chosen watersheds will be assessed for water clarity. Any change in water clarity before and after the wildfire will be analyzed using the Before-After Control-Impact (BACI) research method. We anticipate that results will show that wildfires negatively impact discharge plume water clarity. Wildfires are just one of the effects of climate change that has been a recurring problem in our environment. Although wildfires can only be started on land, this project dives deeper on the many other ways wildfires can affect environments across the land-water continuum.

NATURAL SCIENCE DASBISWAS

Hins Qiu
Natural Science
Dasbiswas

Origin of chirality in biological active chains

By: Hins Qiu, Subhaya Bose, Patrick S. Noerr, Kinjal Dasbiswas, Ph.D. School of Natural Sciences, UC Merced

Chirality, or the breaking of left-right symmetry, is ubiquitous in biology, and may arise from the rotational motion of cells. However, the exact mechanism of how such spontaneous chiral rotations arise is yet to be discovered. Here, we hypothesize that the chiral motion of chains of particles may arise if their propulsion is directed at an angle to the chain axis. While motivated by migrating biological cells, our model may be realized in more controlled settings such as molecular motor-propelled biofilaments, or synthetic, chemically active colloids with electric or magnetic dipole interactions. We examine the model cells' collective motions under different boundary conditions, cells' motility, the strength of the dipole forces, and offset angles, to observe their effects on the motion of chains. The primary method is based on Brownian dynamics simulations on Matlab to model these identical cells and quantitatively analyzing their resulting trajectories. . The current results indicate that for certain offset angles, a chain of cells will go opposite to the offset angles permanently, or temporarily and then will eventually go towards the offset angles. In future work, we analyze collections of such chains to determine if spontaneous chiral rotation requires multi chain collisions , or can arise from a single chain alone.

NIH PSYCH

Alexis M. Galaz
NIH Psych

First Generation Students' Sense of Belonging Changes Feelings of Stress and Anxiety

By: Alexis M. Galaz, Armin Hojjaty, Matthew J. Zawadzki, PhD

First generation college students face increased risk of stress and anxiety, which can lead to decreased academic success for students, increased dropout rates, and social withdrawal. We predicted that it is those first-generation students who feel like they do not belong that are most likely to have high levels of stress and anxiety. We analyzed previously collected data of 71 UC Merced Students who identified as Hispanic/Latino/a, African American, White, Native American, Asian, etc., male, female, nonbinary, and students ranging from 1st year (Freshman) to 5th year (Super Senior). We measured their first or continuing student status, sense of belonging, subjective stress, and anxiety levels. We ran a regression (i.e., Model 1 in PROCESS) using SPSS where first-generation status predicted stress and anxiety, and where sense of belonging was as a moderator.

John P. Vang
NIH Psych

The Moderating Role of Interdependency on First Generation Students and Depressive Symptoms

By: John P. Vang, Armin Hojjaty, & Matthew J Zawadzki, PhD

Although there is much research on first generation (FG) and continuing generation (CG) students' experiences with stress and depression, justifications for increased stress and depressive symptoms in first generation students are still widely debated. A key difference between first-generation and continuing generation students is their tendency to value interdependency or independence. Interdependent justifications for attendance in university, such as returning home to provide after graduation, is more common in first generation students and is shown to induce more stressful responses for these students during their academic career. This study is a contribution to understanding this phenomenon, to determine if interdependent values moderate depressive symptoms and student type (FG or CG student). Using archival data from a survey administered at the University of California, Merced we examined 72 student responses (48 FG, 24 CG) to assess their interdependent and independent values to determine its moderating potential to depressive symptoms. Contrary to expectations, neither independence nor interdependency affected depressive symptoms in both student types. Results from this study can be used to understand how different inherent values may influence behaviors that improve or prevent academic performance and satisfaction at a university for FG and CG Students.

PHYSICS REU

NSF funds a large number of research opportunities for undergraduate students through its REU Sites program. An REU Site consists of a group of ten or so undergraduates who work in the research programs of the host institution. Each student is associated with a specific research project, where he/she works closely with the faculty and other researchers.

The UC Merced Physics REU supports student in research projects at the forefront in the sub-fields of biophysics; condensed matter and solar science; atomic, molecular, and optical physics and quantum optics; nonlinear dynamics; soft condensed matter; and astrophysics.

Julian Davis
Physics REU

Modeling Global Rotations in Chiral Active Nematics

By: Julian A. Davis, Patrick Noerr, Madhuvanthi Guruprasad Athani, Niranjan Sarpangala, Kinjal Dasbiswas, Daniel Beller, Ajay Gopinathan

Inside cells biopolymers, such as microtubules, are often propelled by molecular motors including kinesin. In vitro experiments suggest that microtubules made active by kinesin motors adhered to the substrate gives rise to not only a global nematic phase, but one whose director reliably rotates counterclockwise. We seek to investigate this global dynamic with Brownian dynamics simulations of kinesin driven microtubules modeled as self-propelled bead-spring chains driven at an offset from the tangent of the filament. Varying parameters such as bending rigidity and angular offset to evaluate the system via metrics including orientation collision frequency correlations and average director orientation to characterize this active matter system. Tagging a single microtubule will allow us to capture orientation data and discover why large groups of these microtubules unexpectedly spin in specific directions during experimentation. Results: Based on previous results, a single filament should stay close to zero over the entire time in the context of the body frame being 0. We discovered fascinating results: There appears to be an uneven distribution of rotation over time, tending more toward positive rotation. The expectation was that the trend over time would be equally both positive and negative. Conclusion: This interesting experimental result requires more research. Causes for symmetry breaking could include thermal fluctuations or other sources.

Camilla Hong
Physics REU

Mechanically Driven Organization of the Cytoskeleton in non-muscle cells.

By: Camilla G. Hong, Abhinav Kumar, Kinjal Dasbiswas, Arvind Gopinath

Force generation mechanisms in the cytoskeleton of mammalian cells include actin filaments crosslinked by myosin molecular motors. These active filamentous networks generate forces within the cell that are needed for various biological functions including cellular motility, shape change and division. Non-muscle cells do not typically exhibit the organizational level of muscle cells: yet recent super-resolution microscopy studies (Bershadsky Lab) do show patterns of actomyosin formation similar to muscle cells. It has been suggested that the generation of such ordered structure may be due to long range communication of the mechanical forces created by myosin II. To further examine this, we use minimal computational models incorporating active dipoles embedded in discrete spring-like networked elements to mimic myosin interactions embedded in a network of actin filaments. We study the range of force transmission in such networks for various configurations of active dipoles and correlation to organization via stacking. These interactions provide insight to how the cell cytoskeleton can accomplish the different functions cells perform during tissue development and disease.

Christopher A. Mastandrea
Physics REU

Characterization of Athermal Jammed Granular Systems with Fixed Pinning Sites

By: Christopher A. Mastandrea, Brian C. Utter, PhD

The dynamics of a granular media made up of many individual grains is still not very well understood. This is due in part to the nonlinear interactions between each grain along with a dependence on the systems history resulting from the complex interaction of many grains. When these systems have an external shearing force applied to them, the grains can form arrangements with anisotropic stress networks and transition to a near-solid state that exhibit a large array of so-called jammed states near this transition. These states can be drastically different from each other in their response to both an external force as well as the stress networks present within the medium. Here we investigate a two-dimensional athermal, granular system with fixed pins inserted through the media arranged in various geometries and characterize particle dynamics and the stress network in the regime of sheer-jamming. We use photoelastic grains to visualize the stress networks and computer techniques to quantify these forces to measure the systems dynamics, their physical arrangement, and other parameters such as the packing fractions at jamming. This work provides greater insight into the response of a granular systems to an imposed pinning geometry, potentially opening the path for specifically engineered materials or optimizations in devices that might handle different granular media.

Onasis Mora
Physics REU

Moirè Patterns in twisted bulk 2D layered materials

By: Onasis Mora, Rijan Karkee, Rafael Del Grande, PhD, David A. Strubbe, PhD

The twisted bi-layer stacking of 2D materials can exhibit quantum phenomenon with applications such as superconductivity or tuning optical properties. Moirè patterns arise from twisting the stacks relative to one another, and different patterns exhibit themselves at different angles. If we consider this stacking with an infinite number of layers, there may be further interesting phenomena, and maybe even more applications. To motivate future experiments, we performed a computational study; this functions on Density Functional Theory using the Quantum Espresso package.

Diana Phommavanh
Physics REU

Jamming in Granular Materials Using Photoelastic Techniques

By: Diana L. Phommavanh, Brian Utter, PhD

Jamming is a transition in which a collection of particles gets stuck due to geometrical constraints. It is the phenomenon in which a soft or solid suspension of particles becomes rigid at sufficiently high densities and is important for understanding mechanical properties, such as hardness and strength. Granular materials are characterized by their unique rheology and structure, which vary with grain size, material composition, and packing density. Particles move freely and transition to an arrest/stuck where they are unable to flow due to the arrangement of their neighbors. An understanding of jamming may help design better industrial processing of powders, suspensions, and soil mechanics/geology. Photoelasticity or stress-induced birefringence is a two-laboratory technique that allows the measurement of stresses within the grains when imaged between crossed polarizers. We present a systematic study of shear jamming in two dimensions, where the anisotropic force is determined by the shearing force, and the influence of fixed pinning sites is explored. Initially, we will look at the effects of a pin, and then another pair or pins separated by a fixed distance. Then we will study the anisotropic force network and particle motion during the shear of 2D granular materials. By studying the structure of anisotropic jammed states and the particle flow, we aim to characterize the rheology of granular materials with fixed pinning sites.

Michael Marcos
Physics REU

Phonon dispersion of twisted bilayer graphen

By: Michael M. Santos, Hui Cai PhD

Twisted Bilayer graphene has been found to have emergent properties that are distinct from non-twisted multilayers such as superconductivity. The Raman spectra which is indicativeof the phonon dispersion is one way in which the properties of the material can be determined. We created twisted bilayer graphene of various angles to investigate the emergent activity of the phonon dispersions throughout the material. The heterostructures were created through the mechanical exfoliation and transfer method and the analysis of the phonon activity was measured through the spectrograph produced by a Raman spectrometer. Our results matched what was found in theory and previous experiments which further supports the certainty of these studies.

SALLY CASANOVA SCHOLARS

The California Pre-Doctoral Program is designed to increase the pool of potential California State University faculty by supporting the doctoral aspirations of CSU students who have experienced economic and educational disadvantages.

Sally Casanova Scholars have unique opportunities to explore and prepare to succeed in doctoral programs. Scholars receive one-on-one guidance provided by faculty members within the CSU and the opportunity to work with faculty from doctoral-granting institutions.

Students chosen for the Pre-Doctoral Program are designated Sally Casanova Scholars as a tribute to Dr. Sally Casanova, for whom the scholarship is named.

