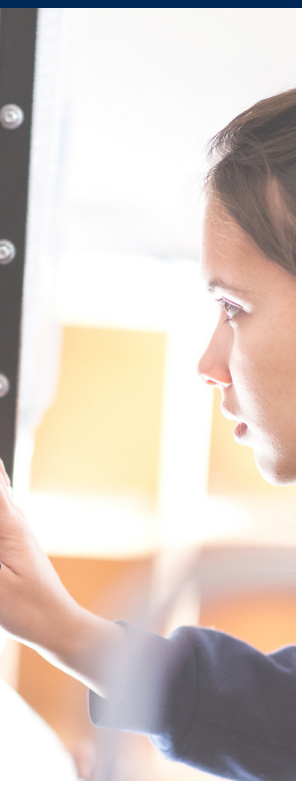


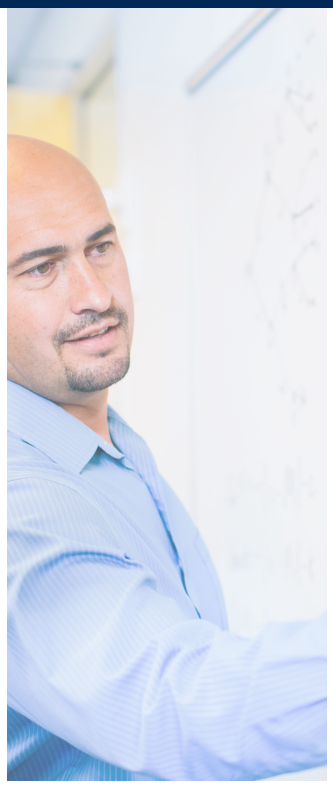


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Summer Undergraduate Research Symposium

July 30, 2021

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California Alliance for Minority Participation

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

Building Classification Models using Machine Learning

Alfredo Ornelas, Adolfo Ramirez, Christopher Kello Ph.D., Kristina Backer Ph.D.
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Extracting various information through Electroencephalography (EEG) using Machine Learning (ML) has been a growing area of research in recent years. EEG uses an electrode grid cap placed on a patient's head with conducting gel to measure the summed activity of postsynaptic potentials (PSPs) from thousands of pyramidal neurons. EEG provides a non-invasive direct measure of brain activity with high temporal resolution. However, there has been little evidence to show that sound can be extracted from EEG. The first step of this study was to test the Model's ability to learn and classify data. The data had 10 different genres, each having 20 second clips of 10 songs. The genres included: blues, classical, country, disco, hiphop, jazz, metal, pop, reggae, rock. The model was able to successfully classify the audio into their respective genres with 63.20% accuracy from one second of each song. Now that it has been confirmed that the model can successfully classify data using feature formats similar to EEG, the model can now be trained to classify EEG data to their respective acoustic stimuli.

Adaptive Immune response to Coccicioides infection

Andres J.Roman, Nadia Delgadillo Miranda, and Katrina Hoyer, PhD
School of Natural Sciences, University of California, Merced

Coccidioidomycosis, known as Valley fever, is a fungal infection, lacks a cure and is in need of better standard of treatment. Infection is on the rise in California, particularly in the San Joaquin Valley. The host immune response forms granulomas within the lung to contain the fungal infection. The immune cells involved in the lung granulomas and the host response within the respiratory tract are largely undefined. I will investigate the cell types that mobilize within the lungs of Coccidioides infection using murine infection models. Paraffin embedded lung tissue will be evaluated by hematoxylin and eosin to assess architecture plus by immunofluorescence to evaluate the immune populations participating in the granuloma. My work will contribute improved understanding of the immune, fungal interactions occurring within the infected lung.

Earth-Abundant Transition-Metal Catalyzed C(sp2)–H Functionalization

Anthony Alfaro, Rebeca Arévalo, PhD
School of Natural Sciences, University of California, Merced

Earth-abundant transition-metal complexes are emerging as a greener and more sustainable alternative than precious metals for achieving catalytic functionalization of inert C(sp2)-H bonds of arenes and heteroarenes. These functionalization processes allow for the construction of versatile carbon-heteroatom bonds which are key synthons for pharmaceutical and agrochemical compounds. In this work, we synthesized the methylene-linked bis-N-heterocyclic carbene (bis-NHC) ligands (bis (3-methylimidazol-2-ylidene) methane (MeCC) and bis (3-tert-butylimidazole-2-ylidene) methane) (tBuCC) by deprotonation of their bis-imidazolium salts. The cobalt(II), [CoCl2(RCC)](R = Me, tBu), and manganese(II), [MnCl2(RCC)](R = Me, tBu), complexes were also synthesized by reaction of the appropriate NHC ligand with the metal halide MCl2(M = Co, Mn). The bis-imidazolium salts were characterized by 1H NMR spectroscopy, whereas the metal complexes were characterized by elemental analysis. The efficiency of theCo(II) and Mn(II) complexes as precatalysts for the C(sp2)-H borylation and C(sp2)-H silylation of fluorinated arenes and heteroarenes upon in-situ activation with hydride or alkyl sources was assessed. Preliminary results were promising and suggested the potential of these complexes as catalysts for the C-H borylation and silylation of 2-methylfuran with B2Pin2 and HSi(OEt)3 respectively. The products of the catalytic reactions were characterized by 1H NMR spectroscopy. Rational catalyst design by tunning of the electronic and steric properties of the bis-NHC ligands and reaction optimization are currently undergoing.

5 Weeks of Oral Cannabidiol Improved Blood Glucose Tolerance in Otsuka Long-Evans Tokushima Fatty (OLETF) Rats

Erick Macario, Jessica N. Wilson M.S., Rudy M. Ortiz Ph.D.
School of Natural Sciences, University of California, Merced

Over 34 millionAmericans suffer from diabetes with more than 90% of those Americans diagnosed with type II diabetes (T2D). T2D is a fatal condition and one of the leading outcomes of metabolic syndrome (MetS). Cannabidiol (CBD) has been shown to reduce body mass increase, a MetS risk factor, suggesting a potential for profound metabolic benefit. However, the effect of CBD on blood glucose tolerance, particularly in metabolic dysfunction, is not completely understood. The Otsuka Long-Evans Tokushima Fatty (OLETF) rats contain a CCK mutation that manifests a phenotype that closely mimics progressive human MetS and resultant T2D. We hypothesize that CBD, administered orally for 5 weeks, will ameliorate hyperglycemia in rats afflicted with MetS. Glucose tolerance was measured by an oral glucose tolerance test. We found that there was a 3.4% reduction of area under the curve (AUC) for the CBD-treated OLETF rats compared to the OLETF untreated group. A delay was observed in the blood glucose spike for the CBD-treated OLETF group comparative to the control strain and OLETF untreated; CBD-treated group was 34% lower than OLETF at T=10 minutes, and CBD treated group was 14% higher than OLETF at T=60 minutes. This change can also be seen in the glucose clearance rate where the CBD group was faster (2.6mg/dL/min) than the OLETF rate (1mg/dL/min). Taken together, CBD appears to modestly facilitate glucose uptake into tissue though more work must be done in order to determine the mechanisms affected by CBD treatment.

Modeling Amide-I Vibrational Circular Dichroism of Peptides

Jacqueline Leon, Hanbo Hong,Yue Yu, PhD and Liang Shi,PhD
School of Natural Sciences, University of California, Merced

Vibrational circular dichroism (VCD) is an effective technique to study the characteristics of amide-I vibrational mode of peptides and thus determine their secondary structures. However, the structure-spectrum relationship for the VCD spectra is yet to be established. Theoretical modeling plays an important role in connecting the peptide structures to their infrared (IR) spectra, and such work is similarly needed for the amide-I VCD spectra of peptides.To ensure the validation of our vibrational frequencies and transition electric dipoles, all of which are pivotal components to stimulating VCD, we begin with simulating the amide-I IR spectra for a series of peptides, including those with well-defined secondary structures. The analyses of the molecular dynamics simulations and IR spectra will allow us to not only compute the VCD spectra but help us gain insight on the molecular origins of the observed VCD spectra features.

5-Week Oral Cannabidiol Reduces Systolic Blood Pressure in Metabolic Syndrome(OLETF) Rats

Jennifer X. Mendez, Jessica N. Wilson MS, Rudy M. Ortiz PhD
School of Natural Sciences, University of California, Merced

Cardiovascular disease (CVD) is the leading cause of death in the U.S.(1/4 deaths annually) and is the main outcome of metabolic syndrome (MetS) which effects more than 30% of the U.S. population. Among those with MetS, more than 85% have high blood pressure (hypertension). Inflammation andoxidant-associated damage are directly tied into hypertension. Cannabidiol (CBD) is a non-psychotropic cannabinoid that has demonstrated anti-inflammatory and strong antioxidant activity. We hypothesize that oral CBD administration (150mg/kg/dx5wks)will attenuate early onset of hypertension in a rat model of MetS, Otsuka Long-Evan's Tokushima Fatty (OLETF). Systolic blood pressure(SBP)was measured in 3subgroups,Long-Evans Tokushima Otsuka (LETO)control group(n=1), OLETF(n=1), and OLETF+CBD (n=3)via surgically implanted radio telemeters[DSI]. High SBP (>130mmHg)is an indicator of hypertension. Our preliminary datashowsthat5-week administration of CBD reduces SBP area under the curve by 3.9%over 35 days. At the start, the SBP for LETO, OLETF, OLETF+CBD was 136□1mmHg, 144□1mmHg, and 145□1mmHgrespectively.During the last 3 days, OLETF had a 2.7% increase (148+□1mmHg) in SBP while OLETF+CBD had a 3.5% decrease (140+□1mmHg) from the start of the study. CBD is shown here to provide partial amelioration of hypertension if administered at the MetS stage of disease progression which suggests that it may have additional cardiovascular benefits not measured here.

Is the N2 Component a Neural Index of Motor Inhibition?

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Inhibiting our motor system from acting in opposition to our current goals is an essential mechanism of human cognitive control. One event-related potential (ERP) component considered to index motor inhibition is the N2, as captured in a Go/No-Go task. In classic Go/No-Go tasks, more Go trials are presented compared to No-Go trials (e.g., 80% Go) making the responses to Go trials more automatic. A greater N2 observed on No-Go trials in these tasks led several researchers to conclude that the N2 is an index of inhibiting prepotent motor responses. However, others concluded that the N2 component observed in cognitive control tasks is an index of conflict monitoring (i.e., detecting a conflict between incompatible stimuli representations). This project aims to address to what extent the N2 component may be considered a neural index of motor inhibition. To address this question, we plan on collecting ERPs from UC Merced undergraduate students under three different variations of the Go/No-Go paradigm: (1) a classic probability, (2) a reverse probability, and (3) a double response condition (i.e., Go/Go-Go).We reason that if the N2 is an index of motor inhibition then there should be a greater N2 for all No-Go trials. The findings of this study will advance our understanding of neural indices of cognitive control.

Measuring the momentum of light by creating water waves with lasers

Matías Lopez, Dustin Kleckner, PhD,
University of California, Merced

Although the speed of light decreases when it enters mediums like glass or water, there are conflicting theories as to how the momentum of light changes. Many theoretical arguments and experimental evidence have supported of one theory over the other, but the controversy persists. This is largely because the absolute amount of momentum carried by a beam of light is small and difficult to measure and isolate from spurious effects. In our approach, we measure the momentum of light by shining light off a water cavity then exciting the cavity with a modulated laser to measure any displacement of the light. We can determine the amplitude of the excited water cavity by treating it as a harmonic oscillator, and knowing that global momentum is conserved, compare the force absorbed by the water to calculate the change in momentum.

Developing Novel Materials for Sustainable Housing

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School of Natural Sciences, University of California, Merced

As human civilization continues to expand, numerous unsustainable resources are exceedingly consumed to satisfy the population's growing needs. To counteract some of these undesirable effects on the environment, researchers are using different approaches to address the challenges related to the fabrication of sustainable housing materials (e.g. reproducibility, reliability, and use of renewable materials) while reducing the carbon foot print arising from the housing industry. Recent studies have produced a novel wood-based insulating material, in combination with ceramic binding agents, to create green samples of varied dimensions. This new green material can lead to load-bearing house components (e.g. walls) and weather-resistant house components (e.g. sidings), where burning is not required in the molding process. In this study, we have investigated the fire-retardant properties and economic traits of the new material for house sidings by calculating composition-dependent properties (Ashby plots) and life-cycle assessment (LCA) via modeling. Using eco-audit data and materials modeling software, we have conducted analyses of representative siding samples and evaluated different traits including physical properties, price, energy, and CO2 foot print .Preliminary results were found to be in good agreement with recent experiments reported independently, and relevant properties together with LCA data of the new material are significant in determining sustainable alternatives rapidly and effectively compared to other traditional methods.

Infant-Initiated Joint Attention Using Multimodal Cues in Parent-Child Interactions

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School of Social Sciences, Humanities, and Arts, University of California, Merced

Joint attention is the shared focus of two individuals on an object. Initiations within caregiver-child dyads, classified as bids, are noted when the child signals the caregiver to an object via sensory information. Past studies, which primarily focused on parent-initiated joint attention in parent-child dyads in contrast to infant-initiated interactions, show that parents often use multiple sensory modalities within a single bid for infants' attention. These multimodal bids are more likely to result in successful engagement in joint attention. It remains unclear as to if and how infants initiate joint attention with their parents. Results from parent-focused studies have led to the question of whether children are active in the initiation process as opposed to acting in passive participation. The current study focuses on identifying the frequency and type of sensory modality used by typically-developing infants to initiate joint attention within caregiver-child interactions. Annotation software was used to track child-initiated bids in 38videos in a play session between typically-developing infants, about 13 months of age, and their caregiver. Bids were coded marking the beginning of the initiation and then checked for caregiver engagement. In the event of engagement, acknowledgment from the child was then checked. Bids were coded based on the outcome of the initiation and then classified by their sensory modality or group of modalities. Deeper understanding of joint attention, and the specific role children play in the process, can have a significant impact within overall understanding of social and cognitive development in children relating to communication.