Alondra Espinoza
Sally Casanova
Scholar

The Role of Support Structures in Radicalization to Violent Extremism

By: Alondra Espinoza, Eliana Fonsah, Anh Tran, and Nella Van Dyke, PhD

As right-wing extremism continues to manifest among the American political arena, scholars are increasingly examining processes of radicalization to violent extremism and terrorism. Previous research on violent extremism indicates that military membership, immigration and refugee population growth, low socio-economic status and criminal history, and socio-political context such as war-making capacity positively affect violent extremism and terrorism. Despite this growing literature, research on how support structures like social media, hate groups, and anti-government groups influence the trajectory of violent right-wing extremists is lacking. This study aims to examine how social organizational context influences individuals to become violent far right extremists through a quantitative analysis using a dataset of 600 violent extremists coupled with data on their socio-economic context. We are employing the Profiles of Individual Radicalization in the United States (PIRUS) dataset from the years 2014-2019 in combination with hate and militia groups in their local area, economic, demographic, and political data. We are currently collecting data from multiple government and non-profit sources, merging datasets, data cleaning, coding and creating variables, and constructing an annotated bibliography. We expect to find potential mechanisms explaining the role of support structures in right-wing radicalization. The Department of Homeland Security describes right-wing extremists as the greatest terrorist threat to the US, and our research can provide insight towards methods of countering the phenomena of right-wing radicalization.

Amish Patel
Sally Casanova
Scholar

Discrimination and Sleep Outcomes among Racial Ethnic College Students and the moderating role of Loneliness.

By: Amish Patel, Armin Hojjaty, Matthew Zawadzki, PhD

Poor sleep quality is widespread among college students. Sleep deprivation disproportionately affects racial ethnic groups, who face increased stressors than their white counterparts. Past research elucidates how discrimination hinders sleep quality among African American, Asian American, Latinx, LGBTQ, women, and older adults. Past research has also investigated how loneliness mediates the relationship between sleep and discrimination among adolescents. This paper aims to examine whether these findings are generalizable to emerging adults by examining if loneliness moderates the relationship between sleep quality and discrimination. The present study uses longitudinal data from a Ecological Moment Assessments questionnaire. The majority of the participants came from ethnically marginalized groups (n=71). Measures included an a adapted form of the PittsBurgh Sleep Quality Index, the Everday Discrimination Scale, and an EMA Loneliness Questionaire. Statistical analysis will be done via SPSS statistical software. Results indicate that experiences of everyday discrimination is associated with poorer sleep quality, however, loneliness did not appear to moderate this relationship. Future directions of this research is seeing if these findings apply to older adults and other ethnic groups like Asian American or LGBTQ individuals. This research provides meaningful insights on how social mechanisms impact discrimination's effects on sleep outcomes.

SHARKS KIM NSF

The Earth's climate has changed through time and during the Eocene Epoch (56 to 34 million years ago) there was a transition from 'greenhouse' to 'icehouse' conditions. During the Eocene, a shift to cooler temperatures at high latitudes resulted in the inception of polar glaciation. This in turn affected the environment for living organisms.

This project looks to uncover the interaction between biological, oceanographic, and climate systems for the Eocene in Antarctica using chemical analysis of fossil shark teeth collected during past expeditions. The combination of paleontological and geochemical analyses will provide insight to the past ecology and ocean conditions; climate models will be applied to test the role of tectonics, greenhouse gas concentration and ocean circulation on environmental change during this time period. The study contributes to understanding the interaction of increased atmospheric carbon dioxide and ocean circulation. This project also seeks to improve diversity, equity, and inclusion within the geosciences workforce with efforts targeted to undergraduate, graduate, postdoctoral, and early career faculty.

Leslie Lopez Ostorga
SHARKS

Is there evidence of trophic redundancy occurring in sharks living along the West Atlantic Coast?

By: Leslie Lopez Ostorga, Mario Hernandez, PhD and Sora Kim, PhD

Sharks are some of the most essential members of marine food webs. As both apex and meso predators, understanding how their dietary niches differ at the species level can help us learn how they balance oceanic ecosystems. Stable isotopes offer the ability to estimate various metrics of a given shark's dietary niche which can then be compared across species. In this study, shark muscle was prepared via lipid extraction (Kim and Koch 2012). I used carbon and nitrogen stable isotopes to gather data that provides insights into the trophic position and dietary niches, respectively, of west Atlantic sharks. Preliminary results indicate Blacktip (Carcharhinus limbatus) and Spinner (Carcharhinus brevipinna) sharks had the most consistent values of both carbon and nitrogen among all the sharks. Silky (Carcharhinus falciformis), Mako (Isurus oxyrinchus), and Dusky (Carcharhinus obscurus) sharks had more variability in their values. A variability in values could show the limitation of prey and certain shark species changing their hunting patterns to survive. Although the values may vary in some sharks, they all fall within a range, the Basking (Cetorhinus maximus) shark being the outlier of all the sharks. Additional analyses using novel Stable Isotope Bayesian Ellipses in R (SIBER) will provide insights into how dietary niches differ between these species.

Angelique Rea
SHARKS

Leopard shark teeth with stable isotopes in the environment

By: Angelique Rea, Kim Sora, Ph.D

Leopard sharks (Triakis semifasciata) are experiencing large declines in California, highlighting the need for conservation initiatives; however, a shark's life history is hard to elucidate. Stable isotopes analysis has been used to understand shark ecology through time. Rows of shark teeth are lost every 45 days that help create a timeline of the last year of life. Enameloid within the tooth incorporates the oxygen isotope composition ($\delta 18O$) of body water, which records the temperature and salinity changes of the environment through time. In addition, dentine of the tooth incorporates the carbon and nitrogen isotopic composition ($\delta 13C$ and $\delta 15N$), which are affected by dietary sources. Isotopic differences are seen across the timeline of teeth, indicating enameloid and dentine may record seasonal life history in the leopard sharks.These discoveries will help us determine the seasonal life history of the leopard shark, aiding in future conservation and management decisions.

SOAR

The following student scholars are participants in UC Merced's SOAR program. The Summer Opportunity for Advanced Research provides funding for UC Merced Undergraduates with prior research experience to continue their projects and research development at UC Merced. Qualified students with interest in pursuing graduate school are especially encouraged to apply. This program is funded directly through the Division of Undergraduate Education.

For more information, please visit https://uroc.ucmerced.edu/soar

Ariadne Castaneda SOAR

Nitrogen dynamics following joint integration of compost and cover crops in Central Valley Almond Orchards

By: Ariadne Castaneda, Alexia Cooper, Rebecca Ryals PhD

Orchards in the California Central Valley are responsible for about 80% of the almonds produced worldwide. Constant usage of these farmlands has left the soil depleted of essential nutrients such as nitrogen. Due to this deficiency, many farmers resort to using high levels of fertilizers to keep orchards productive. Alternative management practices such as applying compost and planting cover crops have been shown to increase nitrogen in the soil without the risk of harmful runoff and exorbitant costs associated with fertilizer. However, there is little research concerning the joint treatment of compost and cover cropping. To address the knowledge gap, this study looks at the dynamics of the nitrogen compounds, nitrate ($NO3^-$) and ammonium ($NH4^+$), in five orchard sites over a five-month period that have been treated with joint incorporation of compost and cover crops. We collected soil from treated and nontreated almond sites and perform KCl inorganic nitrogen extractions to retrieve exchangeable nitrate and ammonium from within the soil. We then use a plate reader to quantify the dynamics of available nitrogen from the orchard samples and analyze the results in the R programming language. We hypothesize that the treatment group will contain more nitrogen than the control group due to the compounding effect of cover cropping and compost integration. The expected increase of these compounds would indicate a potential for the joint use of compost and cover crops as a method for increasing nitrogen availability and soil health in Central Valley almond orchards.

Nataly Contreras Quezada SOAR

LFears Beyond the Virus: How community workers address noncitizens' COVID-19 challenges in California's Central Valley

By: Nataly A. Contreras Quezada, Meredith Van Natta, PhD

Emerging research on the ongoing COVID-19 pandemic has highlighted its disproportionate epidemiological and social toll on Latinx communities. In addition to higher rates of morbidity and mortality among Latinx groups, the pandemic has exacerbated existing social inequities related to economic precarity, housing instability, and access to health and wellbeing services. While growing attention has been paid to the enhanced vulnerability of Latinx "essential workers" to pandemic disruptions, there is little data on how COVID-19 has affected the non-medical "frontline" workers who facilitate health and wellbeing services for these most impacted communities. In this paper, we address this gap by highlighting how frontline community workers in California's Central Valley have navigated the uncertainties of the pandemic alongside changing social welfare policies in recent years. Through in-depth interviews with community outreach workers in a region with a relatively large proportion of Latinx residents that has faced some of the nation's most intense COVID impacts, we argue that social benefits federalism has complicated community workers' ability to respond to the multifaceted need of Latinx communities in the Central Valley—many of whom are immigrants and/or members of mixed-status families. Participants describe adapting quickly to develop the skills and networks necessary to respond to these communities' needs while struggling to overcome numerous structural barriers to essential health and wellbeing services. Our analysis highlights a need to demystify benefits eligibility for noncitizens and mixed-status families and dismantle bureaucratic obstacles that have perpetuated legal violence against Latinx immigrant families during the pandemic.

Alejandra Cornejo
SOAR

Using Deep Learning to Classify Brain Responses to Music

By: Alfredo G. Ornelas, Heather Bortfeld, PhD

Retrieving information from neural activity using Deep Learning (DL) methods has been a growing area of research in recent years with practical importance in areas such as brain-computer interface (BCI) technology. Measuring neural activity using Electroencephalography (EEG) provides a non-invasive direct measure with high temporal resolution, which makes it ideal for recording responses to time-sensitive stimuli like music. The current ongoing study aims to provide a deep neural network (DNN) architecture that is able to classify raw EEG responses from participants listening to music via a method tested by Ramirez-Aristizabal et al. 2022 where EEG channels are treated as a dimension [Channels x Sample]. The experiment's current results recorded a 99.44% accuracy for classifying 0.495 seconds of EEG data, and a 99.47% accuracy for classifying 1 sec of EEG data. The current experiment's results also showed the same DNN classifying the subject to which the 0.495 sec EEG data belongs to with 99.7% accuracy.

Madeline Door
SOAR

The role DYRK3 in activity-induced neuronal gene transcription of the IEG Arc

By: Madeline M. Door, Ramendra N Saha, PhD

Liquid-liquid phase separation (LLPS) is the regulated and reversible formation and disassembly of membraneless organelles in cells. DYRK3 is a kinase that prevents the aberrant condensation of these organelles to ensure proper cell functioning. The role of DYRK3 has not yet been characterized in the transcriptional mechanisms of the brain, specifically its effects on immediate early genes (IEG) transcription. This could lead to a better understanding of neurodevelopmental disorders. We hypothesize that the inhibition of DYRK3 will lead to decreased dissolvase activity and therefore an increase in transcription. To test this hypothesis, primary cortical neurons are treated with an inhibitor of DYRK3 (GSK-626616), DYRK3 shRNA and Bicuculline (GABA-A). The direct transcriptional output (pre-mRNA) is extracted and used to quantify transcription of rapid and delayed IEG pre-mRNAs using real-time PCR. Upon inhibition of DYRK3, there is decrease in transcription of the IEG Arc; this finding is not congruent with the hypothesis. Inhibiting DYRK3 kinase activity caused aberrant condensates that prevented the functioning of membraneless organelles.

Vincent Hernandez
SOAR

Characterizing HIV Vpu and Human IRF-3 Interactions for Antiviral Therapies

By: Vincent Hernandez, Josh Rodriguez, Michael Thompson, PhD

There are various mechanisms that viruses can employ in an attempt to escape their host's immune systems. One of the ways that HIV does this is by utilizing Viral protein u (Vpu) to target human Interferon Regulatory Factor 3 (IRF-3) for degradation. This targeting is a characteristic component to the viral cycle of HIV as IRF-3 serves a vital role in the stimulation of innate immunity which can disturb the viral ability to infect subsequent cells. To better characterize the interactions between IRF-3 and Vpu, we will determine the crystallographic structure of the complex, measure the binding affinity by fluorescence polarization, and identify chemical fragments with the ability to potentially disrupt the interactions of IRF-3 and Vpu for future antiviral remedies. In progress towards resolving the crystallographic structure of the complex we have identified an optimized protocol for producing and purifying IRF-3, and for growing crystals of the protein. Future work will focus on developing optimized protocols for the production and purification of Vpu. The identification of these conditions facilitates the conduction of crystallographic fragment screens to identify what small molecules binding to IRF-3 interfere with the interaction between Vpu and IRF-3. The results of this work will form the foundations for which antiviral HIV drugs can be built.

Sarif Morningstar
SOAR

Vegetative Growth of Tomato Plants Cultivated With Fogponic Compared to Soil And Hydroponic

By: Sarif Morningstar, and Rebecca Ryals PhD

Food security is one of the biggest challenges facing the modern growing world population. This problem is exasperated by the worsening climate crisis. As a result, there is a need for the development of sustainable and yet, high-yielding crop production methods. One promising and novel method of cultivation is a sub-technique of the hydroponic system called Fogponics. This method of horticulture delivers nutrients to plant roots via microscopic nutrient-rich "fog" droplets generated by a piezoelectric atomizer. Aeroponics, fogponics parent cultivation technique that uses nutrient-rich mist created by high-pressure atomizing nozzles, has been well researched and documented in its effect on plant growth. The literature suggests the potential of droplets-air mediums as a viable cultivation system, being sustainable and highly productive with certain crops. Little research has directly compared crop growth between traditional soil methods and fogponics. To fill the literature gap, we cultivated tomato plants using fogponic, deep water hydroponic, and soil methods in a greenhouse experiment. We hypothesize that fogponic will outperform conventional soil treatment in relative growth due to increased aeration. Assuming a similar nutrient uptake rate, the main conjecture for this hypothesis is that the higher root-air exposure in fogponic leads to a higher rate of gas exchange and consequently, increased plant respiration and better growth.

Sorina Munteanu
SOAR

The Role Between the Reduced Induction of Delayed Immediate Early Genes and the BAF Complex

By: Sorina J. Munteanu, Andie Venegas, Ramendra N. Saha, PhD

The SWI\SNF (BAF) complex is critical in the proliferation and differentiation of various cell types. During its function, gene expression can be regulated through ATP-dependent chromatin remodeling, combinatorial assembly, and transcription factor interactions. The BAF complex is enriched with 15 subunits encoded by 29 genes implicated by neurological disorders. Dissociated rat cortical neurons were treated with bicuculline, which stimulates neurosignaling, and then treated with BRD98 (a BAF inhibitor) to observe its effects on gene expression. Studies include immediate early genes (IEGs) induced by viral integration and immediately by extracellular signals. Its subtypes are rapid IEGs, which result in products minutes after stimulation and delayed IEGs, which are detected around an hour later. Preciously, we discovered a decrease in the induction for rapid IEGs treated with 15-minute treatments of BRD98. However, it is unknown how sensitive delayed IEGs are to the BAF complex. Similarly, 60-minute BRD98 treatments indicate a reduced induction for delayed IEGs. Furthermore, there seems to be more resistance against the reduced induction of the delayed IEG known as brain-derived neurotrophic factor (iBDNF), which, at higher levels, could prevent neurodegeneration in Huntington's Disease. Thus, the interplay between the BAF complex and the induced transcriptional factor,iBDNF, elucidates the ability to mediate neurodegenerative diseases.

Alfredo Ornelas
SOAR

Using Deep Learning to Classify Brain Responses to Music

By: Alfredo G. Ornelas, Heather Bortfeld, PhD

Retrieving information from neural activity using Deep Learning (DL) methods has been a growing area of research in recent years with practical importance in areas such as brain-computer interface (BCI) technology. Measuring neural activity using Electroencephalography (EEG) provides a non-invasive direct measure with high temporal resolution, which makes it ideal for recording responses to time-sensitive stimuli like music. The current ongoing study aims to provide a deep neural network (DNN) architecture that is able to classify raw EEG responses from participants listening to music via a method tested by Ramirez-Aristizabal et al. 2022 where EEG channels are treated as a dimension [Channels x Sample]. The experiment's current results recorded a 99.44% accuracy for classifying 0.495 seconds of EEG data, and a 99.47% accuracy for classifying 1 sec of EEG data. The current experiment's results also showed the same DNN classifying the subject to which the 0.495 sec EEG data belongs to with 99.7% accuracy.

SURF SSHA

The following student fellows are part of UC Merced's Summer Undergraduate Research Fellowship (SURF) Program. SURF is a fellowship that is offered to all undergraduate students in any discipline. This 9-week summer fellowship offers our students the opportunity to work alongside faculty and graduate student mentors and provides graduate school preparation. This program is directly supported by the Division of Undergraduate Education.

For more information, please visit http://uroc.ucmerced.edu/surf

Matthew A. Alverez
SURF SSHA

The Influence of Leisure Time Guilt on Anxiety Moderated by Rumination

By: Matthew A. Alvarez, Armin Hojjaty, M.S, and Matthew Zawadzki, PhD

Managing the balance between work and leisure time is a relatable experience in everyday life with the potential for guilt to come when this balance is off. We hypothesize that those with more leisure time will experience more overall anxiety. Further, research has identified the negative effects of rumination that we predict would amplify the effects of guilt on anxiety. To test these hypotheses, we used data that was collected online across the U.S. using Amazon's mTurk platform. A total of 436 participants completed the study, who identified as (53.1% male; 81% white; 88.3% employed, full time, part time, or as a student; M±SDage = 36.5±11.1). We ran a regression (i.e., Model 1 in PROCESS) using SPSS guilt predicting anxiety and rumination as moderator. Results suggest participants who reported more leisure time guilt also reported more anxiety. Rumination did not have a moderating effect. This suggests that guilt while doing leisure is related to anxiety. Therefore, new ways of thinking that allow people to engage in leisure without feeling guilty about it may need to be further researched and developed.

Jasmin Contreras Perez
SURF SSHA

LHuman-Robot Interaction: Ethical and moral decision-making under threat using virtual reality

By: Jasmin Contreras Perez, and Colin Holbrook, Ph.D.

Although an abundance of research has examined how people interact with robots and other machine agents within contexts such as work assistance or education, relatively little attention has focused on human-machine interaction under contexts of serious threat. Physical embodiment and anthropomorphism are two of the factors most prominently associated with trust in robots in prior work, and therefore may be important determinants of trust during potentially lethal scenarios. The present study will be a between-subjects experiment comparing participant's tendencies to trust in the recommendations of either a highly anthropomorphic humanoid guide robot, or a nonanthropomorphic guide robot. The project is currently in a piloting phase, during which our team has refined the study protocol, robot behaviors, and events within the VR simulation to optimize participants' sense of immersion. Following the VR simulation, participants complete multiple surveys assessing their impressions of the robot. I will present preliminary (N = 17) correlational analyses of appraisals of the humanoid robot indicating that appraisals of the robot as intelligent and alive were positively associated with prior attitudinal expectations that automated systems are highly reliable, but were negatively associated with perceptions of the robot as disturbing or 'creepy'. Future work will incorporate the nonanthropomorphic robot condition and analyses of bodily correlates of threat responsivity, such as tendency to look around (i.e., information-foraging), grip strength, heart rate, and posture, as well as measures of self-reported emotions, in the hope of predicting tendencies to conform with sensible robot recommendations, and/or to disregard incorrect recommendations.

Kimberly M. Farias
SURF SSHA

The Effect of Exposure to Cuisine on Political Attitudes and Behaviors
By: Kimberly M. Farias, Courtenay R. Conrad, Ph.D., and Nathan W. Monroe, Ph.D.

What is the effect of exposure to cuisine on political attitudes and behavior? In this paper, we draw on contact theory (e.g., Forbes 1997) and hypothesize that exposure to cuisine is associated with an ethnic group that increases positive affect toward members of that ethnic group. To further examine this, we plan to test the implications of our theory using a laboratory experiment in which we randomize exposure to cuisine and measure consequent political attitudes using respondent surveys and responses to a Dictator game. Moreover, in this study, we will also test for heterogeneous treatment effects along political ideology, food neophobia, and prior contact with an ethnic food.

Emily G. Kendrick
SURF SSHA

Parental stress and its impacts on children's social cognition.
By: Emily G. Kendrick, Rose M. Scott, Ph.D.

Research suggests that hearing and using mental-state talk – words that refer to thoughts, wants, and feelings – is important for the development of children's understanding of others' thoughts, feelings, and relationships. Due to its high influence, it is important to understand the factors that influence this talk. Prior research studies have shown that parental stress and socioeconomic status (SES) is related to parents' mental state talk, but there is a lack of research regarding how these factors influence children's mental-state talk. This study examines the question, do parental stress and SES impact children's mental-state talk and understanding? This study used pre-existing videos of parent-child interactions as well as data regarding parental stress and SES. In these videos, the parent and the child (3.5- to 5.5-year-olds) look at a wordless picture book designed to elicit talk about mental states. We coded how frequently children used mental-state terms, what type of mental-state term they used (cognition, desire, emotion), whose mental state they referenced, as well as whether it was a statement or a question. It is hypothesized that more parental stress will predict less mental-state talk from the child and that higher SES parents will have children who produce more mental-state talk. These findings are significant in the further understanding of children's social-cognitive development and their reliance on a beneficial parental input.

Miriam S. Martinez
SURF SSHA

College Students appraisal of Emotion Dimension

By: Miriam S. Martinez, Eric A. Walle, Ph.D. and Zeynep B. Özden, PhD

Originally proposed in 1991, emotion appraisal has become the fundamental component of emotion processing in modern theories. Understanding the discrete appraisal dimensions that activate certain emotional responses has been a body of research in psychology for many years. Previous studies have students presented with written stories and then asked them to appraise the situations. This study will examine how university students appraise illustrated stories of emotion-eliciting events and their reasoning behind their appraisal. University students will be presented a series of illustrated stories featuring characters attempting to accomplish a goal. After each story will answer questions relating to the protagonist and how the character should react in the next frame. We expect students to apply the correct labels for each situation and their justification to be in relation to attributing factors to the situation not just the result of accomplishing or failing their goal. Validation of these illustrated stories is important in order to use similar methodology with younger age groups, particularly those who are not yet literate.