Effects of Electronic Cigarettes Liquid Components on Airway Mucus Swelling Kinetics

Scott E. Garcia, Carlos Vasquez, Wei-Chun Chin, Ph.D.
School of Engineering, University of California, Merced

Electronic cigarettes or e-cigarettes have gained major traction in several domestic markets across the globe within recent years, with a significant increase in use among underage individuals. E-cigarettes have been repeatedly marketed as a safer alternative in comparison to tobacco products, with lures such as flavored e-cigarettes becoming incredibly successful in targeting younger audiences. With the emergence of these new electronic cigarettes current research has focused on the direct toxicity of these devices, however, our study focuses on addressing the gap regarding the rheological effects on airway mucin secretion associated with e-cigarette use. Furthermore, our study investigates the health impacts correlated to these devices, specifically common lung diseases, such as chronic obstructive pulmonary disease and asthma. We utilized A549human epithelial carcinoma cell lines alongside video microscopy to monitor the swelling kinetics of mucus when exposed to liquid e-cigarette components at varying nicotine concentrations. Our results indicated that e-cigarettes with nicotine at varying concentrations, and whether composed of propylene glycol(PG)or vegetable glycerin (VG), lead to abnormally viscous mucus placing an individual at a higher risk for developing respiratory diseases. More importantly, these results may be used to refine or improve protocols involved in electronic cigarette production and more so the regulation of e-cigarettes.

Using Informative and Uninformative Retro-Cues to Observe the Interaction Between Auditory Attention and Working Memory

Sheemrun Ranjan, Alejandra Santoyo, Kristina Backer, Ph.D.
Dept. of Cognitive and Information Sciences, University of California, Merced

There has been an abundant amount of research examining the effects of both selective and reflective visual attention during working encoding and retention phases, respectively, on behavioral performance and neural activity. Unlike selective attention, reflective attention refers to attentional orienting to internal mental representations and is especially important for auditory perception. However, there have been few studies done to test the interactions between auditory reflective attention and working memory using similar delayed match-to-sample tasks, which is crucial to understand the strength and capacity of auditory attention. Using Informative and Uninformative retro-cues (i.e., cues that provide relevant or no relevant information, respectively, about an item for immediate retrieval),the current online study will observe the interactions between reflective attention and working memory using sounds that vary in temporal properties, specifically their amplitude modulation (AM) rate. It is expected that the use of reflective attention during encoding in working memory using Informative retro-cues should enhance the temporal precision of AM rate discrimination, relative to Uninformative retro-cues. Preliminary data from this online study revealed no differences in sound discrimination accuracy between the Informative and Uninformative retro-cues. A possibility for this null cuing effect is that participants were not given enough time to encode the sounds and effectively utilize the Informative retro-cues. Thus, in a follow-up experiment, we will adjust the timing of trial events to enable robust memory encoding of the sounds. We expect that Informative retro-cues will boost temporal precision of the auditory stimuli in this revised paradigm.

Growth Regulation of Staved versus Non-starved Larvae

Shevelle L. Brown, Jade Quail, Graduate Student; University of California, Merced, Michael D. Cleary, PhD; Stanford University

Maintaining proper food and nutrition needs play an important role in overall growth development and ensures normal maturation that can limit difficulties over time. When an animal transitions from a starvation state to a nutrient abundant diet there may be a quantitative trait, or measurable phenotype, that can regulate growth. In addition, there are complex numbers of genes that affect nutrient-reliant growth. Using Genome Wide Association Studies (GWAS) on a collection of 38 strains of inbred Drosophila with sequenced genomes, a study can be conducted to investigate the genetic cause of such differences in nutrient-reliant growth. Namely, Drosophila is cost effective and an excellent model organism for this study that can be utilized for possible unbiased screens for genes that regulate growth. The three quantitative traits of focus are larval length and mass, cell proliferation, and protein synthesis. These traits are measured using BrdU, or Bromodeoxyuridine labeling, of DNA that recognizes cells of the cell cycle that are in the S-phase, and Puromycin labeling of newly synthesized peptides in larva (proteins). Following, all the collected data is then used in GWAS to identify genes that affect that trait and corresponding brain dissections are conducted to note changes in nervous system growth. Altogether, it is important to do this work, as cells in different tissues have varied nutrient requirements.

Center for Cellular Biomolecular Machines

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.

Preventing The Formation of Harmful Condensates ResultingFrom Liquid Liquid PhaseSeparation

Andres Bonilla, Shahar Sukenik, PhD
University of California, Merced

Liquid Liquid Phase Separation (LLPS) is the process by which proteins separate into two phases: a dense phase and a light phase. It has recently been found to be of utmost importance for the creation of spatially and temporally-controlled subcompartments in the cell. The resulting dense phase droplets can perform multiple biochemical functions, from isolating a specific class of proteins to increase their local concentration and facilitate interactions to sequestering proteins away from the cellular milieu. However, LLPS does not always occur to the benefit of the cell.Specific proteins can be harmful at high concentrations, such as those in dense phase condensates. For example, Tau protein condensates can lead to Alzhimers disease if not managed correctly. Normally responsible for binding to microtubules and stabilizing them, abnormal Tau causes the proteins to bind to each other, creating blockages in neuron transport systems. One solution to disrupt pathological condensate formation is to introduce a molecule to inhibit condensate formation by interacting with the moieties that drive their formation. Yet, the mechanism by which this disruption occurs is unclear.To uncover the physical-chemical determinants that facilitate disruption of LLPS, I utilized coarse-grained molecular simulations that emulate the condensate formation, and introduced molecules to disrupt condensation, which will define the range of interaction required to interruptLLPS-mediated aggregations of disease causing proteins.

Kinesins attachment rate enhances the impact of molecular crowding on kinesin-based transport

Antonio Wilfrido Castro, John O Wilson, School ofPhysics; Jing Xu, School of Physics University of California, Merced

Molecular motors such as kinesin transport material inside of cells along the track of the microtubule.Cargo transport is critical for the proper health and function of cells, such as neurons which can be up to a meter in length. Motors use the chemical energy ATP to move along the microtubule. Cellular crowding impacts the speed of cargos in a non-trivial way which depends on the number of motors on the cargo and also depends on how many motors are with the cells crowding. Because the impact of crowding depends on the number of motors, we suspect the rate motors attach to the microtubule is important. To examine how changes in kinesin attachment alter the effects of crowding, we conducted Monte Carlo simulations. Our findings will help us better understand how these two factors combine to tune kinesins velocityin cells.

Open-Source Smoke Container Design for Tobacco and Electronic Cigarette Exposure Research

Ben A. Reams, Nawshin S. Jenifar, Materials and Biomaterials Science and Engineering, University of California, Merced

With the introduction of e-cigarettes, the World Health Organization estimates 41 million users worldwide as of 2018. The respiratory complications caused by e-cigarettes compared to traditional tobacco smoking is heavily studied across the world. Laboratories analyze different hypotheses in order to understand potential cellular misregulation caused by aerosols. Here, we present a comprehensive aerosol container design that can meet a wide range of aerosol-related research needs. An accessible design is currently being fabricated to consider several factors including open-source assembly information, widely available components, safety and functionality. Once finalized, the design will incorporate freely accessible CAD files of the smoke container, pathways for the smoke automated by components controlled with Arduino, corresponding Arduino code files, assembly instructions and a components list. The assembled container will safely transport and filter out returned smoke for cigarettes and electronic cigarettes at the desired rate of the M3B Laboratory at the University of California, Merced. Based on the progress achieved towards a design thus far, a universal smoke container design can be implemented in any lab to accelerateandimprove the quality ofsmoking exposureresearch.

Designing a Protein Fluorescence Biosensor for Detection of Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV)

Brian Chang, Kevin Ramirez, and Victor Muñoz, Ph.D.; School of Bioengineering, University of California, Merced

The most prevalent methods to detect respiratory viruses are to detect the genetic material of viruses using the polymerase chain reaction or to detect human antibodies generated in response to the viruses. Such tests require skilled health professionals, often take several days, and are not efficiently deployable on a large scale. A faster and more widely deployable alternative to genetic and antibody tests is using a fluorescent biosensor. A biosensor consists of a bioreceptor that mimics the original biological process, a transducer that converts the biological process into a property change, and a reporter that reports the property change. Using various computational tools such as Chimera, PyMol, Robetta, Haddock, and QwikMD, we design a protein that aims to detect MERS-CoV. Our designed protein is a modified portion of the human DPP4 receptor, the target that MERS-CoV originally binds to. The transducer is the change in polarity at the location of a purposely introduced solvatochromic fluorophore when MERS-CoV binds to the biosensor. The reporter is the change in emission wavelength of the solvatochromic fluorophore induced by changes in the polarity of its local environment. Our results demonstrate computational feasibility of applying these biosensor principles to detect MERS-CoV.

Simulating Spontaneous Fluid Flows Destabilization

Daniel He, Cayce Fylling, and Maxime Theillard, PhD,
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Solutions to Navier-Stokes equations usually cannot be written down on paper, and must be solved numerically. Because there is no proof that the Navier-Stokes Equations have a unique solution, these simulated results must be considered with healthy skepticism and scrutiny, particularly if a time series of results destabilizes and becomes non-physical after a time. It is challenging, if not impossible, to compare numerical results to real-world data in a point-by-point way. Problems whose solutions have no steady state, such as active fluids, can be particularly challenging. To probe the accuracy of numerical results, we observed incompressible fluids in atypical geometries and confined active fluids, both of which were simulated using a hybrid numerical scheme involving finite volume, finite difference, and level-set methods. We visualized the data in Para view and made observations by comparing our results to real-world data. Destabilizations in data are common, but usually results can be improved by refining the grid on which the problem is solved. However, this does increase the time it takes for the computer to generate results. These are the trade-offs every modeller must consider when developing their numerical methods.

Measuring the Ensemble of Intrinsically DisorderedProteins in the Nucleus and Cytoplasm of the Cell

Dianna Liakos, Karina Guadalupe, MS, Shahar Sukenik,PhD;
Chemistry and Biochemistry, University of California, Merced

The nucleus is a membrane-bound organelle with a distinct physical-chemical composition that differs from that of the cytoplasm. Within these structures, intrinsically disordered proteins(IDPs) which constitute 30% of the proteome, play vital roles in sensing and adapting to the physical chemistry of their environment to modulate function. IDPs are unique as they lack astable tertiary structure and have few intramolecular bonds, and in response, cause expansion or compaction of their ensemble. For example, IDPs in the cytoplasm are highly sensitive to fluctuations in water and macromolecule concentrations.Our goal is to probe the changes that occur in IDP structure between the nucleus and cytoplasm in order to characterize and understand how their structure changes to allow function in a spatially-dependent manner. To do this, we use live-cell microscopy and Förster ResonanceEnergy Transfer (FRET) to measure the end-to-end distance of naturally occurring IDPs in the cytoplasm and the nucleus. We find that certain IDPs change their ensemble depending on their localization in the cell, offering a new avenue for spatial regulation of protein function.

Studying the response of modified Calnuc protein in a salt gradient using single-molecule fluorescence measurements

Grace Newman, Mourad Sadqi PhD, Victor Muñoz PhD
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The calcium-binding protein, Nucleobindin-1, also known as “Calnuc” is known to bind to calcium at two locations on the protein known as EF hands. EF hands are specific sequences of amino acids that cause a specific tertiary structure of two alpha helices and a beta sheet. These structures allow the Calnuc protein molecule to bind to one calcium ion per site, with a total of two calcium molecules per protein. The wild type Calnuc protein folds when it binds to calcium ions, however my lab group has modified the Calnuc protein’s EF hand sequences to prevent calcium binding at both sites. FRET will confirm that the modified Calnuc protein we are studying no longer binds to calcium based on which fluorophores are excited when the protein is exposed to calcium ions. If the modification to the EF hands of Calnuc were successful, the biomolecular conformational changes and interactions of the modified Calnuc protein in response to various salt concentrations will be studied, also using FRET. The results of this study will be used to determine if the modified Calnuc protein is ready for use in in vitro studies on the modified protein.

Vascular Network AssemblyUnder Various Medias

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School of Engineering, University of California, Merced

It is predicted that by 2030 40% of adults in the U.S. will have a cardiovascular related injury. The severity of which may range based on the condition and progression of the disease, however one unifying factor is the damage acquired by the preexisting vasculature. Therefore, by understanding how vascular networks emerge and develop under different media and cellular combinations can then seek to find repair or replacement solutions for larger scale vascular diseases. Here we used human umbilical vein endothelial cells (HUVECs) in co-culture with accessory cells (such as smooth muscle cells, pericytes, and fibroblasts) under various media combinations to investigate the emergence of 2D vascular networks. Specifically, we tested whether a preexisting accessory cell type monolayer was needed to support HUVEC network development. The co-cultures were observed for two weeks with their vascular development recorded and analyzed every other day. These studies reviled that vascular networks emerged more readily in co-cultures with a preexisting accessory cell type monolayer rather than from a directly mixed co-culture. Additionally, these networks require the presence of the endothelial cell (EC) medium, while conditions containing a 1 to 1 ratio of EC medium and accessory cell type medium did not improve the vascular network. Alternatively, combinations containing only accessory cell type medium led to no network formation. By successfully finding the ideal media conditions for specific co-cultures of vascular development we can transition to building better and more robust 3D vascular networks to better study vascular diseases.