Alondra Mercado
SURF SSHA

Examining Intentions to Quit E-Cigarette Use Among Black, Latino, and White Young Adults

By: Alondra Mercado, Mariaelena Gonzalez, PhD, Anna V. Song, PhD, & Anna E. Epperson, PhD

Electronic cigarette, e-cigarette, or vape use is on the rise among youth and young adults. The harms of e-cigarettes include both health harms (e.g., lung disease, high blood pressure, etc.) and harms to the environment (e.g., nonbiodegradable cartridges, toxic chemicals, etc.). The majority of regular users report wanting to quit tobacco use more generally, but less clear is knowledge about cessation-related behaviors for this newer tobacco product (e-cigarettes). Previous research has indicated that both general tobacco use and quitting behaviors (i.e., tobacco cessation) vary by race and ethnicity, but fewer studies have focused on whether differences exist for e-cigarettes. The aim of the current study is to examine whether differences exist in e-cigarette cessation-related behaviors among young adults identifying their race or ethnicity as non-Latinx Black, Latinx, or non-Latinx White. Young adult participants living in Central California were recruited online via social media ads. Inclusion criteria included identifying as Black, Latinx, or White, being 18-35 years old, and being a current e-cigarette user (past month use). Participants (n = 1,160) were asked questions about demographics (e.g., age, gender, socioeconomic status), e-cigarette use, and cessation-related behaviors (e.g., lifetime quit attempts, intentions to quit in next month and year). The goal of the present study is to examine whether differences exist for e-cigarette cessation-related behaviors among Black, Latinx, and White young adults.

Janet Norio SURF SSHA

The role of the English agricultural revolution in the decline of monarchy

By: Janet S. Norio, Aditya Dasgupta, PhD

During the seventeenth century, the English parliament grew in political power, eventually defeating the monarchy in the English Civil War and resulting in the Glorious Revolution – representing one of the earliest cases of democratization in modern history. There are many factors that have been considered in existing explanations for the emergence of democracy in 17th-century England. However, few consider the importance of the English agricultural revolution. We hypothesize that the English agricultural revolution, which contributed to the emergence of a rural middle class of commercialized farmers and businessmen, led to or at least played a major role in the defeat of the monarchy by parliament. Using data on historical wills, we measure the social composition of local wealth holders over time at the county level. Additionally, the biographies of the members of parliament (MPs) of the long parliament era will be coded according to their alliance with the crown or parliament using specific indicators. We predict that the results from this study will showcase a connection between the changing economic and social structure, and the alliance of the MPs. Overall, the study highlights the role of agriculture in changing the course of government in England.

Joshua Rotondo SURF SSHA

Examining The Role Social Support Plays in Moderating the Relationship Between Employment Status and Experiences of Rumination

Examining the Moderating Role of Social Support on Employment Status and Rumination

By: Joshua W. Rotondo-Valentine, Armin Hojjaty, & Dr. Matthew J. Zawadzki, PhD

Rumination, which is the experience of habitually focusing on negative thoughts and experiences, is an experience common to people of all employment statuses. The content of ruminative thoughts varies depending on the employment status of the individual. The present study examines the moderating role of social support on employment status and rumination. We analyzed previously collected survey data measuring participants' employment status, levels of rumination, and social support, collected through the Amazon Mechanical Turk platform. We found that unemployed individuals experienced the highest level of rumination, while employed individuals experienced the second highest and retired the lowest. Social support was shown to have no moderating effect on this relationship.

Luis Solorio
SURF SSHA

The Impact of Cannabis Advertising on Related Behaviors among California Latinx Young Adults

By: Luis Solorio, Anna Epperson Ph.D, Nicotine and Cannabis Policy Center

Over the last few decades, there has been an increase in the number of U.S. states that have legalized cannabis (i.e., marijuana) which has led to a rapid rise in use. While the impacts are unclear, there is potential for health harm particularly for communities most at-risk for substance use. This may be influenced by targeted marketing of cannabis to communities (e.g., Latinx, youth and young adults) however, fewer studies have in general focused on cannabis marketing. Less research has examined whether marketing influences cannabis-related behaviors among Latinx young adults, a priority population that is the fastest growing racial/ethnic minority group in the U.S. This research study will focus on how marketing of cannabis influences cannabis- related behaviors among young Latinx adults. Participants were recruited for an online survey through targeted social media ads as part of a larger study examining cannabis and tobacco knowledge, attitudes, and behavior among residents in Central California. Inclusion criteria included identifying as Latinx and being 18-35 years old. Participants were asked questions about demographics (e.g., age, gender, socioeconomic status), cannabis use (ever and past month), and about exposure to cannabis advertising (ads against and promoting cannabis, ads providing information about harms and benefits). With this study, we hope to better understand how cannabis marketing impacts cannabis behavior, with an emphasis in the Latinx community.

Devin Verma
SURF SSHA

The Effects of Scenes, Faces, and Postures on Emotional Categorization and Perception in Children

By: Devin Verma, Zeynep Ozden, Eric Walle, Ph.D

Prior research has found varying responses to the presentation of an emotional image with incongruent emotional scenes, faces, and/or postures (Hassin et al., 2013; Reschke et al., 2018). Postural, facial, and scene emotional expressions influence the perceived emotion depending upon the emotion in question. Facial expressions have been found to be the main consideration of adults for the perception of various discrete emotions with incongruent scenes and postures (Reschke & Walle, 2021). The present investigation will examine the interactive effects of context and expression (facial, postural, and scene) of six emotions (anger, sadness, fear, disgust, joy, and neutral) viewed by 5- to 7-year-old children. Assessing responses to emotional images varying in the congruency of distinct elements will provide insight into how children utilize various emotion cues to perceive discrete emotions, as well as how such abilities may be similar or distinct to those found with adults

Sophia Wallace-Boyd
SURF SSHA

The Gender Differences in How Relationship Status Relates to Anxiety Levels.

By: Sophia R. Wallace-Boyd, Armin Hojjaty, Matthew J. Zawadzki, PhD

A partnership can influence an individual's anxiety level. However, current research largely examines marital status, rather than relationship status broadly, which has the potential to miss data from individuals in domestic partnerships. When examining relationships, it is also important to consider a person's gender as a way one is socialized to cope with emotions and how that can affect how a relationship is perceived. We hypothesized men will have higher anxiety levels when in a relationship and women will have higher levels of anxiety when single. To test this hypothesis, we used data collected online using Amazon's mTurk platform. A total of 437 participants completed the study: 202 women, 232 men; 169 in a relationship, 266 single; with an average age of 36.5 years. We tested gender as a moderator of relationship status and anxiety using regression models (i.e. Model 1 in PROCESS). We found a significant interaction effect such that men in relationships have the highest average anxiety level, and women in relationships had the lowest average anxiety level. This indicates that a relationship may not always act as a strong source of social support depending on the individual's gender.

SURF STEM

The following student fellows are part of UC Merced's Summer Undergraduate Research Fellowship (SURF) Program. SURF is a fellowship that is offered to all undergraduate students in any discipline. This 9-week summer fellowship offers our students the opportunity to work alongside faculty and graduate student mentors and provides graduate school preparation. This program is directly supported by the Division of Undergraduate Education.

For more information, please visit http://uroc.ucmerced.edu/surf

Emma Brass
SURF STEM

A model for following electron transfer along reaction pathways

By: Emma Brass, Hrant P. Hratchian, PhD, Cristian Sarabia

Most successful models of chemical reactions include an element of electron transfer. Such a framework based on electron density along the intrinsic reaction coordinate in quantum chemistry has not been developed or widely used. Building on our group's difference density natural orbitals and natural ionization orbitals models, we have developed such an approach for following electron transfer along a reaction pathway. This model offers both visual and quantitative measures of electron transfer during a chemical reaction. In this presentation, we will describe the model and show initial applications to a variety of chemical reactions.

Nora Chen
SURF STEM

Age Differences in Semantic Norms

By: Nora Chen, Ellis Cain, Rachel Ryskin, PhD

The N400 is a negative deflection in the event-related potential that is elicited by words that are semantically incongruous with the context in which they appear. A growing body of evidence suggests that these effects are influenced by a number of factors, including the thematic relatedness of the words being repeated or primed. In addition, it has been suggested that diachronic aspects may also play a role in determining the semantic associations of words. In this research, we aim to investigate potential differences in semantic associations between different groups and the possible factors that may be driving these differences. To determine which word in a given list is the most semantically associated with a set of categories, given age-related differences, we run an online behavioral study and present an Odd-One-Out task to determine whether a word is an associated concept. An EEG study is also conducted to provide a multidimensional representation of the semantic organization, while Representational Similarity Analysis is used to create a simplified version of the data that can be compared across different datasets without having to worry about the source data format. Our results suggest that there are age-related differences in the semantic associations of words and that these differences may be driven by a combination of diachronic and thematic factors.

Kaylee Davis
SURF STEM

Information Recall Accuracy from Social Media Scrolling Feeds Compared to Traditional Forms of Information

Kaylee R. Davis Spencer Castro, PhD

People often utilize social media scrolling feeds as a means of information dissemination. Previous research demonstrates that traditional information formats, such as PDFs, have poor usability and are difficult to navigate. Human memory is limited in capacity–however, the use of memory encoding techniques, such as chunking, can help expand the total amount of information stored in memory capacity. Due to the nature of social media, information tends to be chunked together in posts. This study assesses how different forms of information, specifically PDF versus scrolling feeds, impact how people can remember information. In this study, participants read excerpts from the Intergovernmental Panel on Climate Change's (IPCC) 6th report in both PDF and scrolling feed formats. They then completed a multiple-choice test on the content of the report as a measure of recall. We expect our findings to expand prior work by demonstrating higher recall accuracy for the scrolling feed format compared to the PDF format due to the advantage scrolling feeds provide through chunking. Based on our results, we can better understand how to effectively disseminate information to maximize recall potential.

Jacqueline Garcia
SURF STEM

Surveying Almond Orchards to Identify Leptoglossus Zonatus' Nutritional Symbiont

By: Jacqueline Garcia, Ryan Torres, MSPH, Gordon Bennett, PhD, and E. Maggie Sogin, PhD

An economically important agricultural pest is found within and damages almond orchards in the Central Valley of California. This heteropteran, plant sap-feeding insect forms symbiotic relationships with bacteria to receive the necessary nutrients lacking from their diets. The main purpose of this research is to determine the symbiotic associates present within almond orchards, and to prepare for differential gene expression experiments. A paired sampling device will be utilized to compare host symbiont to environmental microbial communities. Leptoglossus zonatus, will be collected from almond orchards in Madera, Waterford, and Patterson, CA and preserved in 95% EtOH. Adjacent topsoil (3cm depth) and five individual leaf swabs will be collected. All samples were stored on dry ice until final storage at -80 °C in the lab.

Wendy Haw
SURF STEM

Investigating the Effects of Scent on Text Transcription and Composition

By: Wendy Haw, Ahmed Sabbir Arif, PhD, Inclusive Interaction Lab

While scent has been widely studied in psychology, sociology, neuroscience, and chemistry, experiences and interactions with olfactory systems and the effects of scent on performance with computers have not been well-studied or understood. In this project, we investigate the effects of scent on text transcription and composition performance on a computer in a controlled study. In the study, participants transcribe short phrases from a set and compose an essay both with and without the presence of a user-selected pleasant ambient scent. Since transcription tasks do not require much planning, retrieving information from long-term memory, or revisions, we assume that the investigation will fail to reject H0 (there is no significant effect of user selected scent on text transcription speed and accuracy). Since composition is fundamentally different than transcription, which is a goal-directed process composed of a set of distinctive thinking processesthat which are hierarchically organized and embedded in other processes, we speculate H1 (there are significant effects of user selected scent on text composition length, speed, accuracy, and quality) will be accepted.

Gurleen Kaur
SURF STEM

Evaluating Smo-interacting proteins in Hedgehog signaling

By: Gurleen Kaur, Jingyi Zhang, Xuecai Ge, PhD

The primary cilium is a signaling hub for the cell. An essential signaling pathway that relies on the primary cilia is Hedgehog (Hh) signaling. This crucial pathway plays a critical role during embryogenesis and maintenance in adults. Overactive Hh signaling can lead to over proliferation of cells, resulting in cancers such as medulloblastoma. One protein, Smoothened (Smo), is a key positive regulator of Hh signaling. When the pathway is ON, Smo moves into the primary cilium, overcoming the effects of pathway suppressors, such as SuFu and PKA. The detailed mechanisms remain to be resolved. Here, we focus on Smo and its interacting proteins. We have used TurboID, a biotin ligase, to label Smo proximal proteins. We will use shRNA and CRISPR/Cas9 to silence target gene expression to study its role in Hh signaling. Our study will reveal essential roles of Smo-interacting proteins in Hh signaling and provide clues for the treatment of Hh-related cancers and disease.

Joanne Luu
SURF STEM

IElectrochemical behavior of ArBIAN-FeII Complexes

By: Joanne Luu, Miguel Angel Chacon Teran, PhD, Michael Findlater, PhD

Since the field of catalysis has become increasingly focused with earth-abundant metals as replacements for the expensive, scarce, and toxic precious metal elements, it is no surprise to see attention has become focused on iron. However, iron has demonstrated its preference to undergo single-electron transformations rather than two-electron processes such as oxidative addition and reductive elimination. To overcome this drawback, non-innocent ligands like bis(arylimino))acenaphthene (BIAN) have been employed. Thus, studies reporting the preparation and application of BIAN-Fen complexes have merged from our group and others. These complexes are particularly attractive has they display electronic flexibility and possess formal oxidation states of the iron center ranging from +1 to +3 supported by formally neutral, monoanionic, or dianionic BIAN ligands. However, the exploration of their redox behavior through electrochemical techniques is scarce in the literature. Consequently, this work is going to be focused on understanding the behavior of those complexes under controlled electrochemical conditions.

Ma Angela Edith Montiel
SURF STEM

Verb Bias Learning using Computer Webcam Eye Tracking

By: Ma Angela Edith Montiel, Rachel Ryskin PhD

Eye tracking equipment is often used in research lab settings to study cognitive processing by monitoring fast shifts in eye fixations. These eye-trackers have high spatial and temporal resolution but require recruiting participants to the laboratory which can take a long time and limits the potential size and diversity of the sample. However, recent advances in webcam technology show the possibility for eye tracking studies to be conducted in modern laptop devices equipped with webcam devices. The goal of the present study is to compare the quality of in-lab and webcam-based eye-tracking data. We replicated a study by Ryskin et al. (2017) in which pictures of objects were displayed on a computer screen and eye and mouse movements were tracked while participants reacted to pre-recorded audio instructions (e.g., "Pet the frog with the flower"). When the sentence was ambiguous, some verbs led to increased fixations on the target animal (e.g., frog) and while others led to increased fixations on the target instrument (e.g., flower). These differences reflect the common usage patterns of those verbs: some verbs are often used to describe an action that requires an instrument and others are not. Preliminary results are inconclusive; however, there may be potential for accuracy close to the level of eye tracking lab equipment. As further research develops, understanding of the capabilities of computer webcam devices as a viable eye tracker device may expand future research eye tracking studies outreach and accessibility.

Shalyn Ngyen
SURF STEM

XAI Empowered Physiological Signal Understanding: Drone Pilot Stress Detection

By: Shalyn Nguyen Rafal Kryzysiak, MD

With the recent advancement in sensor technology within smart watches, we are able to measure physiological components of stress within humans with minimal evasiveness. In this work, we study the effects of flying drones within a simulator and a controlled open environment. To help understand the effect of drone piloting on stress levels, we conducted a pre-pilot in lab human subject study where a participant operates a drone prior to and after using drone simulation software with known and unknown drone piloting commands. Our preliminary results show that not only flying drones in the simulator improves stress levels when flying real drones, but unknown flight commands produce higher stress levels when compared to known flight commands. Post-trial surveys were conducted after each test was completed in the experiment and revealed an increase in frustration in the simulation during the experiment with known pilot commands, while real drone flights revealed higher levels of frustration when given quick commands. Results show that the participant experienced a lot more stress and frustration during the first real drone flight and an increase in confidence and cognitive levels during the second real drone piloting phase after using a drone simulation software. This study lays a foundation for additional experiments in stress detection using the Empatica E4 wristband and developing XAI model for real-time explainable stress detection.

Isaac Ortiz-Madrigal
SURF STEM

Harvest Equipment Innovation for Olive Augmentation

By: Isacc L. Ortiz-Madrigal, Reza Ehsani, PhD

In the field of agriculture, harvest equipment along with the precision of harvesting continues to be innovated. Currently, olive harvesters have a high productivity in harvesting but are still far from perfect. When olive harvesting, equipment tends to either bruise olives or damage the limbs of the olive tree branches. The development and focus of a new design for an ideal olive harvester is to ensure there is progression in the health of fruit at harvest. Through the development of a new design, it can be evaluated if a new design becomes more efficient. Utilizing the body of an Oxbo blueberry harvester and the use of the 3D program SOLIDWORKS, the design of the Oxbo may be modeled and fabricated to become an olive harvester. Through this program (SOLIDWORKS), the design can be modeled in a 3D simulation and tested for design components stress analysis. The design created utilized a hydraulic system which allow the harvest and it catch frame to move for harvest. The use of a foam material was inserted on the harvester bars to almost completely reduce bruising of the olives. The new design looks favorable and is set to be complete the end of august which is right before olive harvest season.

Michelle Padilla
SURF STEM

Evaluating Grease Behavior Under a Simulated Space Environment

By: Michelle Padilla, Jose Morales, BS, Ashlie Martini, PhD

Utilizing the proper lubrication within space applications is essential to creating long-lasting mechanical systems. Mechanical components that operate in space need high-performance greases to decrease wear and increase operating duration. To evaluate the performance of these greases, it is necessary to test and analyze the behavior under space conditions. Nitrogen can reliably simulate space conditions as it is unreactive and creates a low oxygen environment. To determine the greases' behavior, a series of tests were conducted under typical air conditions and nitrogen. By using a Falex tribometer, four 440C steel balls, different grease samples, and a custom bellow to create a nitrogen enclosure, greases can be tested and analyzed. After completing the appropriate testing and comparing the results, it was observed that the presence of oxygen plays a significant role in the greases' performance. The samples exposed to nitrogen showed higher wear and lower final temperature than those exposed to air. The greases evaluated operated more efficiently under oxygen conditions, which does not bode well for their use in mechanical systems for space applications.

Citlaly Ponce Torres
SURF STEM

Does Deletion of Vhl in Bone Activate SEPs in the Spleen?

By: Citlaly Ponce Torres, Janna M. Emery, Jennifer O. Manilay, PhD

The spleen is a secondary lymphoid organ that recycles iron and blood particles, filters atypical blood cells, sustains the immune system when fighting infections, and produces antibodies. Blood cells normally develop within the bone marrow (BM). Previous research indicates that changes in the BM may alter the function and architecture of the spleen. To investigate the relationship between BM and spleen, we used a Dmp1-Cre; Vhl conditional knockout (KO) mouse model in which the von Hippel Lindau (Vhl) gene is deleted in specific bone cell types, resulting in bone overgrowth and reduction of the BM cavity. Vhl is a gene that targets hypoxia-inducible factor, which plays a role in the body's response to low oxygen concentrations, or hypoxia. In recent studies, we observed enlarged spleens (splenomegaly) and evidence of dysregulated production of red blood cells in KO mice. We hypothesize that the occluded BM in the KO mice is triggering extramedullary hematopoiesis in the spleen by the activation of stress erythroid progenitor cells (SEPs). Currently, there have been few detailed studies on SEPs. To test our hypothesis, we will utilize several complementary methods to identify and isolate SEPs: flow cytometry of BM and spleen and histology to assess the splenic architecture. We expect to observe higher numbers of SEPs in the KO spleens. Altogether, these studies will yield new information on SEPs and the role of Vhl in the bones in regulating erythropoiesis and will advance knowledge in the fields of osteoimmunology and hematology.

Catherine Randolph
SURF STEM

Measuring the Dissociation of Lanthanides from Crown Ethers using UV-Vis Spectroscopy with Murexide Indicator

By: Catherine A. Randolph, Michael Findlater PhD, Kotono Babaguchi

It has been difficult in the past to measure dissociation of metal ions from crown ethers because certain factors interfere with the Ultraviolet-Visible (UV-Vis) Spectra, but by adding Murexide to the metal and crown ether solution it becomes possible to obtain accurate UV-Vis Spectra. Using UV-Vis to measure absorbance a calibration curve was developed with metal ions and Murexide solutions with concentrations of 0.10mM, 0.12mM, 0.14mM, 0.16mM, 0.18mM, 0.20mM. After calibration curves are created, we plan to obtain UV-Vis spectra of the metal and crown ether solutions were obtained at constant time intervals with the addition of murexide directly before taking each spectrum.

U-RISE

The goal of the Undergraduate Research Training Initiative for Student Enhancement (U-RISE) program is to develop a diverse pool of undergraduates who complete their baccalaureate degree, and transition into and complete biomedical, research-focused higher degree programs (e.g., Ph.D. or M.D./Ph.D.).

Charles Hu
U-RISE

Developing path-optimization approaches for GPS-assisted swath surveys in the intertidal zone

By: Charles Hu, Lauren M. Schiebelhut, PhD, Michael N. Dawson, PhD

Transect and swath-based surveys are important methods for sampling biodiversity within the intertidal zone. Transects are increasingly done using GPS instead of physical tools. GPS transecting in intertidal zones, where stops are often made to inspect organisms, may produce inaccuracies within the recorded path in the form of knots. To increase the effectiveness of intertidal GPS transects, it is thus important to develop smoothing algorithms to minimize recording errors. Here we report that several algorithm-based smoothing approaches, which involved exclusion of noise by data density, slope, and by skipping fixed numbers of values, were varyingly effective at producing smoothed length measurements from raw transect data. The examined paths were composed of coordinate data collected across various sites on the California coastline. Results from each of these approaches were compared to previously user-verified lengths by a paired T-test. Approaches based on data density and skipping values were ineffective at accurately predicting transect lengths, while a combined approach based on data density and slope proved somewhat effective. Use of smoothing algorithms could assist in conducting GPS-based transects and swaths in the intertidal region, and in other areas where use of physical transect lines would be impractical.