Scattering Suppression Using Nano-Assembled Plasmonic Meta-Structures In The Visible Spectral Range

Jesse R. Leeder,Sayantani Ghosh, PhD;
School of Natural Science, University of California, Merced

As medical technology advances, the need for more accurate medical imaging increases. The answer to this problem may lie in plasmonic cloaking -an electromagnetic cloaking method that works by suppressing scattering from an object. A plasmonic cloak(meta-structure)is capable of suppressing scattering of the incident light, reducing back scattering, and enhancing forward scattering. We established that there is an optimum relationship between the percentage of the area of the core covered by metallic nanoparticles(AuNPs)and the amount of scattering suppression observed. We image meta-structures using a Scanning Electron Microscope(SEM) and analyze surface coverage of the core by the AuNPs. This surface coverage value is fed into a multi scale platform to simulate scattering from the meta-structures. We found a noticeable scattering suppression is observed at 30% surface coverage. We compare the simulated scattering suppression using the analyzed coverage with the measured values of scattering suppression. An example of a scattering suppression application is the Near Field Scanning Optical Microscope (NSOM), which is a type of imaging tool that scans an object and creates images from the near field response. Having the scanning tip covered with cloaking structures would suppress scattering from the tip and enhance signal coming from the sample. Future work involves applying these plasmonic meta-structures in clinical settings and analyzing their efficiency as compared to standard medical imaging equipment.

Rectification of flows through diodic microfluidic channels

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Microfluidic devices are commonly used to study very small volumes of biological material. To manipulate the flow, valves must be used. Most valve designs for microfluidics are bulky, costly to produce, and require external actuation. To circumvent these problems, we explored methods involving embedding valves directly into the channel. The operation of these valves are based on rationally designed structures that are foldable upon flows in a given direction.The channel is printed by a high-resolution resin-based 3D printer. The flexible portion of the device is composed of a thin hinge and a thick paddle, which operates with one degree of freedom. While with one direction of flow the paddles open and allow free flow, in the other direction the paddles are moved to obstruct, reminiscent of a diode in electric circuits. This device can thus be connected together to provide advanced and yet universal manipulations, including a fluidic rectifier that harvests noise-driven vibrations to unidirectionally generate flows.

Disordered Proteins Sense Changes in the Physical-ChemicalEnvironment in Cells

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The composition of solutes in the cell routinely fluctuates due to changes in cellular volume.While many proteins may be resilient to these fluctuations, intrinsically disordered protein regions, or IDRs, can be sensitive to changes in their surrounding solution. This is due to a low content of intramolecular bonds and high surface area exposed to their chemical environment.However, the molecular grammar that dictates this sensitivity in IDRs remains poorly understood. In this project we use Förster ResonanceEnergy Transfer (FRET) paired with live cell microscopy to measure structural changes in a library of synthetic IDR ensembles as cells undergo changes in volume.We have designed a library of FRET constructs consisting of a fluorescent protein pair that flanks the IDR of interest.The IDRs were explicitly designed to cover a wide range of chemically distinct sequences while still maintaining disorder. The end-to-end distances of these sequences are assessed by the FRET efficiency and are used as a proxy to measure changes in IDR structure. We find that IDRs have a unique, sequence encoded response to these perturbations. The completed set of experiments will be used to train a machine learning algorithm that will be able to predict the sensitivity of naturally occuring IDRs and design de novo sequences with predetermined solution sensitivity.

Cell Detection in the Cleared Thymus using Machine Learning

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The proliferation of tissue clearing techniques and advanced microscopy have allowed for the rapid generation of large sets of biological images. With giant datasets, however, comes the need for large scale data processing, which has relied heavily on manual or semiautomated methods. Manual cell labeling is largely subject to human perception and its biases. Machine learning has shown great promise in automating cell labeling while maintaining objectivity and consistency and increasing data turnover. In this study, a supervised machine learning model is trained using classification and regression algorithms to accurately label thymus progenitor cells. To begin with, an image stack is filtered by color leaf filtering and gaussian noise reduction to isolate cell candidates. With feature extraction, different aspects of each candidate are recorded – such as size, density and color. Fourteen different features are used to train four different algorithms – each either classification or regression based. Each model's efficacy is measured by overall accuracy and the ROC-AUC metric. Preliminary results show 80-85% accurate labeling with an ROC-AUC of 0.9 when using classification. Based on a backward selection process, the cell candidate's cell density is the most contributing factor to labeling.The most promising are the Adaboost and Random Forest classifiers, both based on ensemble learning methods using decision trees. Decision tree-based parameter tuning can be used to improve performance.

Microtubules:Active matter with complex dynamics of non-uniform motor density

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Microtubules (MTs) are the straight, hollow cylinders found in all eukaryotic cells and some of the prokaryotic cells. MTs are the protein filaments that carry out a variety of functions, ranging from transport to structural support during cell division.The diameter of these cylinders are about 25nanometers which helps in moving other organelles throughout the cytoplasm. Unlike other filaments, MTs work in small groups or individually.Our current understanding of MTs shows a unique nematic behavior when placed under a gliding motility assay. The experimental geometry consists of a nanoscale motor protein (Kinesin Motor)and supported lipid bilayer (SLB). Modeling of an individual microtubule is described as a nematic system of self-propelled filaments (bead-spring chain); hence the numerical approach will be done by means of Brownian dynamics. The experimental results show that MTs spend less time in the region of high motor density and move towards the region of low motor density, giving us an uphill graph. In order to keep track of the simulations, python code was developed.In review,we will numerically describe the complex dynamics of non-uniform motor density and define if there are any choices of simulation that can oppose the experimental behavior shown by microtubules.

Novel Photoluminescent Ligands And Their Potential Application In Nano-Assembled Active Materials

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Nano-assembled active materials can modify their initial state as a response to external stimuli. Previous research suggests that, through ligand engineering, novel ligands can be designed for modulating properties of nano-assembled active materials. When bound to Quantum Dots, optimal ligands can stimulate the structure to exhibit tuned properties with potential applications in the biomedical field. As part of a search for ideal ligands, spectroscopic measurements were performed on base pyrazines models and neutral BF4 salt. These methods were used to determine the photoluminescent emission of molecules that could potentially work as ligands for Quantum Dots. The data was analyzed through Gaussian plots in order to find correlations between these molecules and determine how good of a candidate the molecules can be as ligands for this purpose. It emerged that, regardless of the molecule, the area of the function was directly proportional to an increase in wattage power. Additionally, it was found that the center values follow a decreasing pattern as the wattage power increases. By understanding the significance of these values, a direct comparison can be made between molecules to find a better fit. This study has the potential to lead to a novel selection of ligands that can form nano-assembled structures with applications such as drug delivery.

Merced Nanomaterials Center for Energy and Sensing

MACES

MERCED NANOMATERIALS CENTER FOR ENERGY AND SENSING

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.

Perovskite Solar Cells for Space Exploration

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The four eras of solar cells differ in the materials that make them up, their cost, and efficiency.The fourth solar era is the best for building solar panels in space due to the use of perovskites which are cheap and highly efficient. Although perovskites are relatively new to the researchworld, they have accomplished the same as PV technology which has been around for decades.This research is a contribution to figuring out how to build solar panels in space considering space conditions. The research team uses photoluminescence spectroscopy (PL) with a laser beam to measure the energy absorbed by the quantum dot sample and the light generated by the sample when it falls from the excited state to the ground state. Previous research has shown that maze-like perovskites seem like the perfect fit for building solar panels in space due to their low cost and high efficiency. However, a major issue that must be considered in future research is increasing the stability or lifetime of perovskites since the highest lifetime recorded is one year.

Preventing SOFC Cathode Segregation Through ALD Surface Coating

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n the 21st century,there is an ongoing effort to develop increasingly efficient power generation technologies to minimize the effects of climate change. The conversion of chemical energy to electricity through fuel cells is an option that is being explored. The Solid Oxide Fuel Cell (SOFC), which operates at higher temperatures of 600°C+, have shown high efficiency when converting hydrogen-based fuels into useable electricity. A current issue with SOFCs is the segregation of materials on the surface of the cathode after prolonged use at high temperatures. This degradation mechanism can impact the fuel cells in multiple ways, resulting in decreased performance over time. A possible solution is the use of atomic layer deposition (ALD) to coat the cathode surface with a material that can suppress segregation and increase the stability of SOFC performance.Current experimental research suggests that this method can be very effective in suppressing segregation and reducing degradation over time. Prolonging the performance life through further research and implementation of ALDwould allow for SOFCs to be a more viable candidate for cleaner energy production in the future.

The development of non-noble metal-based catalysts for oxygen evolution reaction

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The oxygen evolution reaction (OER) is a process of creating molecular energy(O2) through a chemical reaction. OER is vital to water splitting, along with being used in reactions for rechargeable metal-air batteries and regenerated fuel cells. Noble metals such as iridium and ruthenium, the current benchmark catalysts, are expensive, scarce, and have poor durability, which makes it hard to mass-produce. To enhance the durability, performance, and economic viability of catalysts for OER, we must find cost efficient, environmentally friendly, and easily accessible materials to achieve them. Researchers are largely exploring transition metals as the most promising materials for OER catalysis.Hybrid transition metals- as opposed to single composite materials, can enhance catalytic activity and structural stability, while having electro catalysts withstand corrosion in electrolytes.

The Influence of Charging on Palladium NanoparticleCatalysts inSuzuki Cross-Coupling Reactions

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In the last decade, palladium nanoparticles have been shown to catalyze numerous reactions, such as the Suzuki-Miyaura, Heck, Negishi, Sonogashira reactions, better than its bulk counterpart. This is partially due to its much greater surface area.However, little is known about the correlation between the charge of a nanoparticle and its catalytic properties. To better comprehend the link between charge and the catalytic activity of palladium nanoparticles, we measure the product yield of the Suzuki-Miyaura reaction after charging or discharging the nanoparticles in various reaction conditions. To induce charging or discharging, we use reducing agents such as ascorbic acid that give electrons to the Pd nano particles, or we introduce oxygen to remove electrons from the Pd nanoparticles. Our results demonstrate that an increase in charge density increases the yield of the biphenyl product. Conversely, the discharging experiments show significantly lower catalytic yields.Although the results suggest that our hypothesis was correct, we cannot directly relate charge and catalytic activity due to the possibility of surface modification by the presence of palladium oxide. Palladium oxide is naturally formed and present under aerobic conditions on the surface of the nanoparticles which blocks active sites on the substrate. Due to the blocking on the active sites, interactions that facilitate biphenyl production are reduced. Thus, palladium oxide may poison the palladium nanoparticle catalyst and result in lower product yields. It is possible that the catalytic activity of these nanoparticles is affected by charge or surface modification, or a combination of both.

Fractional - Order Methods for Modeling Supercapacitors/Pseudocapacitors

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Supercapacitors provide proficient storing abilities due to their high power density and long cycling life. Given that the majority of studies on these supercapacitors have centered around the average temperatures of 14°C (57°F) found on earth,a supercapacitor must be developed to consider the drastically cold temperatures of Mars which reach lows of -125°C and average -60°C , while simultaneously maintaining power and energy density levels sufficient enough to properly store energy. In order to gauge the observed relationship of the supercapacitor relative to the size of the pores and surface area, a quantitative model will be formed using a fractional order method; which produces more information on the properties of a supercapacitor as compared to its integer-based counterpart. The non-integer model will represent the observed relation of pore size, surface area, capacitance,and resistivity. Once the connection is established, the ideal density can be determined for the supercapacitor.

Investigation of KOH Activation onCarbon Surfaces

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Carbon materials, such as carbon nanotubes (CNTs), graphene, and carbon cloths (CC), are of great interest as electrode materials to use in energy storage devices, such as electrical double layer capacitors (EDLCs)and scaffolds for batteries and pseudo capacitive devices due to their high conductivity and tailorable morphology.Activated carbon materials have been widely reported in scientific literature due to their low cost and the abundance of precursor materials available.Recent works focus on incorporating various forms of activated carbon materials for filtration and EDLC electrodes. KOH has been known for decades to activate carbon with high micropore volume. Several groups have compiled information from various papers to explain the chemical process of KOH activation beginning from the reaction of carbon with H2O to how the intercalation of potassium can expand the carbon lattice, significantly increasing the substrate's specific surface area, which is important to the performance of EDLCs due to their areal dependance.In this literature review, KOH activation of carbon materials is discussed, focusing on the mechanism driving the activation process, analysis methods to examine carbons activated by KOH, and recent research onKOH activation.

Measuring the Friction of Steel Specimen Pin on Disk Tests

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Tribology is the study of surfaces moving relative to one another by testing the friction, wear and lubrication of the material. This study has a prominent role in today's engineering because a great amount of energy and material is lost due to friction in mechanical components. In order to effectively conserve energy while simultaneously making components more durable and resistant, we must first test the materials using a tribometer. A tribometer is a vital tool in tribology; it helps measure the friction and wear of materials in a controlled manner. More specifically, the pin on disk test is a method we use in the Falex tribometer that consists of a pin perpendicular to a steel disk. Depending on the test parameters, the load and the pin's rotational speed are adjusted. After running the test on the specimen we graph the coefficient of friction vs.time data. Though, after running some tests we noticed that our data did not match the theoretical values from the reliable RTEC machine. By calibrating the torque sensor we expect to obtain amore accurate coefficient of friction results.