Dominique Gabriele Inocencio
U-RISE

Estimating Poisson's Ration Values of Elastic Substrat

By: Dominique Gabriele Inocencio, Ariel Smith, Roberto C. Anderson Eguiluz PhD

Polyacrylamide hydrogels are soft biomaterials often used to study cell-extra cellular matrix (ECM) mechanical interactions. Due to their ability to mimic the in vitro environment by tuning their mechanical properties that is relevant to the elasticity of soft tissues (1- 40 kPa). This can be achieved by altering the chemical composition of acrylamide and bis-acrylamide when fabricating the gels. The basic polyacrylamide hydrogel material properties include the Young's Moduli and Poisson's Ratio, the Young's Moduli is calculated by indentation test and Poisson Ratio is often overlooked and estimated to be = 0.5 (incompressible material). In this study the Young's Moduli of gels with varied stiffness (8.8 kPa and 40 kPa) is obtained via microindentation test. The Poisson's Ratio is estimated by the change in axial and lateral strains calculated by: εa = (L2 - L1)/L1 and εl = (D2 - D1)/D1, as a result of stretching a polyacrylamide strip. We experimentally highlight Poisson Ratio changes as we alter the chemical composition of acrylamide. We expect to see a higher Poisson's Ratio for a stiffer hydrogel (40 kPa). Characterizing the Young's Moduli and Poisson Ration can be used for mechanobiology studies.

Nayeli Perez
U-RISE

Implementation of Coiled-Coiled Interactions Yield Hybrid Functional Biomateri
By: Nayeli Perez, Emil Samson, Andrea D. Merg, PhD

Gold nanoparticles and their assembly into hierarchical structures are an emerging hallmark in the fields of biomedicine and nanotechnology. When gold nanoparticles are assembled into hierarchical structures they are utilized in sensory probes, drug delivery methods in medical and biological applications, and cellular imaging. This is due to their new and collective properties when they are assembled in addition to their optoelectronic properties based on (size, shape, and surface chemistry). Recent work about the arrangement of gold nanoparticles has focused on the usage of two strategies, the forms of DNA used for the assembly of nanoparticles. The implementations of those strategies are materials composed of DNA (DNA origami) and materials composed with DNA (DNA-GNPs) to assemble 2D and 3D crystalline structures. A rising method for functionalizing gold nanoparticles is with biomolecules such as peptides and proteins. In comparison to DNA, proteins can carry a richer chemical diversity as opposed to DNA code which has Watson-Crick base-pairing interactions of just four base pairs. Protein design offers possibilities for exploring protein sequence, structures, and functions presenting exploitable applications. In this project, implementation of protein design methods, like coiled coil interactions, are used to assemble gold nanoparticles into hierarchical structures that rival current GNP self-assembly methods. Successful implementation of this fabrication strategy will yield hybrid functional biomaterials with emergent collective properties for drug delivery, biosensors, and cellular imaging.

Brent Zeyus Valdez
U-RISE

Biofilm Evolution and Marine Symbiosis of Hawaiian Bobtail Squid
By:Brent Zeyus Valdez, Daravuth Cheam, Michelle K. Nishiguchi Ph.D

Marine bacteria in the family Vibrionaceae have a specific beneficial symbiotic relationship with bobtail squids (Cephalopoda: Sepiolidae). Sepiolids use their Vibrio fischeri symbionts, creating bioluminescence as a defense against predators and prey through counterillumination. Although little is known about protozoan grazers influencing V. fischeri outside the squid light organ, we can examine how V. fischeri responds to such selection by adapting Vibrios in vitro conditions. Therefore, we have experimentally evolved biofilms treated with protozoan predators including Acanthamoeba castellanii and Tetrahymena pyriformis under non-grazed and grazed conditions to examine the effects of grazing on symbiosis of V. fischeri. The Hawaiin V. fischeri strain ES114 and Australian strain ETBB1-C increased biofilm concentrations over a number of generations of treatment by A. castellanii. ES114 generally had a decrease in biofilm concentration when treated with T. pyriformis, whereas ETBB1-C had a general increase in concentration. Comparative analysis of non-grazed and grazed biofilms along with predator concentrations demonstrate how the bacteria adapt to predation pressure. Treating biofilms with biotic factors such as protozoan grazers, we can determine whether V. fischeri evolves to counteract such pressures. This may have downstream effects on the squid-Vibrio symbiosis such as evolved strains being more competitive than their ancestral clones and shaping the evolution of symbiotic relationships.

UC LEADS

The following student scholars are part of the University of California Leadership Excellence through Advanced Degrees (UC LEADS) Program. The goal of the UC LEADS research and graduate preparation program is to educate California's future leaders by preparing promising students for advanced education in science, technology, engineering and math (STEM) fields. The program is designed to identify upper-division undergraduate students with the potential to succeed in these disciplines, but who have experienced situations or conditions that have adversely affected advancement in their fields of study. This program is funded by the University of California Office of the President.

For more information, please visit http://uroc.merced.edu/uc-leads

Gabriela Ceron
UC LEADS

IAntibody Recognition of Toxoplasma gondii GPI Sidechain Knockout Strain
By: Gabriela Ceron, Julia Alvarez, Kirk Jensen

Toxoplasma gondii is an intracellular parasite that is known to infect one in three people worldwide. Infection in immunocompromised people leads to the disease Toxoplasmosis, symptoms of this disease include muscle pains, fevers, and headaches. There is no effective vaccine for any human parasitic disease, T. gondii included, partly due to the gap in knowledge about pathogen and host interaction. T. gondii like all other pathogens, have a GPI anchor, this anchor servers to mediate the attachment of proteins to the membrane of the pathogen. T. gondii is known to have sugar side chain on its GPI anchor, we know that when the side chain is knocked out it increases the virulence of the parasite, the question is why? We hypothesize that the host antibodies are not able to recognize and defend against the GPI side chain knockout strain of T. gondii. To address this, I will be using Western Blotting to both identify the proteins that are being expressed as well as to measure the host antibody recognition of T. Gondii proteins. Western blotting is a technique that allows us to detect whether certain proteins are being recognized. In addition to western blots, I will be utilizing flow cytometry to analyze host antibody ability to neutralize the parasite to prevent invasion into host cells. Upon completion of this research, it will take us one step further to understanding interactions between T. gondii and its host and also one step closer to being able to create a functional vaccine for T. gondii and many other parasites.

Yumie Lee
UC LEADS

Towards Building 2D and 3D Porous Biomaterials: Design, Synthesis, and Assembly of Multivalent Peptide-Organic Hybrid Building Blocks
By: Yumie Lee, Anthony Perez, Andrea D. Merg Ph.D

Reengineering biomolecules as synthetic building blocks for creating artificial, programmable nanostructures represents a promising approach for developing the next generation of materials within the field of bionanotechnology. However, methods for producing these biomaterials, notably with 2D and 3D structural features that can be physically and chemically tailored, remains a significant challenge. As a step in this direction, this project aims to develop materials that are constructed from novel biomolecular, multivalent building blocks that self-assemble using peptide-based interactions. Peptides are ideal building blocks because they are easily synthesized via solid-phase synthesis and offer a wide side-chain diversity, which allows them to adopt a variety of secondary and tertiary structures, such as coiled coils (CCs). CCs are α-helical peptides that form a superhelical bundle with a partnering α-helix through the burying of periodically repeated hydrophobic residues. These CC peptides are attached onto multivalent organic scaffolds to create hybrid peptide-organic building blocks that can assemble together via designed coiled coil interactions into porous 2D and 3D assemblies, which can serve as biocatalytic/biomineralization scaffolds, selective membranes, and drug delivery capsules.

Maria Pimentel
UC LEADS

Can the microbiota inhibit Coccidioides growth?

By: Maria Pimentel, Susana Tejeda-Garibay, Katrina K. Hoyer

Coccidioidomycosis, also known as Valley fever, is a respiratory fungal infection caused by Coccidioides immitis and Coccidioides posadasii. It is endemic to soil in aeras like the San Joaquin Valley. Upon soil disturbance it is aerosolized and infects the lungs. Valley fever is often misdiagnosed as bacterial pneumonia, leading to antibiotic treatment that is ineffective against this fungal pathogen, and alters the host microbiota. My project seeks to determine how depleting the natural microbiota with antibiotic treatment influences/alters Coccidioides growth. The lung is not a sterile environment and I hypothesize that treating patients with antibiotics kills lung microbiota that inhibit Coccidioides. To assess the inhibitory capabilities of the mouse microbiota, I will plate microbiota by spreading the organ on several agar plates with different growth properties. I will use antibiotic discs with PBS (phosphate buffered saline; control) or antibiotics to partially clear the plate of microbiota. After 48 hours, I will remove the disc, spike in arthroconidia, and measure Coccidioides growth at day 4, 7, and 11. If the Coccidioides growth area is greater on the antibiotic disc plates compared to PBS plates, then the antibiotic cocktail depleted microbiota creating a niche for Coccidioides growth. The project goal is to identify bacteria that inhibit the growth of Coccidioides to serve as a potential therapeutic treatment.

Adelynne E. Wagner
UC LEADS

Electrochemical Hydrosilylation Promoted by a Manganese Complex

By: Adelynne E. Wagner, Miguel Angel Chacon Teran, Ph.D., Michael Findlater, Ph.D.

The development of highly efficient and selective catalysts is one of the major goals of research in sustainable chemistry. The preparation of novel catalysts in conjunction with practical techniques or setups will allow the development of new routes to the synthesis of value-added materials and unlock new transformations of chemicals. In this regards, synthetic electrochemistry offers an appealing alternative to traditional redox transformations. Thus, with a precise manipulation of redox potential, organic molecules may selectively loss or gain electrons over the surface of electrodes and ready to interact with a catalytic specie responsible to yield the desirable product. In this sense, this work will center focus on the evaluation of the electrocatalytic activity of an earth abundant catalyst based on manganese under controlled electrochemical conditions.

URAP INTERNSHIP

Undergraduate Research Apprentice Program (DoD URAP)
The Army Educational Outreach Program's (AEOP) Undergraduate Research Apprentice Program (URAP) provides undergraduate students with an authentic science and engineering research experience alongside university researchers. Students will develop skills in Army-critical science and engineering research areas in a university lab setting to prepare them for the next steps of their educational and professional career.

At UC Merced the URAP students carry out biochemical experiments to study protein-protein interactions that are important in anti-inflammatory strategies. This work has the overall goal of studying and ameliorating harmful inflammation such as occurs in traumatic brain injury.