Trends and Limits of a Nanovea ST400 Interferometer

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White light interferometers are devices used to scan samples in order to understand their surface height and topography. Specifically, it is used in the field of tribology to help quantify important parameters such as wear and surface roughness of mechanical components following other experiments. Understanding the limitations and capabilities of the interferometer is essential to learn how to optimize the data obtained from scans.In this study, a Nanovea ST400interferometer was analyzed to understand the trends in scan parameters. The data obtained from different scans was reviewed and Gwyddion 2.53 was a software used for data processing and analysis and helped to improve image quality. Through performing various scans on different samples, it was found that changing the acquisition rate and frequency was helpful for obtaining data for various surfaces. Results from these scans were compared with those from the more reliable RTEC interferometer to highlight the limitations of the Nanovea device. Through adjusting scan parameters and continuing to compare the two devices we can understand the reliability of this instrument.

Summer Opportunity for Advanced Research (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 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

Potential Well of Pyrolytic Graphite Plate Levitation

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Diamagnetic levitation has shown interesting properties which have shown potential for high resolution resonant sensors and energy harvesters. In this analysis, we introduce a new analysis to illustrate and achieve controlled levitation by simulating a pyrolytic graphite plate under a magnetic field produced by solenoids arranged in an alternating pole checkerboard pattern. By analyzing the induced current on the graphite by our solenoid configuration, we can obtain the force exerted on the diamagnet thus yielding the information to draw the 3D potential well. Previous studies have concluded that the presence of a levitated magnet in a superconducting radio frequency (SRF) cavity has an effect on the quality factor (Q-factor) of the cavity.

Evaluating the association between cortisol levels and infant temperament using human breastmilk samples

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Human milk contains cortisol, a glucocorticoid hormone, yet its role in infant development has not been fully elucidated. Cortisol plays crucial roles in glucose metabolism and in response to stress. Previous research in non-human animals has demonstrated that cortisol is transferred from mothers to offspring through breast milk, in turn, influencing infant brain development and behavior. However, the role of cortisol in human milk has not been fully accessed. The aim of this study will be to examine whether there is a correlation between cortisol levels in human breast milk and infant temperament. Given the animal research, I hypothesize that infants who are exposed to higher levels of cortisol in breast milk will exhibit more fear and behavioral inhibition. Using a longitudinal study of 100 breastfeeding mother-infant pairs, I will use a commercially available ELISA kit to assay existing breast milk samples for cortisol and correlate these with maternal reports of infant temperament on the Rothbart-Revised Infant Behavior Questionnaire, which assess infant fearfulness, negative affectivity, surgency /extraversion, and orienting/regulation. Pearson's correlations will be used to examine the association between milk cortisol and the four subscales on the infant temperament scale. This project will aid our understanding of the role of cortisol in human breastmilk and how this relates to behavioral traits in developing infants.

Applying "knock-in" strategy to insert NG11 into a zebrafish gene using the CRISPR technique

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Fluorescent protein tags are useful tools for imaging and observing proteins in living cells. In contrast to full-length fluorescent proteins (FPs), split-FPs consist of multiple protein fragments that on their own are not fluorescent but together self-assemble into a functional fluorescent complex. The Woo lab uses a split-FP system called split-NeonGreen (split-NG). Our goal is to use CRISPR/Cas9 technology to knock-in sequences coding for one half of the split-NG complex (NG11) into target genes of interest, while the second half (NG1-10) will be expressed under a tissue-specific promoter. In this way, we can fluorescently label broadly expressed genes in a tissue-specific manner. In this project, we are using CRISPR to knock-in NG11 into two target genes, actin 2b(act2b) and EMAP-like 2(eml2). We first synthesized guide RNAs that will direct the CRISPR/Cas9 complex to each gene and injected each guide RNA into zebrafish embryos. We will then assess knock-in efficiency by PCR using specific primer pairs designed to amplify each gene's predicted CRISPR target site. If successful, my CRISPR strategies should result in knock-in of NG11 sequences into act2band eml2, which will be important tools for helping us understand the function of these genes.

BAF Complex Regulates Neuronal Activity Induced Gene Transcription

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The BAF complex is an ATP dependent chromatin remodeling complex that is known to facilitate gene transcription. However, the underlying mechanisms are not fully understood. Changes to the BAF complex subunits, or mutations in genes encoding the subunits, have been found in patients with neurodevelopmental disorders. We hypothesize thatneuronal activity induced gene transcription requires BAF complex-dependent chromatin remodeling and is impaired when the latter functions sub-optimally. The methodology consisted of RNAi-dependent targeting and depletion of the expression of BAF complex subunits in cultured primary dissociated rat cortical neurons obtained from prenatal day 18 rats. BAF subunit KD significantly attenuated activity-induced transcription of neuronal immediate early genes. To verify any impact of BAF complex knockdown (KD) on synapses, we used anti-MAPK/Erk ½ antibody, to assess whether shBAF KD impaired the activation of the MAPK/Erk pathway which is a marker of synaptic activity. The results demonstrated that shBAF knockdowns did not impair activation of the MAPK/Erk pathway. These findings suggest that impaired neuronal activity induced gene expression is not due to disrupted synaptic activity since expression of the MAPK/Erk pathway is not affected. Instead, it is possible that neuronal activity induced gene expression isimpaired by the stalling of RNA polymerase II at the promoter. These findings can help improve our understanding regarding the molecular mechanisms of how the BAF complex regulates neuronal activity induced gene transcription.

Environmental & Climate Justice Mobilization and Policy Outcomes, and their Connection to Community Choice Programs and Clean Energy Relief Programs: Southern California and the Eastern Sierra Nevada 2000-2020

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This study will establish the connection between environmental justice and climate justice movements and community choice programs at the county level by analyzing a sample of over 80 protest events in Southern California and the Eastern Sierra Nevada region. Additionally, this study will explore the conditions for the adoption of clean energy programs in counties in Southern California and the Eastern Sierra Nevada region. The research shows that counties adopting clean energy were more Democratic, had a higher level of education, and had a more comprehensive history of environmental justice organizing than counties that did not adopt clean energy programs. The goal of this research is to explain these patterns by analyzing different news sources on protest events in Southern California and the Eastern Sierra Nevada region and to effectively explain the reasoning for the implementation of these community choice programs. This study also serves to demonstrate trends between the environmental justice and climate justice movements and to examine their mobilization over time and across geographic locations. The analysis explores climate policy outcomes at the local level by distinguishing the intersections between environmental movements and community control of energy administrations and costs for consumers. Lastly, this research will also go in-depth on how clean energy initiatives could be improved in the future, such as by forming stronger alliances with community-based organizations and local labor unions and making themselves more accessible to all community members.

Digital Theatre: Dissecting Lyrical and Melodic Textures

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The COVID-19 (Coronavirus) pandemic halted the 2020 live theatrical seasons of global theaters, from Shakespeare's Globe in London to New York City's Broadway Theatres, to community organizations all over the world. Community-based theatre organization Merced Shakespeare fest and the University of California's Shakespeare in Yosemite adapted their 2021productions as screenplays to produce new modes of digital theatrical shows. As music director for Merced Shakespeare fest's bilingual adaptation of Miguel de Cervantes's Don Quixote, my study examines the use of Ableton Live 10 (digital audio workstation) to film score and create a theme song for the seven-episode web series. Working as a musician and researcher in the tradition of Practice-as-Research, I am able to dissect lyrical and melodic textures within original compositions and evaluate their success in enhancing the thematic tropes of a Spanish-English Don Quixote. A case study of Shakespeare in Yosemite's filmed screenplay Imogen in the Wild studies how original music promotes environmental justice and ecological sustainability.Serving as a songwriter and composer for the film, my original ecological anthems are used for the production's music videos.This study discusses homophonic textures used in the song compositions of "Earth's Cry" and "We Need You" from Imogen in the Wild. Qualitative methods also include interviews with directors, cast members, and project managers of Cymbeline in the Anthropocene. Both filmed productions of William Shakespeare's Cymbeline and Don Quixote serve as free, accessible theatrical shows that combine the works of community-based and professional creatives/actors.

Movement Generated Policy Succes in the Central California Region: CALCCA's

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This study establishes the links between environmental justice struggles and climate justice in Central California as well as works to identify the greatest environmental and climate justice related accomplishment within the given time frame. As the Central California Region is significantly impacted by air pollution, fracking, and toxic power plants, the investigation suggests that the mobilization will be heavily concentrated in areas that are impacted by these issues-in the same manner, the greatest accomplishments will be found in the cities who have been the most impacted or mobilized by environmental movements. The Central California region is much less densely populated in comparison to the Northern and Southern urban areas of California which reflects the limited amount of literature that addresses the social movements that occur within it. The investigation uses the method of protest event analysis with a coding of newspapers between 2000 and 2014 for environmental justice and climate justice events to demonstrates trends in environmental movement mobilization over time and across geographic space. The study employed protest event analysis and policy outcomes methodology. Protest event analysis is a form ofcontent analysis that codes newspaper reports for collective action events (Almeida 2019). A sample of environmental protest events was used in the final analysis. Additionally, the study examines climate policy outcomes at the local level by identifying links between environmental movements and community control of energy distribution and costs for consumers at the county level. Ultimately, the research defines trends that occur over the past 20 years that are directly affecting the Central California and how the mobilization of community members and organizers has cued legislative change at the local level.

Community Mobilization Towards Climate and Environmental Justice, Northern California 2000-2009

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Environmental justice movements have struggled collectively since the early 1980s, exposing the environmental racism that has contributed to an increase in disproportionate effects of industrial pollution on low-income, communities of color. Climate justice has emerged as a relatively new, yet important movement that focuses on the threatening impacts of climate change (Mendez 2015: 1). This study shows the links between environmental justice struggles and the progress that climate justice policy initiatives have established in Northern California at the county level. The investigation uses protest event analysis of newspaper articles related to environmental justice and climate justice events between the years 2000 and 2009 and policy changes at the county level to demonstrate trends of movement mobilization over time and across geographical space. A sample of over 50 environmental events in northern California were used in the final analysis. Additionally, this study assesses the conditions associated with implementing California choice aggregation programs. Counties adopting clean energy were more Democratic and had a greater history of environmental justice organizing than counties that did not adopt clean energy programs. In the future, clean energy initiatives would benefit from even deeper alliances with community-based organizations and local labor unions in an effort to achieve environmental and climate justice.

Using machine learning algorithms to detect COVID-19 from CT images: A patient by patient basis and cross dataset analysis

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Rapid detection of COVID-19 is essential to prevent the disease from spreading. Currently, numerous machine learning algorithms have been developed to detect COVID-19using ComputerizedTomography (CT) lung scans. However, due to how broad and general they are, there is a lack of precision and attention to these patients. In particular, these algorithms prioritize accurate detection on an image-by-image basis, instead of on a patient-by-patient basis. Treating each scan independently(image-by-image) might result in a misdiagnosis if there are multiple CT scans of a single patient and they are not all incorporated in the final decision process. Having repeated images in different parts of the model will produce an invalid outcome that can't be trusted for real world scenarios. Moreover, these developed algorithms use a single dataset, which raises concerns about the generalization of the methods to other data. Various datasets tend to vary in image size and quality due to differing CT machine environments. Our approach of tackling both of these issues is to create a convolutional neural network (CNN) machine learning algorithm that prioritizes producing an accurate diagnosis from multiple scans of a single patient. These methodologies include (1) a voting system based on individual image predictions, and (2) a CNN that takes multiple images from the same patient. The approach is tested with the two largest datasets that are currently available in patient-based split.A cross dataset study is presented to show the robustness of the models in a realistic scenario in which data comes from different distributions.

Telemedicine benefits and language access in community health during the pandemic: a qualitative study

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The COVID-19 pandemic led to a steep increase in the use of telemedicine as an alternative to in-person care for patients. It is not well known whether it is an effective delivery mode for chronic care services, particularly for patients who have limited English proficiency (LEP). The purpose of this study is to examine telemedicine experiences and language access among LEP patients with a chronic illness (diabetes or a cardiovascular disease) at two community health centers in California. We recruited adult patients diagnosed with either diabetes or a cardiovascular disease who were enrolled at two community health centers in Northern California. Patients spoke either Spanish or Mandarin. Study staff conducted semi-structured interviews to better understand patients' experiences with telemedicine during the COVID-19 pandemic. The interview guide covered COVID-19 experiences, technological access, telemedicine visit experiences, telemedicine access and support, health education services, continued use, and health conditions. Interviews were conducted over the phone (duration range: 60-90 minutes). Audio recordings were transcribed verbatim and qualitatively coded to identify salient themes. Results indicate patients who had a physician who was language concordant (i.e., spoke the same language) had higher levels of satisfaction using telemedicine compared to those who relied on a third-party interpreter. Patients with language concordant providers expressed greater comfort discussing private matters over the phone. Some patients reported concerns about confidentiality using telemedicine visits. These results can provide key information to support policies and programs to improve the use of culturally responsive and linguistically appropriate telemedicine in community health centers.

Masonic Networks of Policing: Merced, California,1875-1896

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Freemasonry has a long history in the United States. European settlers, who were members of masonic societies in their home countries, brought that aspect of their culture with them to colonies in North America. The whole of Freemasonry is made up of Masonic Bodies, local chapters of dozens of separate fraternal organizations. Many prominent figures in American history were part of masonic societies, including George Washington and Benjamin Franklin, among others. When US settlers moved west, they similarly brought their fraternal orders along, and masonic fraternities took root in many new towns, including Merced, California. In 1875, a chapter of the Knights of Pythias, founded in Washington D.C. just 11 years earlier (1864), was formed in Merced. The founding members of the Merced chapter included the County Sheriff A.J. Meany, Members of the Board of Supervisors, local physicians Hiram Rucker and E.S. O'Brien, prominent businessmen, and more. Using records from Merced's Masonic Lodge, Merced County Board of Supervisors minutes, as well as local newspaper archives, this project seeks to understand the extent to which this masonic brotherhood connected local policy makers and law enforcement officials in the creation of tools used by the county to police its residents. This includes action taken by the County Sheriff as well as the Board of Health to increase the power law enforcement had over the people in the growing town of Merced.