Rafael Guerrero
URAP Internship

Viral Macrophage Inflammatory Protein-II (vMIP-II) Binding Properties with Viral CC Chemokine Inhibitor (vCCI)

By: Rafael Guerrero, Wenyan Guan, MS, Schools of Engineering; Patricia J. LiWang, PhD

Chemokines are important proteins in the immune system that act by causing activation and chemotaxis of innate immune cells in response to infection or injury. Viruses produce chemokine homologs that can bind to chemokine receptors to interfere with the chemokine system. For example, herpesvirus HHV-8 produces viral Macrophage Inflammatory Protein-II (vMIP-II) that has 40% amino acid identity with human chemokine MIP-1b and acts as an antagonist against several chemokine receptors to prevent inflammatory responses. The unique properties of a virus also allow for the ability to interfere with the chemokine system by making proteins that bind chemokines themselves, inhibiting/blocking native chemokine binding. For example, poxviruses make vCCI, a viral CC chemokine inhibitor that binds and inhibits more than 80 CC chemokines, potentially a potential therapeutic candidate for inflammation. Because vMIP-II and vCCI are complementary proteins, each having evolved as either a prototypical chemokine ligand (vMIP-II) or to bind chemokines (vCCI), they can be investigated together as a near-ideal protein-protein binding pair. My project mainly investigates the key residues involved in the interaction between vMIP-II and vCCI using BLI (biolayer Interferometry) and fluorescence anisotropy assay.

Airam J. Martinez
URAP Internship

Designing Chemokine TARC/CCL17 Mutants for Improved Viral CC Chemokine Inhibitor (vCCI) Binding

By: Airam J. Martinez, Wenyan Guan, MS; Patricia J. LiWang, PhD

Inhibiting chemokines is an appealing option to control inflammation, as these proteins activate and cause chemotaxis of immune cells during the inflammatory state. TARC/CCL17 (thymus- and activation-regulated chemokine) is a chemokine that focuses on the induction and development of immune responses, playing an important role as an inducer of inflammatory diseases. The protein vCCI (viral CC chemokine inhibitor) tightly binds dozens of chemokines in the CC subfamily, becoming a potent inhibitor of these and their inflammatory function. However, preliminary results suggest the interaction between TARC and vCCI is very weak, unlike other chemokines in its subfamily. Our group studies the key residues involved in their interaction, and how to improve their binding affinity. In current time, our work involves the design and production of TARC mutants which we hypothesize will bind more tightly to vCCI. TARC G17R, V44K, and Q45R variants are being produced, each with a fusion tag (LPMTG-CHis), to allow binding experiments by BLI (Bio-Layer Interferometry Analysis) and fluorescence assays. If successful, this work will lead to a greater understanding of vCCI as a possible therapeutic candidate to develop treatment for TARC-related inflammatory diseases, such as allergic asthma and atopic dermatitis.

UROC-H

The following students scholars are part of UC Merced's Undergraduate Research in the Humanities (UROC-H) Program. The goal of the UROC-H program is to engage promising UC Merced undergraduate students each year in faculty-mentored research during the summer and prepare them for advanced education in the humanities and humanistic social sciences. This collaborative program led by UROC, the Graduate Division, and the School of Social Sciences, Humanities, and Arts is made possible through a grant from the Mellon Foundation. Learn more at mellon.org

For more information, please visit http://uroc.ucmerced.edu/uroc-h

Shelly Anne Abu
UROC-H

Looking into the Online Representation of Carceral Spaces via 'PrisonTok'
By: Shelly Anne Abu, Yehuda Sharim, PhD;
For many decades, the portrayal of prison in entertainment media has been the center of many TV shows, films, and literature. Often these narratives are dramatized, inaccurate, or highly censored. These media forms affect perceptions of formerly or currently incarcerated individuals into being reduced as violent, untrustworthy, and undeserving of a second chance. When the mainstream media is not heavily censored or edited, viewers are able to see the reality of inhumane conditions that take place within the prison industrial complex. When incarcerated communities began to control and contribute to their own representation, former and currently incarcerated individuals showed their lives through their own perspective. The popular social media app 'TikTok' allows these individuals to control their narratives. The app has a growing community of incarcerated creators, which is mainly known as "#PrisonTok". To gain a better understanding of PrisonTok's influence on how formerly or current incarcerated individuals areperceived and affected, an analysis of five users and around fifty videos all together is done. The analysis will be about the aesthetics of a video, engagement of online user interactions, and what the individuals affected by the justice system are trying to communicate. This research demonstrates a reflection of determination, hope, and the need for connection with the aim ofopening and facilitating a dialogue about abolition.

Ruby C. Arceo
UROC-H

AUtilizing Home Sales to Determine Blockbusting Within Neighborhoods in Washington, D.C.
By: Ruby C. Arceo Tanya Golash-Boza, PhD
IBlockbusting is the pushing out of homeowners by real estate agents to increase their profits, causing racial transitions within neighborhoods. Throughout history in Washington D.C., real estate agents have taken advantage of fear tactics such as white flight to gain high profits at a low cost. Pressuring homeowners to move out upheld segregation through the norm of living among the same race, impacting the perceived worth of the area after racial transitions from White to Black. Community organizations and local, state, and federal legislation had been placed to prevent further occurrence of such tactics. How can we use home sales profits and losses to determine if blockbusting occurred in Washington, D.C.? The Washington D.C. Recorder of Deeds was used to determine home sale profits and pinpoint middle people. Data from 1948 to 1970 for three square blocks was analyzed to compare factors of blockbusting, such as differing home sale prices and periods of rapid sales. Preliminary analyses show that there were a handful of real estate agents that overtook the neighborhood and home sales patterns have shown signs that blockbusting occurred. The historic impact blockbusting has had on neighborhoods can be utilized to address related issues that continue to impact communities in the present day.

Tiffany Arnold
UROC-H

Communications Technology in City Diplomacy: The Relationships Built Between Cities in California and Japan Following World War II

By: Tiffany A. Arnold, Muey C. Saeteurn, PhD; Tommy Tran, PhD

In 1956, Dwight. D. Eisenhower established the "People to People Program," inaugurating sister city relationships, or formalized international partnerships between cities, with the intention of displaying the strength of local governments and to promote world peace. City diplomacy programs have been important tools used by the United States and Japan to strengthen their relationship in the aftermath of WWII, yet these often grassroots and volunteer-run programs have historically lacked formal analysis of their evolving changes. In the present day, the U.S. and Japan now share more sister city relationships with one another than with any other country. Globalization and widespread Internet use have additionally opened channels of communication between these countries and allowed individuals to participate in international relations efforts through smaller organizations, such as their city or subnational endeavors. Using case-studies of several California-Japan sister city relationships, and reviews of archival documents from sister city efforts from before the advent of the Internet, this paper focuses on how modern communications technologies have thoroughly changed the landscape of city diplomacy. This research also attempts to uncover the new communications challenges faced by these city diplomacy efforts since the introduction of the Internet, and the implications they may have on the national diplomacy goals of the United States and Japan.

Estrella Bonilla
UROC-H

Examining the anxiety derived from statistics: An analysis on blended learning as an effective statistic teaching methodology

By: Estrella G. Bonilla, Amanda Mireles, PhD

For decades sociologists have long been intrigued as to why undergraduate students hold negative perceptions and anxiety towards courses requiring a heavy quantitative curriculum. Prior research suggests blended learning may ease anxiety, promote motivation, and empower students. Existing research in this area has been limited, as it has focused primarily on predominantly white institutions (PWI). To date, we have limited understanding of whether and how blended learning can improve student confidence and ease statistical anxiety among low-income and first-generation undergraduate communities. In this project, I focus on conducting an extensive review of new literature to identify the effectiveness of blended learning in statistical courses and the current quantitative literacy gap among first-generation and sociology undergraduate students. The review reveals students who were assigned blended learning experienced significant increases in confidence, decreased anxiety, and improved overall quantitative comprehension. These preliminary findings from the literature suggest that blended learning is not only an asset to statistics teaching but additionally a useful method for increasing students' quantitative confidence, potentially empowering students to pursue careers requiring heavier quantitative skill sets. Overall, this preliminary analysis demonstrates a vital need for further research on the potential benefits of embedding blended learning methodologies in courses designed to be taught at institutions with a growing number of first-generation college students.

Gisell Cuevas
UROC-H

Are Schools Preparing Us for Prison?
By: Gisell Cuevas, Yehuda Sharim, PhD
Schools and prisons are the two primary institutions that connect with the lives of individuals'. School is the place where one receives an education not only in academia but also about the norms of society, such as following authority. Prison is the institution where one goes to be "punished" for disobeying authority and society's laws. In the state of California, there are thirty-three prisons compared to nine University of California campuses. Students of color coming from low-income communities can see the division between them and their peers. Some students are guided into the college route, while others are pushed into the incarceration system. This stems from a child's experience in primary school dealing with "good" and "bad" behavior. We believe that the school-to-prison pipeline starts with having students excessively disciplined in ways like mandatory detention or expulsion from school. Then it develops into having correctional officers on school campuses which can lead students into juvenile detention facilities. The purpose of this research is to answer "How do our schools unconsciously guide our students into prisons and not into college?". We examined who the majority of students fall victim to the school-to-prison pipeline with twelve Ted Talk videos. This method was chosen in order to understand the reasons why and how students and their communities are affected by incarceration.

Lane Johnson
UROC-H

A Comparative Analysis on Activism Participation Between the 2nd and 3rd Generation of Japanese Americans
By: Lane Johnson, Tommy Tran, PhD, and Muey Saeteurn PhD
This presentation is an analysis of the perspective the 2nd generation of Japanese Americans had on their incarceration and how this affected the 3rd generation. Attitudes towards the incarceration are comparatively different, specifically between the 2nd (Nisei) and 3rd (Sansei) generations. The Nisei were physically held captive in these camps, while the Sansei experienced an identity crisis due to generational trauma. This project seeks to review information from the 1940's-1980's and analyze Japanese American community politics to explain the difference in activism between the generations. This information originated from secondary and primary sources in digital archives, interviews, and transcripts. An analysis of the literature suggests that the Sansei were severely affected by the lack of communication from their Nisei parents about their incarceration. Additionally, Nisei elitists and Japanese American Citizens League carried a strong patriotic mindset, viewing the social structure of the camps as law. Racism and a lack of empathy the Sansei faced caused them to question whether they are Japanese or American, largely due to their own country abandoning them. The most notable difference between generations is the lack of participation from the Nisei in activist movements before WW2 and in the 1970's Asian American movement.

Robert Leachman
UROC-H

SIA (δ13C/δ15N) Reconstruction of Imperial-era Feather Exchange in the Central Andes (ca. 600 –1000 CE) (SIELO)

By: Robert Leachman and Beth Scaffidi

The Middle Horizon (600-1000 C.E) is thought of as a period of heighted mobility, inter-regional exchange, and the emergence of the first states and empires in the ancient Americas. During the Middle Horizon two cultures became the predominant players in the Andes, Wari and Tiwanaku. Both cultures spread throughout the Andes and long-distance trade became increasingly important. Feather crafts were vital for elites within the prestige economies of the ancient Americas and were traded extensively throughout the Andes. These feathers were used to make textiles and other prominent artifacts. In the 1940's, approximately 86-97 textile feathered textile panels were found at Corral Redondo, Peru. By using paleodietary analysis (δ13C/δ15N) on 76 blue and yellow macaw feathers, we hope to understand the diets of the birds and their origins. This can give us an insight as to how the feathers were assembled and whether the birds were domesticated or captive reared. Similar studies have indicated that domestication seems to be the primary method in Mesoamerica. We believe that the feather samples collected from the textiles will indicate a broad geographic distribution in the trade of these feathers. By observing the origins of the feathers, we can ascertain just how extensive the trade networks were.