Are religious conversions like scientific insights? Similarities and differences in critical transitions across domains of human belief

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Why do people change their minds, lose their faith, leave their relationships, or transform their moral stances? These are all examples of critical transitions, or 'ruptures,' in personal belief or identity. This study investigates the causes, contexts, and effects of these sudden, transformative ruptures. Past work has studied critical transitions in single domains (e.g., religious conversion, scientific insight). However, little is known about domain-general mechanisms that underlie these ruptures, about how a rupture in one domain may affect another, and whether there are individual differences in how people experience these ruptures. In a within-subjects survey design, we are collecting data from US adults about ruptures they have experienced in a variety of domains (e.g., morality, social identity, politics, scientific beliefs, aesthetics, etc.). The survey uses a funnel design, beginning with open-ended free-response questions and gradually narrowing down to targeted, theory-informed, forced-choice questions. Data collection is ongoing. Responses will be analyzed using multilevel generalized linear models. Free-response data will be analyzed using iterative interpretative coding (i.e., Grounded Theory). We predict that personal 'ruptures' will be predicted (and perhaps caused) by changes in seemingly unrelated aspects of people's lives, including social network, physical location, and cultural practices. We also predict individual differences, with some people experiencing many sudden ruptures across domains, others undergoing gradual changes, and others experiencing repeated ruptures in only certain domains. Ultimately, this study will contribute to the development of a domain-general account of when and why we experience critical transitions or 'ruptures' in our lives.

Needs on Nutrition Education Capacity Assessed byPediatric Provider Informants

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The COVID-19 pandemic has hampered the ability of many low-income families to secure nutritious food, which can worsen the nutritional status of children in these families.Pediatricians and other clinicians play a key role in identifying children at risk of malnutrition and providing preventive and corrective nutrition advice to parents. However, providing effective advice in clinical settings poses challenges, including lack of time and specialized skills. The purpose of this study is to explore pediatric provider experiences and needs around providing nutrition advice to parents with young children before,during, and after the COVID-19 pandemic. We are interviewing pediatric providers to explore their experiences and capacity needs for offering nutrition counseling and advice to parents of preschool-aged children and the feasibility of partnering with existing local nutrition education programs for parent referral.Prospective participants are being identified through purposive sampling through local medical clinics that offer pediatric services and county-level medical societies in California. Recruited pediatricians were emailed a flyer and Qualtrics survey asking to participate in one 30- to 60-minute interview. Interview data will be transcribed and thematically analyzed using a code book, with categories including perceptions of patients' nutrition, experience and competence, and capacity needs. Results from this study will inform the implementation of clinic-community partnerships to improve nutritional outcomes in young children in times of public health crises.

Using CRISPR/Cas9 to Create Fluorescent Knock-in Zebrafish

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The application of CRISPR/Cas9 technology has increased in prevalence in recent years to edit genes for biology research. Our main goal is to use CRISPR/Cas9 to knock-in a fragment of a fluorescent protein called Neon Green 11 (NG11) into specific genes in zebrafish. Two genes of interest in this case were our primary focus –alpha-catenin 1(ctnna1), and beta-tubulin 5(tubb5). First, we found CRISPR target sites in both genes and designed guide RNAs that will direct the CRISPR/Cas9 complex to those target sites. This was accomplished utilizing an online tool called ChopChop. After this, we used a DNA sequence editing program called A Plasmid Editor (ApE) to computationally predict what a successful knock-in of NG11 would look like for each gene. Then, we synthesized the CRISPR guide RNAs for each gene and injected them into zebrafish embryos. In the future, we will determine how efficiently NG11 is knocked into each gene. If successful, these knock-ins will help us better understand the function of these genes, ctnna1and tubb5.

Summer Undergraduate Research Fellowship (SURF)

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The Preditor-Prey interactions of Wolf Spiders Based on Environmental Differences

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The dietary interactions of wolf spiders play an important part in their community food webs, such as their role in connecting underground and above-ground ecosystems. There is still information needing about how spider diets differ in different locations with unique ecological compositions. By collecting and analyzing data of wolf spiders in Cedar Point Biological Station, such as their communities, pray, DNA barcoding, and isotopic analysis data, and connecting that to information about the specific location where the spiders were found such as temperature and vegetation, we get data about the factors affecting their dietary choices. Results are then compared and may find that predator-prey interactions depend on environmental distances from bodies of water and pray diversity. This also may provide information on the causes and occurrence of cannibalism among these spiders and its implications on community structure.

Molecular Dynamics Study on the Behavior of Nano-sized Water Droplets under an Electric Field

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A recent molecular dynamics (MD) simulation study shows that a nano-sized water droplet can stretch in a sufficiently large electric field. It confirms that the interaction between water molecules and the electric field is crucial in understanding its structural change. In this study, we further analyze the behavior of nano-sized water droplets by using additionally generated MD simulation results. We aim to find characteristics that can effectively describe the shape dynamics of a water droplet. Using a combination of programming languages, including Python, Shell script, and C++, we extract the data sets to compute the shape parameter, the aspect ratio, and the collective alignment of water dipoles for each water droplet at each time frame. Based on the time-series values of these parameters, we want to understand the molecular mechanism of the shape extension process. The behavior of a droplet depends on its initial size along with the strength of the applied electric field. The observations made from this study will help find a better understanding of the electro-stretching phenomenon of nano-sized water droplets.

CXCR5+CD8+ Tfc Cell Functional States within IL-2KO Mice

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CXCR5+CD8+ T follicular cytotoxic cells arise in cancer, infection, and autoimmune disease as seen in IL-2-deficient (KO) and MRL/lpr autoimmune mouse models. Within autoimmune disease, CXCR5+CD8+ Tfc cells have been shown to interact with B cells within the follicle and germinal center, where they promote class-switching and plasma cell differentiation. To further understand this population, the CXCR5+CD8+ Tfc cells were investigated in IL-2KO mice. Peripheral lymph nodes and spleens were dissected, protein expression assessed by antibody staining, and analyzed by flow cytometer to investigate markers of exhaustion, anergy and senescence. We hypothesized that these cells would be exhausted at disease endpoint . Our results show these cells appear functional and not exhausted or senescent atend-stage disease of hemolytic anemia. Markers of exhaustion and anergy are poorly expressed on CXCR5+CD8+ T cells indicating a lack of tolerance (no anergy) and poor feedback inhibition (no exhaustion) on these autoimmune cells. . Overall, these results show a trend towards dysfunctional CXCR5+CD8+ Tfc cell activation in IL-2KO mice allowing autoimmune pathology.

Employment exclusion and the health of Latinx and Asian Pacific Islander communities

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This targeted systematic literature investigates how experiences of labor exclusion are associated with immigrant's health and economic trajectories in the US. Every year, millions of immigrants including undocumented individuals, mainly contribute to our economy through low-wage labor such as the service industry, agriculture, and construction. Focusing on the Latinx and Asian Pacific Islander (API) communities, we analyzed thirty (30) primary research studies to understand possible mechanisms by which experiences of exclusion in the labor and employment sectors may be associated with poor health outcomes. Synthesizing literature that we examined, the three main themes which show relevant results included; labor market exclusion, occupational downward mobility, and violation of worker rights. Existing research shows that undocumented workers are more susceptible to detrimental health outcomes aligned with job insecurity, poor working conditions, occupational hazards, lack of healthcare access and workers compensation, among other indicators of poor health. Immigration policies create specific boundaries of exclusion that influence the types of jobs that immigrants can take, how they are treated and the types of conditions that they may face in the workplace. Furthermore, these experiences may vary by structural factors, such as citizenship or race/ethnicity, as immigration policy directly racializes and stratifies immigrants and their position as workers in US society. These results indicate that both Latinx and Asian Pacific Islanders (API) immigrants work under precarious labor conditions that are characterized by occupational hazards, work-induced injuries, and exploitative abuses that disproportionately target both groups.

Pregnancy Intention in Women with Disability vs. Women Without Disability

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Pregnancy intention and desire among women with disabilities is understudied. This stems from issues such as misconception about their sexuality, lack of access to care, stigma, and personal feelings of burden, etc. The objective of this study is to explore pregnancy intention in women with disability compared to those without disability in California. We hypothesize that women with disability will have similar pregnancy intention as women without disability. We identified 5512 women ages 18 to 44 from the California Health Interview Survey (2017-2018), a state representative sample of California non-institutionalized residents. Chi-square and t-tests compared characteristics of women with and without disabilities. Logistic regression models calculated the odds ratio and 95% CI for the association between disabilities and pregnancy intention. Models were adjusted for potential confounding factors identified through direct acyclic graph. Based on preliminary results, we found that pregnancy intention in women with sensory disabilities was 39% higher compared to women without disability (unadjusted OR: 1.391, 95% CI: 0.691, 2.801). Factors that were associated with disability presence include citizenship status, education, marital status, poverty level, general health status, and smoking. In the next phase, we will calculate adjusted odds ratio and 95% CI to adjust confounding factors.

Known-Word Facilitation Effect for Artificial Speech Segmentation in Spanish-English Bilinguals

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Researchers have established that monolinguals show a clear known-word facilitation effect in the segmentation of novel artificial speech. However, whether this effect holds in bilinguals has not yet been established. Research in our lab demonstrates that the known-word facilitation effect holds for both English monolinguals and Spanish-English bilinguals when the known word is in English. In the current study, we aim to explore whether Spanish-English bilinguals experience a facilitation effect when the known word is from the Spanish language. If so, the advantage should manifest for Spanish-English bilinguals and not for English monolinguals. We hypothesize that English monolinguals will not recognize the Spanish word as a known-word in their lexicon, and thus not experience a facilitation effect in their ability to segment the artificial speech carrier stimuli. Findings from the current study will further elucidate the interaction between prior knowledge (top-down information) and incoming speech information (bottom-up information) in speakers with different lexical knowledge available to them.

Vibration-based Indoor Occupant Gait Monitoring with Robot Vacuum Cleaners

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Gait monitoring (foot clearance, step symmetry) is important for fall-risk assessment. Assessment tools have been designed for clinically assessing the fall risk of older adults. However, such assessments are done in the clinical setting and are biased. As a result, various smart home systems were explored to achieve in-home long-term monitoring. It was decided that structural vibration-based methods were going to be used considering their abilities to non-intrusive and passive sensing for fine-grained information. Robot vacuum cleaners are common in homes, which why it was proposed to utilize the in-home mobile platform to reduce the need for room-level deployment for indoor occupant gait monitoring. To validate the system, real-world experiments and active sensor testings were conducted. The results then had to be visualized in a visualization tool which was built with web development tools. The tool had to have an interactive interface that displayed the data flow of the project and real-time data collection using an integrated data collection tool. Active hands-on work with the sensor's system was tested to provide and link the data from the system to the running web-app platform. Overall, the result of the visualization tool illustrated the feasibility of combining the in-home mobile platform with vibration sensing for gait monitoring and the opportunities of replacing dense-deployed infrastructural sensing with mobile platforms.

Breaking Down Barriers with Depolymerase: K. pneumoniae Biofilm Disruption on Ventilator Components through Novel Bacteriophage Discovery

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Biofilms are communities of microbes attached to a surface and encased in an extracellular matrix of polymeric compounds. Unlike its planktonic form, bacterial biofilms are highly resistant to antibiotics. Antibiotic resistance is imparted through several structural elements that prevent antibiotic penetration and serves to localize infection through persistent colonization. K. pneumoniaeis a significant nosocomial pathogen, and the proliferation of its biofilm often leads to the development of ventilator-associated pneumonia (VAP). VAP accounts for the greatest amount of complications within intensive care units. Therefore, discovering novel methods to reduce K. pneumonia biofilm growth across ventilator components are essential to combating VAP. Bacteriophages are viruses that target specific bacterial families. Bacteriophage-encoded depolymerases disrupt the structural elements of biofilm and may serve as a useful tool in combating ventilator-associated pneumonia (VAP) when applied across ventilator components. Fieldwork paired with in-lab isolation and characterization of novel bacteriophages aids in the identification of specimens that have the potential for encoding depolymerase. The research team will focus on isolating bacteriophages specific to K. pneumoniae followed by genome sequencing to determine if the specimen has the depolymerase gene. After the presence of the depolymerase gene is verified, the original phage sample can be amplified for further testing and possible use in compassionate-care treatments for patients or other downstream applications.

Characterizing the Viscoelastic Parameters of Polyacrylamide Hydrogels via Microindentation

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Viscoelasticity of living tissues- the ability to have solid-like and liquid-like properties- plays an important role in the development of diseases such as cancer, chronic obstructive pulmonary disease, and several other diseases among others. Over the past few decades, significant progress has been made in understanding tissue viscoelasticity and its impact on cell mechanobiology, that is; studying how mechanical and biophysical forces regulate cellular activity. Cells have the ability to sense/interact with the physical, elastic and viscosity, parameters of their substrates .Here, the viscoelasticity of a commonly used class of biomaterials, polyacrylamide hydrogels, is characterized using micro-indentation techniques. Polyacrylamide hydrogels allow for facile and independent tuning of elasticity (stiffness) and viscosity(friction). During microindentation, a steel ball is pressed into the material's surface with a light load of a given dwell time to allow the measurement of relaxation regarding the viscoelastic component. Using microindentation, the force-relaxation and force-distance profiles will be analyzed to obtain the force relaxation as a function of time and elastic modulus. Matlab was used to extract the two parameters, relaxation and elastic modulus, to assist in confirming the stiffness and viscous properties of the polyacrylamide hydrogels. Using matlab to analyze the results of two different polyacrylamide hydrogels of 8.8kPa and 40kPa, the results showed8.8kPa contained a larger force relaxation curve in comparison to the 40kPa. This work can lead to broader use of examining cellular behavior using various confirmed physical parameters of polyacrylamide hydrogels.

Pandemic effect on civic engagement in the 2020 election. Analysis of individual-level data

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The COVID-19 pandemic resulted in soaring unemployment rates, income insecurities, and a high death toll which affected millions of Americans. Previous research on census completion during the pandemic, found that the high levels of unemployment interacted with low resilience to accurately predict lower levels of census completion during the pandemic era. The present study examines the pandemic shocks and resilience effects on voting participation in the 2020 presidential election. To study civic engagement in the 2020 election, a dataset from the Cooperative Congressional Election Study (CCES) is utilized to examine individual-level analysis of pandemic shocks such as loss of employment and resilience factors including government aid or stronger financial network. First and foremost, CCES is a nationally representative survey data that is used to show how policies that protect economically vulnerable from full impacts of pandemic predict voter turnout. Using quantitative analysis of individual-level data from CCES 2020, the finding shed light on how different types of resilience from a major shock such as pandemic can increase civic engagement. In addition, high levels of pandemic shock interacted with low resilience accurately predicted lower level of voting participation in the 2020 election. Ultimately, the study shows the importance of resilience from government policies or financial resources to reduce the civic engagement gap in moments of crisis such as the pandemic.

Optimizing Support for Type 1 Diabetes Management in Early Emerging Adulthood

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The transition from adolescence to adulthood is a critical time when early emerging adults (ages 18-24) encounter new difficulties with managing their type 1 diabetes (T1D). The emerging adult's support for T1D shifts as parents become less involved and young adults establish stable romantic relationships. Involvement from parents in young adults' T1D management remains beneficial, but limited research has examined the involvement of romantic partners or what emerging adults and support providers (SPs) find helpful or unhelpful for management. We tested an intervention to help emerging adults with T1D optimize support for diabetes management. Interviews conducted after the intervention with 29 emerging adults and 20 SPs were qualitatively coded to understand: the selection of a SP, the role of SPs in emerging adults T1D management, how emerging adults optimize support for T1D, and differing perceptions across support sources. Most patients selected a parent or romantic partner as their SP. We are developing a qualitative coding system to identify common themes that capture what is helpful or unhelpful in these social relationships. Initial findings suggest patients view others as helpful, but may not want or know how to optimize support as they become independent, regardless of primary source of support. Findings have important implications for understanding the social context of T1D management and assisting emerging adults and SPs to better manage diabetes.

Housing Inequity: An Overview of How Land Use Policies Contribute to Political Inequality and Housing Segregation in the Bay Area

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Since the early 19th century, local governments have used their powers of land use regulation to generate and sustain inequality by constructing policies that disproportionately benefit white property owners at the expense of marginalized communities. Local governments' land-use powers range from designating the use of an entire neighborhood to determining the minimum parking spaces a home must have. This study aims to analyze land-use regulations within Bay Area cities to better understand which policies drive racial segregation. City-level data was collected on land use regulations for over 100 cities. The variables coded include, but are not limited to, restrictions on building townhouses, the presence of density bonus overlays, and senior housing restrictions. We use Ordinary Least Squares (OLS) regression to test the relationship between land use regulations and city-to-city segregation. The analysis shows that several land-use regulations such as restrictions on townhouse development, larger minimum lot sizes, and lower floor area rations are associated with different kinds of city-to-city segregation in the Bay Area. Residential zoning density, in particular, is the strongest predictor of city-to-city segregation amongst all variables. The results attained in this study will aid local governments in recognizing the racial inequalities entrenched in their land-use policies and will outline suggestions for moving towards intentional and fair housing practices in the Bay Area.

Healing Events About Covid-19 and Its Effectiveness On Civic Engagement

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The Covid-19 pandemic has affected millions of people across the world, especially those in higher education institutions. Students have faced stress in not only fulfilling their academic duties, but the hardships that have come along with the pandemic (loss, food insecurity, mental illness). The University of California Merced has pushed many resources for their students one being of healing events most called "Healing Circles." This project focuses on questioning if healing events that discuss the subject of COVID-19 pandemic life impacts increases civic engagement for UCM students. The purpose is to see if people who attend healing events later show an increase in civic engagement. Although other resources on campus host other means of support to students during these uncertain times, the effectiveness of event-related resources is what will be explored.

Manganese-Catalyzed Hydrofunctionalization of Terminal Olefins

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The use of earth-abundant metals in catalysis has gained attention in the past years. Cobalt, iron, and nickel catalysts have been extensively researched, to act as a replacement for the more expensive precious metal catalysts. We have synthesized the manganese (II) catalyst, [MnCl2(dmpe)2], we have assessed its efficiency as precatalyst for the hydroboration, hydrosilyation, hydrostannylation of styrene and 1-octene.The results show that this catalyst is efficient for the hydroboration, hydrosilyation, and hydrostannylation of styrene upon in-situ activation with NaHBEt3or KOtBu. The reaction has been optimized for time, temperature, activator, catalyst loading. The products were characterized by 1H NMR spectroscopy. Remarkably, NaHBEt3afforded anti-Markovnikov regioselectivity, while the KOtBu activator yielded the Markovnikov alkane as the major product. Further work is currently undergoing to expand the substrate scope, with morefocus on different substrates.

The role of the BAF complex in activity-induced neuronal gene transcription

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The BAF complex is an ATP dependent chromatin remodeler that facilitates gene transcription. Neuronal activity stimulates gene transcription and causes the release of two classes of immediate early genes (IEGs) called the rapid and delayed IEGs. What is still unclear is the role the BAF complex plays in neuronal activity-induced gene transcription. The BAF complex has a subunit called BAF 170, and past research has shown that it is necessary in brain development. When this subunit is mutated, it leads to neuronal development disorders such as autism spectrum disorder, amyotrophic lateral sclerosis, and schizophrenia. We hypothesize that the BAF complex is needed for the activity-induced transcription of IEGs. We test this hypothesis by using pharmacological degradation (ACBI) or functional inhibition (BRD98) of the BAF complex and study transcriptional response of the IEGs by measuring their pre-mRNA, the direct transcriptional output. RNA is extracted from primary cortical neurons treated with degrader/inhibitors and Bicuculline (a pharmacological inducer of neuronal firing) and was utilized to quantify transcription of rapid and delayed IEG pre-mRNAs using real-time quantification PCR. This project is expected to illuminate brain developmental processes which may have relevance to neuronal development disorders.

Livingston Centennial: Discrimination Against Racialized People in Agriculture

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The City of Livingston, California will mark its 100-year anniversary in 2022. Throughout its time, Livingston has been home to Indigenous, Mexican, Japanese, Punjabi, and European communities. Despite the city's rich history, much has been buried by dominant narratives. The Livingston Centennial Public History Project is a multi-faceted project which exhibits the critical history of Livingston. Through collection of newspaper articles, letters, photographs, and oral history interviews, the Livingston Centennial team is developing a publicly-accessible archive to center marginalized communities and their experiences in the history of Livingston. For the project, researchers focused on different aspects of this community history. This presentation specifically highlights historic discrimination against racialized people in agricultural settings. Thus far, materials have been uncovered which point to efforts by wealthy landowners to prevent racialized people from buying land. Additionally, the prevalence of racial slurs against Mexicans calling them “wetbacks” in newspapers from 1950’s may point to the overall view of racialized people in Livingston at that time. In the 2021-2022 academic year, community members will contribute to the archive through image upload, written stories, and oral histories about their lives in Livingston. From these materials, the team will develop a curriculum for Livingston High School students to conduct their own community-based research projects to be presented in Spring 2022.

Livingston Centennial Project

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In 2022, the City of Livingston, CA will mark its 100-year anniversary. Livingston has a diverse history, with Indigenous, European, Mexican, Japanese, and Punjabi communities. Despite the city’s rich history, many of its stories have been lost or covered by dominant narratives. The Livingston Centennial Public History Project is a multi-faceted project that showcases Livingston’s rich and diverse history. During the duration of the project, researchers focused on different aspects of Livingston’s history. Through a review of creative projects from Livingston High School students, researchers identified a sentimental response to Japanese internment. Researchers also identified memory work from Livingston through newspaper articles which portrayed delayed graduation for Japanese Americans and a school dedicated to the Yamato Colony. Materials and stories were collected from online archives, local archives, and oral history interviews. Through archival research and digitization of various resources, an online repository to showcase Livingston’s updated history will be created. The community-based online repository will enable participation from the community through image upload, written stories, and oral histories about their lives in Livingston. In Fall 2021, a curriculum will be developed informed by the stories unearthed in the Summer project. During the 2021-2022 academic year, Livingston High School students will review the newly created repository to develop their own community-based research projects which will be presented in Spring 2022.

Analyzing Cell-Extracellular Matrix Interactions Via Traction Force Microscopy Using Various Stiffness

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Mechanical forces between cells and their extracellular matrices play a critical role in regulating cellular behavior involved in diseases. The ability to quantify these forces remains a challenge in science today; yet mechanobiology has ushered in new techniques that allow for the measurement of forces through traction force microscopy. The development of traction force microscopy has given us an insight into understanding these forces that play such a prominent role in cellular behavior. Traction Force Microscopy was performed by placing human lung fibroblast cells (MCR-5) on collagen covered Polyacrylamide hydrogels with varying stiffness of 40kPa and 8.8kPa, using a bead size of 0.5□m at a high bead density. Using fluorescence microscopy, before and after images of the fluorescent beads embedded in the hydrogels were captured, which allows us to analyze the displacement applied by the cell. We expect the results to show that a substrate with a higher stiffness will allow the cell to create larger traction forces but will result in smaller displacements. Understanding how these cells interact with a known substrate allows us to gather biological, biochemical as well as biomechanical information regarding the cell's behavior. Future work will involve constructing a gradient that will allow us to determine forces based on the stiffness of the substrate.

Community Meets Healthcare: A Review on Immigration Status as a Social Determinant of Health

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Healthcare is not a right in the U.S., which makes it difficult for citizens to seek care. And because of exclusionary immigration and health policies, noncitizens—especially undocumented patients—face even more uncertainty when seeking care. COVID-19 has impacted every aspect of life, including the need for health care, and increased this uncertainty for undocumented patients. Existing scholarship has acknowledged the socially determined nature of health and highlighted immigration status as a determinant of health, but it overlooks the importance of medical legal violence (MLV) during COVID-19 in the San Joaquin Valley. This review explains the importance of MLV and immigration status as a social determinant of health prior to COVID-19. The review will start by looking at existing sociological theories of health, beginning with the first acknowledgement of socially determined health to immigration status as a determinant of health. Following this will be the explanation for immigration status being racialized and how it relates to MLV. Using existing literature in the field, the review underlines the presence of MLV and how this may affect the ability of undocumented patients to seek health care. Literature was found using the following keywords: health access, immigration status, policy, migrant workers, San Joaquin Valley, and social determinants of health. The review argues that there is a need for studies about MLV in the San Joaquin Valley. Undocumented patients need to be given the right to healthcare and there must be further research on the effects of COVID-19 on undocumented patients access to healthcare.

Teen Parents' Mental-State Language and its Impact on Children's Emotional and Social Development

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Parent mental-state language is essential for children's emotional and social development. Prior studies have shown that in general teen parents speak less to their children when compared to adult parents, raising the possibility that there is less mental-state talk between teen parents and their children. No prior research has examined teen parents' mental-state talk. This research will examine how teen parents talk to their children about thoughts and feelings and whether they engage in less of this talk than adult parents.Data was collected from 14 families in Merced and Fresno county. Participants completed a 10-minute videotaped semi-structured play session between teen parent (13-18 years old) and their child (12-36 months).The videos were coded for parent talk, including the amount of talk about mental states, the type of mental-state terms used (e.g., cognition, desire, emotion), and whose mental states were referenced (e.g., parent, child, other).Once the videos are coded, we will analyze these variables to determine how teen parents talk in comparison to adult parents. If it is found that teen parents speak less to their children about mental states, then this would suggest that their children could be at risk of delays in social and emotional development.

Analysis of a Microorganism living within the Seagrass Rhizosphere using Pangenomics

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Seagrass meadows are important marine ecosystems that provide a variety of different ecosystem services to people. For example, they regulate water, prevent erosion, and recycle carbon dioxide from the atmosphere. The services seagrasses provide to people are contextualized by the microorganisms they associate with. The microorganisms that inhabit the rhizosphere aid in maintaining and stabilizing the productivity of seagrass meadows. For example, in exchange for nutrients, Chromatiales living within the rhizosphere are predicted to oxidize sulfur to remove sulfide. Sulfide is toxic, therefore its removal is essential for Seagrass meadow's health. Both seagrass species and microbes heavily rely on each other for survival. But, the knowledge on seagrass-microbial relationships is limited. Chromatiales living in the seagrass rhizosphere likely have genes that other related symbiotic Chromatiales don't possess. In the rhizosphere, Chromatiales depend on their host, which could possibly cause them to express different genes that aid in the survival of both their host and themselves. The main focus of my research is to compare and contrast the gene content of Chromatiales species that are isolated from different sources. Using a pan-genomic approach, one can compare the presence and absences of genes between a genome isolated from a seagrass rhizosphere to its closest relatives with the Chromatiales. By using the program Anvio, a pan-genome created from the genomes of seagrass microorganisms can display the absence and presence of genes in closely related Chromatiales.