Lily Lindros
UROC-H

Analysis of Blockbusting and Real Estate Profiteering in Washington, D.C.

By: Lily Lindros, Tanya Golash-Boza, PhD

IBlockbusting is the intentional action of one or more real estate agents to provoke white flight in a previously racially homogeneous area in order to sell at a profit to a racialized group. Blockbusting is known to play a significant role in the racial turnover of certain neighborhoods in Washington, D.C. between 1950 and 1970, with demographics transitioning from almost completely white to almost completely black within twenty years. Previous research on blockbusting has identified a pattern of "speculators" initiating the process of white flight, potentially in order to receive profit on home sales that are quickly sold then resold. This study investigates the role of profit in blockbusting and to what extent potential profits may have incentivized speculators to conduct blockbusting in the area of Brightwood Park, D.C. Individual lot sales from three blocks collected from the Washington D.C. Recorder of Deeds are analyzed in terms of profit. In addition, historical data is gathered to understand the roles of real estate agents and speculators in each home sale. Preliminary analyses suggest that home sales conducted in the context of blockbusting a neighborhood may have provided significant profit to speculators but may have come at significant risk of loss as well.

Lisette I. Muniz
UROC-H

Farmworker Health Study (FWHS): Language Barriers in Utilizing Health Care Among Farmworkers in California

By: Lisette I. Muñiz, Nimrat Sandhu, Paul Brown, PhD.

For farmworkers to access healthcare, it must be affordable, readily available, and delivered in a manner that is appropriate to their needs and culture. This project examines the extent to which farmworkers report facing language barriers when accessing healthcare, and the issues that healthcare providers face when providing translation services to farmworkers and their families. This mixed method study combined information from the recently completed Farmworker Health Study (n=1199), the largest study regarding farm workers in California, with qualitative data from interviews with healthcare providers. Results from the quantitative analysis were examined based on the various California regions from the FWHS. The results from a search of the literature and the interviews with healthcare providers identified a number of barriers and facilitators that farmworkers face, including language proficiency and the need for appropriate translations. Taken together, these results put forward an introduction to current language barriers among farmworkers and the healthcare providers who assist these individuals.

Kye Ponce
UROC-H

How Slavery and Racism are embedded in the Carceral System

By: Kye T. Ponce, Yehuda Sharim

This comparative analysis is a comprehensive and analytical research project reflecting on facets of everyday life in the Justice System and the inmates of the United States. This project will go in-depth as to how there is a great disparity in how the mediatization of imprisonment in documentaries shows one story and the reality of what the former inmates experienced in their written autobiographies and bibliographies. This shows us how racism affects the systemic treatment and resources that the inmates and former occupants receive and how that also profoundly affects the community around them for the lack of them. It is a deeply investigative outlook on the experience within structures of incarceration, including placement, treatment, and structural inequality, and questioning the development of the prison system across the UnitedStates. Given the insufficient local and national documentation of the justice system in the U.S., this project aims to bring together approaches from critical media studies to an analytical review that portrays the history embedded across America. This will promote the vital need for equity and justice among confined communities. This work charts a community often ignored with neglect in the carceral system.

Angela Roberts
UROC-H

Understanding Vaccine Decision Making Among California American Indian Parents

By: Angela L. Roberts, AA, and Anna E. Epperson, PhD

Covid-19 has impacted and highlighted disparities among racial/ethnic minorities, but especially has impacted American Indian (AI) communities (also referred to as Native American communities). Covid-19 infection, hospitalization, and death rates for the AI community are higher than rates reported for non-Hispanic Whites. The widespread use of covid-19 vaccines currently allows for the greatest potential of protection among communities most at risk, including the AI community. Previous research has indicated that AI youth, especially adolescents (aged 13-18 years old) are less likely to receive vaccines compared to youth from other racial/ethnic groups. To date, very few studies have focused on understanding how AI youth and their parents make decisions about whether or not to receive vaccines; none have done so in the context of the Covid-19 vaccine. This research study will tell a story about how AI parents make decisions about whether or not to vaccinate their adolescent children. This study will collect data from AI parents and focus on characterizations of AI vaccine acceptance and hesitancy. Themes will be developed based on the analysis of focus group data through transcripts. In conducting this study, the hope is to develop interventions to increase vaccine confidence in order to combat disparities in AI communities.

Nyjah Robertson
UROC-H

Amending Organization

By: Nyjah N. Robertson, Nigel Hatton PhD

Mass incarceration of the Black community is the institutionalized reincarnation of Jim Crow- removing a large amount of Black people from society into a system intended to dehumanize the race. From state policies to institutional rules and regulations regarding these individuals' actions and interactions with the law and those who work under it, humane superiority is enforced through grouping people based on prototypicality stemming from racial, sexist, and capitalist intentions. I utilized the coding software ATLAS.ti to collect specific aspects of data from the literature to contain and review those segments in order to form an analysis. This material provided unguarded perspectives that aided my ideal world without prisons but instead an Amending Organization which will be an establishment of reformative practices for Law offenders that consists of preferred career camps, drug, and intrapersonal rehabilitation centers, and restorative justice laws and not criminal justice laws. Preferred career camps will provide offenders with a range of career exploration resources to reform their mindset and ability in work ethics, drug, and intrapersonal rehabilitation centers will serve as examined and sustained holistic reformative actions aside from substance abuses while restorative justice laws and not criminal justice laws will dissect the background of crime and disregard its proclaimed sentence because the time intended to be spent for these crimes in a cell is being carried out in the camps and centers to aid the rehabilitation of the offender intentionally. Further groundwork regarding this abstract will be investigated to execute this conception.

Gabriela Rodriguez
UROC-H

The Diverse Experiences of First-Generation College Students
By: Gabriella L. Rodriguez, Yang V. Lor PhD,

A sense of belonging is very important to the success of college students, especially those from under-represented or socially disadvantaged backgrounds. In this research, we examine the factors that shape a sense of belonging for college students and the consequences a sense of belonging has on student outcomes. With the usage of digital archives, a sense of belonging can be referred as the individual feeling a relation to others and their surroundings. Some of the factors that influence a student's sense of belonging are interactions they may encounter, and stereotypes. It is important to note that both negative interactions & stereotypes could affect a student by not being motivated toward their academic achievement. A student's sense of belonging can impact their interest, aspirations, and accomplishments. Where this influence will bring their belonging to a state of comfort towards their institution and success after postgraduate life.

Isac Soriano
UROC-H

Blockbusting vs the people of Washington D.C.
By: Isac Soriano and Tanya Golash-Boza, PhD

Blockbusting is a real estate practice based on racial prejudice where "middle people" flooded white neighborhoods with propaganda to instill fear so that the homeowners would panic sell after a black family purchased a property in the area. From the 40's to the 70's, residents of Washington D.C. fell victim to the practices of blockbusting creating a barrier for integration. Blockbusting techniques were used by realtors to attain property at a discount price to sell, on contract, to black families at a premium rate. At the time, black individuals were restricted from approval for government funded loans, "middle people" purchased the property on a government back loans then sold properties with high restrictions. This study aims to view if blockbusting techniques took place in the neighborhood of Brightwood Park, Washington D.C. from 1948 to 1971, if realtors or "middle people" purchased properties to sell on contract to individuals for profit. The methods for this study included accessing Washington D.C. recorder of deeds to analyze patterns of blockbusting and qualitatively code the findings, and a literature review of historical documents. The data is based on analyses of three square blocks in the Brightwood Park area. Preliminary analyses show irregular property sales and ownership patterns inferring unequal and unethical practices did take place in Washington D.C.

Jocabed Soto
UROC-H

After Incarceration: Navigating Release During the COVID-19 Pandemic
By: Jocabed E. Soto, Yehuda Sharim, PhD

Each year, the United States releases more than 600,000 individuals from prisons across the nation, yet 2 out of 3 ex-convicts are rearrested within three years. During the early stages of the Covid-19 pandemic, thousands of prisoners were released early to control outbreaks due to prison overcrowding. Release during the pandemic brought unprecedented challenges for these individuals in reintegrating into society. Considering the recent and ongoing impact of the Covid-19 pandemic, I examined news articles to better understand how the media explains these reentry experiences for discharged prisoners amidst this worldwide health crisis. A content analysis of U.S. newspaper articles reporting on societal reentry of the formerly incarcerated during the pandemic was conducted. Preliminary findings reveal that the mass media shows former prisoners are not equipped with the appropriate resources to enable a successful reintegration into their communities. These essential services and resources are even more scarce during the pandemic. I argue that considering this especially difficult time of returning to society, the absence of transition resources may have long-term implications for increased recidivism rates in the U.S.

Bhullar S.
Sukhpal
UROC-H

Gateway to Merced: Livingston Centennial - Sikh Diaspora
By:

The Gateway to Merced Project aims to redefine perceptions of Merced County wherein its directionality transcends the category of transitory into the categories of intentional, cultural, diverse, and essential as the space relates to the history and present of California's Central Valley. Through the collection and analysis of the oral histories of the Punjabi-Sikh residents of Livingston, C.A. - by way of guided interviews, video and audio recordings – this research project inquires into the gap between historical records of the Punjabi-Sikh diaspora in California and their lived experiences, ultimately considering the diasporic movements, identity and future of the diaspora. Interviews were conducted on Punjabi-Sikh youth (aged 18-25) in Livingston, California. The approach of the project extends beyond a historical paradigm into one of phenomenological inquiry and analysis; an essential and under-looked aspect in the understanding of history as constituted by historical agents. Preliminarily, findings indicate a shift from the communal to the individual, and from primary and tertiary sectors to quaternary and quinary sectors. That is, a westernization of mindsets and presence of upwards socioeconomic movement. Ultimately, the Punjabi-Sikh diaspora in California constitutes an essential building block of the Central Valley, with future movements indicating an upwards shift in cultural milieu, and a reconstitution of cultural or personal values.

Maylyn Torres
UROC-H

Gateway to Merced

By: Maylyn A. Torres, Jayson Beaster-Jones, PhD

Merced has been commonly known as the “Gateway to Yosemite” for decades. A small town that is just a stop on the way to other areas. As a result, there is a collaborative effort to gather information from underrepresented groups in Merced County to showcase the value of Merced. This effort also aims to produce open-ended discussions and embrace all aspects of the community. The purpose of my project is to gather the history and experiences of the LGBTQIA+ community in Merced County since there is near to none recorded. We have interviewed individuals who have experienced or viewed the changes in how the LGBTQIA+ community is treated and included in the community. These interviews are conducted and recorded through video and audio. They are then transcribed and preserved as oral histories. The results will likely exhibit discrimination and negative actions against the community prior to the 2000s. The results will also examine how the existence of the University of California, Merced has had an impact in pushing the Merced community to be more forthcoming with its support of the LGBTQIA+ community. The Merced area has multiple communities that have been overlooked due to the lack of sharing experiences with the mass public. There are many unique and interesting narratives that deserve to be preserved and publicized to frame the true value of the area.

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