Listening to the Margins of the Valley: Documenting the Oral Histories of California Central Valley's Punjabi Community

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In recent decades, efforts have been made to document the histories of California's diverse Asian immigrant communities, but they continue to be relegated to the margins of the state's official history. A much smaller body of work has documented the histories of the Punjabi community across California's Central Valley. To bring the Punjabi's historical presence in California to the surface, this study documents the collective memory of Livingston's Punjabi community as it has been passed down through generations in the form of oral histories. A piece of this community's oral histories was compiled through literature review of this community through articles that discuss this community's history through the States and what is missing in terms of understanding of this population. To advance the research a series of fifteen minutes semistructured interviews will be conducted to addresses issues such as ethnicities, the change of time in perspective of being Punjabi, politics, growth of families and changes in generations. These interviews will be then transcribed and thematically coded to identify the Punjabi community's concerns and self-positioning within the greater Livingston community's history. By analyzing the oral histories of the Punjabi community in Livingston, this study contributes to a larger body of research on underrepresented populations across California's Central Valley while unearthing the voices of Livingston's Punjabi community and repositioning it within California's official history.

Swarm Gas Sensing

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Earth's atmosphere protects the earth from the sun's rays allowing the earth to be inhabitable. Methane (CH4) is a greenhouse gas that is produced in various ways. Methane emissions obstruct the earth's atmosphere composition causing global warming. In our venture to quantify Methane emissions utilizing multi-UAV methods. The targeted goal of creating an interconnection between a robot simulator (Gazebo)to a MATLAB plume odor simulator(POSIM) through ROS (robotic operating system) will allow for testing of methodology. Proficiently bridging these platforms will pave the way to use ROS and MAVLINK, MAVROS, to govern pixhawk autopilots and/or visualize in a ground control station for the UAV.

Misinformation the phenomenon, and how it affects Stockton, CA

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Misinformation has become a problem, as the number of countries with political disinformation campaigns on social media doubled in the past 2 years, according to a recent New York Times article.Low levels of education and declining local news sources leave communities like Stockton vulnerable to misinformation. Stockton's local news outlet The Record has shrunk dramatically, leaving individuals to look at other more modern news sources. In its place, an Instagram page called 209Times has gained popularity and now has 145K followers. It claims to be the central valley's most impactful media source. This research will examine 209times's Instagram page, review information, and seek to understand why this source has become people's main news source despite it not being an established, well-recognized media source in the news industry. In addition, an assessment that analyzes a recent subset of posts will seek to uncover if bias and emotion affect engagement levels and the contribution of possibly misleading content.

Influence of Type VI Secretion System On Host Colonization and Spatial Structure of V.fischerii Symbionts in the Euprymma-Vibrio Symbiosis

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Fighting and competition build the basis of the natural world, the fiercest of which are among microbe. Even in highly specific relationships such as symbiosis, variance among symbiont creates instrapecific competition, increasing the complexity of the interaction. The symbiotic relationship between bobtail squid, Euprymna, and the bacteria, Vibrio fischeri, is one of the model organism used to study such interaction due to the 1 to 1 obligate relationship. In this symbiotic relationship, V. fischeri colonizes individual crypts of the light organ of E. scolopes that is housed within its mantel cavity. The bacteria bioluminescent at night, helping the squid to camouflage against the moon in a process called counter illumination. Even though E. scolopes highly specific to V. fischeri, various strains of the bacteria compete fiercely to dominate the crypts of the light organ. In this study, we look at specific strains of V. fischerien coding a Type VI secretion (T6SS) system that were isolated from squid hosts from various geographical locations. This system represents a mode of competition where bacteria with T6SS inject effect or proteins into nearby bacteria, killing off those without immunity. Various strains of V. fischeri from within and among symbiont population will be coincubated to determine if T6SS-encodingstrain confers a higher fitness against V. fischeri strain that was T6SS negative.

College Readiness: The Determinant of Student Success

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Students' academic success, resources, and achievements have been found to vary based on their socioeconomic backgrounds. This study focuses on socioeconomic differences in how high schools prepare their students for college. Through inductive coding of interviews with high-achieving students and a review of relevant literature within the field of sociology, this research shows how students with similar levels of academic achievement encounter different types of college preparation and college exposure from their high schools because of their socioeconomic backgrounds. Results show that high schools provide this environment of growing social capital and existing program aids without impactful intervention. Although, the amount of social capital and the number of programs meant to expose and prepare students for postsecondary education differs depending on the socioeconomic status of the student majority.

Investigation of Wildfire Ignition Behavior Using Statistical Tools and Programming Languages

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Wildfire has been a major issue in some areas of California because of the environment and dry weather, and it has cost the state enormous amount of funding to compensate for the fire. Due to the great number of wildfires, understanding and characterizing ignition sources can help better prevent fires. Our group has conducted experiments on ignitions and recorded the parameters with observation and video processing, but to draw conclusions from the data, we need to develop a framework that examines factors influencing the ignition of wildfire by using ANOVA test in Python. ANOVA is a statistical modeling technique that examine if there are significant differences between three or more data groups using variance analysis. To perform the test efficiently, Python will be used to automate the process and output statistical result. The final script should be able to take user inputs, extract experiment data and perform the analysis on the data and producing an ANOVA table. Successfully building the model will play an important role in identifying important aspects that are contributing a wildfire's ignition, the outcome is then used to help people better understand wildfire, thus help preventing or suppressing wildfire more effectively in real life.

Meatpacking Work Health and Safety

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Meatpacking work is labor intensive and the experiences for these workers has often been overlooked. There has been no qualitative research on COVID-19 workplace health and safety in meatpacking workplaces. This study would examine how people experience workplace health and safety protocols in meatpacking workplaces. Due to the demanding working conditions of meatpacking workers they can be expected to be especially vulnerable during the pandemic. To further examine this, we plan to conduct interviews with 30 individuals working in these meatpacking industries using a semi-structured interview guide. These interviews will contribute to better understanding their experiences in these workplaces during an especially vulnerable time.

UC Leadership Excellence Through Advanced Degrees (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.

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

Structural biology of the regulatory mechanism of biofilm formation by cyanobacteria

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Cyanobacteria, the first oxygen-evolving species are unique and have widely been used for decades as model systems to study the principles of photosynthesis. In aquatic environments, cyanobacterium may cluster together encased by a protective slimy layer to form biofilms. Biofilms can be harmful as they restrict nutrient inflows in aquaculture and can cause infections in humans. However, they also offer huge potential for bioremediating hazardous waste and form bio-barriers to protect soil and groundwater from contamination. Schwarz's lab1 identified several genes that regulate biofilm formation in cyanobacterium Synechococcus elongatus. The studies also revealed a tripartite complex of three proteins- EbsA, Hfq, and an ATPase homolog PilB (formerly T2SE) and demonstrated that each of these components is required for assembly of type IV pili (T4P) appendages, DNA competence, and affects the exoproteome in addition to its role in biofilm self-suppression. Recently, the solution structure of EbsA was determined by NMR2. The main purpose of the current project is to elucidate the structures of Hfq, PilB and a stable complex between them using X-ray crystallography. Protein purification techniques using Ni-NTA columns and size-exclusion chromatography were employed to get a high yield of recombinant Hfq and PilBG611-N666 proteins. Crystallization trials are currently being optimized to obtain crystals of the complex- Hfq: PilBG611-N666. Crystal diffraction data will reveal the structural details of the proteins and stoichiometry of the Hfq: PilBG611-N666 complex.

Formulation and Cure Behavior of Clear and Elastic Stereolithography Resins

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Within the field of additive manufacturing, three dimensional (3D) printing is a method to create three dimensional (3D) objects and shapes using small layers. Stereolithography (SLA) printing is a specific method that uses polymers in viscous liquid form called resin as the material to build objects. Resins are made using formulations, so it was necessary to read literature on how formulations reveal the process of creating resins. Testing the capabilities of commercially available clear and elastic resin from FormLabs on their Form2 printer using the publicly available AmeraLabs "Town" calibration tool provided a comparison to define the characteristics of each resin. Then a quantitative analysis of the clear and elastic formlabs resin was done using FTIR spectra of printed parts in various post-cure stages. The post-cure stages ranged from 5 to20 minutes in 5 minute intervals. This helped gain understanding in how resins are formulated, how each resin performs, and how the chemical structure is affected during the post-cure process and provided a preliminary database of resins used in the Wang laboratory.

Equity of Wastewater Monitoring of SARS-CoV-2in California

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During the span of the ongoing coronavirus disease 2019 (COVID-19) pandemic, the scientific community has fostered a responsibility and standard to provide accessible public health resources within their communities. Continuing the methods of the "COVIDPoops19" global dash board of wastewater monitoring for SARS-CoV-2, the goal of this research was to perform a geospatial equity analysis of COVID-19 Wastewater Based Epidemiology (WBE) in the U.S. state of California. Methods included a combination of government-provided data, standard literature review, webinars and conferences, and database keyword searches. There are 12 universities, 9 public dashboards, and 48 of 384 wastewater treatment plants monitoring wastewater for SARS-CoV-2 within their communities and counties. Considering the monitoring inequities in disadvantaged communities throughout the state, WBE cannot be solely dependent on publicly accessible data with the many gaps that present themselves in the income, linguistic, educational, and health access disparities .Much of the wastewater monitoring in rural areas particularly in the Central Valley of California hardest hit by COVID-19 in the state with lower vaccination rates. Also, little monitoring is occurring in Northern California. Similar to access to COVID-19 clinical testing and vaccinations, there is disparity in access to wastewater testing that can often provide an early warning system to outbreaks. This research demonstrates the need to consider equity when determining locations for environmental monitoring.

Potential for Automating Environmental Compliance by Farmers: Soil Carbon Emissions

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California is a major agricultural producer and a state where sustainable agriculture (SA) is an important research topic. As SA approaches are identified, automated systems for documenting outcomes will be needed. This work focuses on two interrelated SA challenges: (1) farming to enhance soil carbon storage and (2) flooding farmland (during wet years) to ensure adequate future water availability by recharging groundwater. Soil carbon storage is vital to crop production while improving soil structure, reducing erosion, and mitigating climate change. We studied flood irrigation using Hydrus-1d, a model that stimulates water movement through soil to groundwater, for a range of soil types. We also developed and tested carbon dioxide (CO2) sensors for estimating soil CO2 emissions from soils with varying moisture conditions. Model results showed differences in groundwater recharge rates for different soil types, and also provided the soil moisture conditions to support development of a soil CO2 sampling plan. In the future experiments, we will use the CO2 sensors to compare emissions from irrigated and non-irrigated soils and use Hydrus-1d outputs to help develop more efficient irrigation practices. The outcomes from this work will be used to better connect the processes of groundwater recharge and soil carbon storage, and to bring forward ideas on the future of agriculture within automated sustainability measures.

Interaction Between Flaming and Smoldering in Hot-Particle Ignition of Wildland Fuel sand Effects of Moisture

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The purpose of fire behavior research is to cut fire hazard. This study deepens the understanding of the smoldering phenomena in wildfires. Smoldering is the leading cause of deaths in residential fires due to the characteristics of incomplete oxidation reactions causing a mixture of toxic asphyxiants. Being a low temperature flameless slow burn, smoldering is prolonged by heterogenous chemical reactions that transport heat throughout the fuel. In our lab, we observe distinct ignition types including direct flaming, smoldering, and smoldering to flaming transitions by dropping hot particles into a fuel bed. Prior to, we measure the FMC (fuel moisture content)since this can cause delays in ignition timing. Due to the dangers of smoldering fires, we study this phenomenon to have a better interpretation as to how this complex system operates. Little research has explored this trend and our objective, is to find a quantitative understanding of how this occurs under unique conditions. To observe these occurrences will help us understand the systems behind rapidly spreading wildfires.

Optimization of ECM Ligand Patterning on Polyacrylamide Hydrogels

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Polyacrylamide hydrogels are used to prepare substrates of controlled stiffness to explore extracellular matrix (ECM) effects on epithelial cell function. The surface of these hydrogels are relatively simple to functionalize with different ECM components, such as collagen or fibronectin, making them very versatile once it is transferred onto the hydrogel. In this project, we will control the shape (circular), size, and the number of arrays of the ECM ligands, and optimize the protocol to obtain high reproducibility. The presented approach does not require photolithography approaches. Optimization is important to observe the epithelial cell function clearly under the microscope. The ECM-ligand patterned hydrogels will then be plated with cells, to yield a cell monolayer within a controlled geometry and cell colony size. These cells will be used for an in vitro model to mimic the alveolar epithelium in the lungs where smoke will be introduced and the effects will be recorded.

Analyzing HDPE Plastic Bag Polymer Material for 'Plarn' Bag Applications

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'Plarn' is a portmanteau term used by crafters to describe yarn made up of cut and knotted plastic bag film. This term results from combining the words "PLastic" plus "yARN" and is a material used to re-purpose plastic bags into other products. The process of making plarn is comparatively slow compared to common recycling methods, but it is still underutilized in mass production since there is still little known about its viability as a recycled material. The most common application of plarn is weaving or crocheting the strands into bags. Recent studies have utilized typical plastic materials to create yarn samples for testing and measuring their mechanical behavior. In this study, we have investigated plarn's usefulness for bag applications by computing composition-properties plots and life-cycle assessment (LCA). Using independent experimental studies, eco-audit data, and materials modeling software, we have evaluated how the relevant mechanical properties of plarn change as a function of size and analyzed different traits including price, energy, and CO2 footprint in the fabrication of bags. Preliminary results indicate that the plarn material is comparatively very low cost and can have similar properties as conventional materials. Relevant properties together with LCA data of the plarn material are pivotal in determining its potential and alternatives in a systematic approach to optimize a rationale to better select and design plarn. We envision this research will help decrease plastic pollution in the environment as the plarn technique will increasingly become more commercialized and prevalently used as a mechanical plastic recycling method.

UC Center Sacramento

The following student scholars are part of UC Merced's UC Center Sacramento (UCCS) Program. UC Center Sacramento supports the work of researchers and students in the UC system by giving them access to data and policymakers in Sacramento, California. Doing this helps bridge the research and policy divide to do better research and make research backed policy decisions.

For more information, please visit: https://uccs.ucdavis.edu/public-policy/uccs-collaboratives

Resource to Opportunity: Access to Higher Education in CA Public Schools

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The state of California is composed of many acclaimed higher-education institutions. Also composed of a distinctively diverse population, college attendance demographics are not reflective of the state population at large. Majority of students who attend college stem from the middle-class, holding a familial background in higher education and completion. Generational experiences provide educational guidance that further navigates their student's success. A degree gap is created, separating low-income communities and underrepresented groups away from educational attainment. This research aims to understand factors of the degree gap. Do students in low-income communities attend schools that hold fewer educational resources? And do schools with fewer educational resources produce lower educational attainment/college enrollment?
Data for this comparative cross-analysis covered areas in Southern California, the Central Valley, and Northern California to serve as a regional outlook in the state's public education system. Using Free Reduced Lunch (FRL) as an SES indicator, low-income students lack access to educational resources, hence college enrollment when compared to middle-class peers in their respective districts. This research looks further into defining the type of resource-based programs that supplements educational attainment.

Undergraduate Research in the Humanities (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 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 Center for the Humanities, the Graduate Division, and the School of Social Sciences, Humanities, and Arts is made possible through a grant from the Andrew W. Mellon Foundation.

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

The Impacts of Blockbusting on Neighborhoods in Washington D.C.

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Blockbusting was a technique used by real estate agents to integrate African Americans into all white neighborhoods, in hopes to profit off whites' fear. Before 1948, neighborhoods were all-white residents. After 1948, blockbusting became a prevalent tactic. These changes have led to racial disparities, community displacement, and the shaping of the neighborhoods which exist today. This study examines the impacts that blockbusting has had on neighborhoods in Washington D.C. Specifically, finding connections that blockbusting may have to neighborhoods, segregation, city development, and housing policies. The focus is to explore how blockbusting affected African American's socio-economic statuses and the determinants of neighborhood living in Washington D.C. Through collecting historical information on blocks in Washington D.C., results show that living conditions lessened in neighborhoods with primarily African American residents. The methodology for this study included analyzing public data record sheets and qualitatively coding them to find patterns of blockbusting. The data was concentrated on the neighborhoods of Jefferson St. Kennedy St., Longfellow St., 4th St. Ingraham St., Kansas Avenue, Hamilton St., and several more. The data results indicated that inmost instances when a sale happened on the same day it was usually sold more than once. Once these neighborhoods became mainly resided with communities of color, there became a lack of adequate institutions, stores, city development, layout, and even law regulations. Overall, blockbusting built the foundation for the cities of Washington D.C. which now has created segregated neighborhoods based on race and class.

Bengain Post-Colonial Kenya from 1966 to 1969: Asserting African Identity and Bridging the Communicative Divide Between the Government and its People

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Musical influencing and cultural blending have been an integral part of expression ,permeating every corner of the world and showcasing the experience of civilization throughout history. Twentieth century Africa is no exception as technological accessibility expanded and opportunity for creative expression and output. Prior to this technological expansion however, musical hybridity existed through cross-cultural contact and, at times, forced influence. In taking an in-depth look at the explosion of benga music in the 1960s, the ways in which this music form was used to reassert Black identity in a nation which had seen its collective conscious fragmented by colonial segregation. Expressive performances, lyrical content, and performance locations will illuminate the social context of the everyday Kenyan regarding perceptions of their newly gained uhuru (freedom) and the relationship between the people of Kenya and its government in the new Republic. Qualitative analysis of primary source material and existing research suggests a plethora of social commentary and political dissent which found opportunity to circumvent censorship practices within the nation state. The commentary found within benga music in Kenya exemplifies the capacity held by its populations to form and critique perceptions of sociopolitical conditions and continues to be an integral part of discourse within the nation.

Gentrification, Zoning, and Segregation in the Washington DC Neighborhoods of Naylor Gardens and Mclean Gardens

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Both Naylor Gardens and McLean Gardens were built by the Defense Homes Corporation for war workers and their families during World War II. They were both built in response to overcrowding in low-income neighborhoods. After the war Naylor Gardens was sold to the Veterans Housing Association, while Mclean was sold to a private investment. This paper addresses why these housing projects took different trajectories. Naylor Garden became primarily African American in the 1960s and more recently has been gentrified while Mclean remains a community for white residents. Mclean Gardens complex serves moderate- and middle-income housing, but tenants have concerns with the development of high-rise buildings. Drawing from historical analysis of newspaper articles and scholarly articles with information from the past and present of the housing projects, this paper will help us to understand these changes. The findings will hopefully help the DC Council understand the needs of residents as well as explain neighborhood change.

Expanding the Fear One House at a Time: How Does Blockbusting Instill Fear and Affect the living environment in Manor Park and Brightwood Park Washington, D.C.

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One of the factors allegedly influencing the racial turnover of neighborhoods is blockbusting. Blockbusting is when real estate brokers pressure homeowners to sell their homes quickly in order to influence the racial turn over of a neighborhood. Despite there being an awareness of this tactic, very few studies have focused on the effects of blockbusting on the disinvestment from the community, which is caused by the perception of crime. No studies to our knowledge have examined the impact of blockbusting on disinvestment from the community. Historical articles and newspaper clippings described the growing perception of crime from blockbusting. With the use of the Record of Deeds from Washington, D.C., and Census Tract 21.02, this study demonstrates the disinvestment between 1940 and 1970in Manor Park neighborhood and Brightwood Park neighborhood. The results also implicate that the real estate brokers' tactic of blockbusting impacts the living environment of Manor Park neighborhood and Brightwood Park neighborhood in Washington, D.C.

The New Orality Project: Podcast as an Educational Media for Learning and Access to Academia

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In recent decades, especially since the explosion of the internet, technological advancements have deeply impacted the circulation speed of information on a global scale and transform its access and consumption. Digital media like podcasts serve as oral forms of expression allowing for distinctive literary access and reception. The convenient and personal management of podcasts allows for their availability to cater to a larger public. This widespread access is in stark contrast to the private community of academia. Taking this into consideration, this study analyzes podcasts as an educational media platform that further democratizes the discovery and access of knowledge beyond the academic realm. I argue that the format and structure of the podcast have the potential to disseminate academic discussions and engage with a non-academic public. This merging access between the academic and non-academic realms is essential to ensuring equity and inclusion for those in the pursuit of discovery and knowledge.

Chinese School: Americanization and Merced Chinese, 1919-1920

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Asians in the U.S. have faced unfairness and ostracism in immigration and education. Despite racist and exclusionary policies and practices, Chinese immigrants passed through Angel Island, near San Francisco, and their U.S. born children went to school, adding to the community's sense of permanence. In some places, such as San Francisco, school boards practiced segregation. Although state laws made this illegal, others looked to establish private Americanization schools for various immigrants. In 1919 in Merced, local Reverend Frank E. Davis of the Christian Church opened an Americanization school at the Chinese National League Building on Fourteenth Street. Located in Chinatown, Davis appealed to third-generation American-born Chinese. Having spent nearly three years doing missionary work in China, Davis thought that Chinese traits were incompatible with the 'American character'. He referred to his students as foreigners and believed it was the Church's role to lead the Chinese into becoming "useful" and "good" citizens. This school, built on Rev. Davis' earlier successful Sunday School that served Chinese residents, a school which he opened almost immediately upon returning from China. Using digitized newspapers, this project analyses this school, its intended work among the Chinese community, and its significance as a Merced-specific iteration of Americanization efforts oriented to altering the allegedly "heathen" and "inferior" Chinese culture.

Obstacles of Public Housing Over the Years

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The public housing program and its residents have over time gained a homogenized, negative image. This image has influenced policies made based on a disaster program rhetoric that have led to years of varying experiences among residents. Obstacles to public housing can be seen to have arisen as early as the planning and construction phases. And later, when the program began showing signs of failure and discontent, efforts such as the HOPE VI program, which intended to correct severely distressed public housing, also saw new obstacles for both the program and residents. To address the ongoing obstacles in public housing, I will first provide an overview of the program. Next an analysis of newspaper articles on the sites Lincoln Heights, Richardson Dwellings, and East gate Gardens, located in Washington DC, will be provided to illustrate some of the obstacles public housing sites faced while being established in the early to mid-twentieth century. Finally, I will provide an overview of the HOPE VI program, followed by new literature that identifies new obstacles to public housing and residents after this specific policy change. The new literature seeks to change the outdated image of public housing and its residents in the media and in existing research. The purpose of this paper is to illustrate the need for policies and research that more thoroughly take into consideration residents' opinions, experiences, and diversity among public housing sites.

Refugee Teaching Institute

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Refugee Teaching is an Ethnic Studies Project that aims to emphasize the experiences and histories of immigrants and refugees. The experiences and histories of undocumented immigrants are often not adequately displayed. Their stories are not directly told by them, causing dehumanization, misrepresentation, and criminalization. This project approaches undocumented immigrants' experiences as knowledge, and not a problem that needs to be solved. Through the creation of a podcast, three undocumented young adults from the Central Valley share their experiences by using reclaimant narratives and story telling to declare that their experiences matter and should be preserved. Preliminary results determine that undocumented people's experiences can be different and complex but are all valid and deserve to be heard. This podcast can be used in ethnic studies curriculum for K-12students to have a broader understanding of undocumented people's stories that come directly from their experiences. In addition, its use inK-12 curriculum will help undocumented students feelrepresented and valid in class.

Re-designing Cultural Institutions through Indigenous Voices

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A research study that examines the representation of local California Yokuts tribes in Merced County museums/ history centers and UC Merced library. The Yokuts are the original native peoples of the Central Valley composed of different tribes and language groups, and where UC Merced resides. This study is designed to analyze public museums/history centers in Merced County arguing that incorporating indigenous voices and perspectives will result in more accurate and culturally relevant depictions about California tribes. Combining site visits with interviews of key personnel such as directors, and interviewing individuals that identify as members of the Yokuts, the study explores how we are learning about our local California tribes, specifically in what ways are they being represented visually, materially, and in written language. Specific recommendations are offered to re-design or enhance the way information is presented by including indigenous perspectives. By extension the recommendations will be applicable to other public institutions for improving the future representation of California Indians.

Shakespeare's Representational Theater: Claiming New Transformations through Classical Mediums

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When contemplating Shakespeare's presence in our ever-fracturing world, and even more importantly, when contemplating Shakespeare's perceived Eurocentricity in today's diverse and disparate culture, we may question the relevance of our world's "greatest playwright". At first sight, 400 years old plays written in an archaic language and deriving from a former colonial power can appear untranslatable in today's contemporary society. Recent theatrical work, however, has shown that Shakespearean theater can continue to not only remain a part of education and elite cultural circles but more importantly, be actively repurposed to be performed by and for traditionally marginalized communities .Through this research, we aim to raise awareness of the underrepresented aspects of theater by showcasing the work of ground breaking Shakespearean companies. This includes a literature review on Shakespearean productions that engage with questions of race and representation, semi-structured interviews with theater creators and members of the "Take Wing and Soar" Theater company, and the archival of their work. By providing an exploration of the various ways Shakespearean literature is being repurposed for more inclusive access in today's society, we demonstrate the perpetual relevance that theater and Shakespeare have on our ever-diversifying world.

The Hidden Conditions in the Washington D.C Projects

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During the creation of Washington D.C's housing projects in the 1960s, the main goal was to provide residents with affordable quality housing in the city. Beginning in the 1970s, the quality of living within these housing projects declined. With the rise of housing project demands, residents have found their living conditions and surroundings to be a threat within itself. This paper aims to highlight the change in quality of living caused by the declining conditions in the 1970s and the rise of gentrification, beginning in 2004, within Northwest One housing project neighborhoods. The study reveals the impacts of deteriorating housing conditions, violence, and gentrification. The main steps taken to resolve these problems include the formation of a neighborhood task force and initiatives taken by residents. The study suggests that additional initiatives and the formulation of upgraded solutions would strengthen and enhance the quality of living for residents within these housing projects.

Shakespeare and Sexuality: Utilizing Theatre for Gender Education

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Current primary and secondary educational curricula in the United States K-12 systems which address gender and sexuality are often limited or restricted in both content and form. Recent studies suggest that the inclusion of creative and performing arts in these curriculums has the potential to initiate dialogues around these topics. However, research on the use of theatre as an educational tool addressing questions of gender and sexuality is rather limited. Thus, this study analyzes the way that modern Shakespeare adaptations can be used as specific tools to address gender stereotypes and educate younger generations about gender systems and hierarchies. I center my analysis on semi-structured interviews with theatre performers, creative pioneers, and contributors to LA Women's Shakespeare Company and on an assessment of Shakespeare's productions in modern educational settings, with a focus on the work of Lisa Wolpe. By presenting the various ways in which Shakespearean theatre has altered and affected the understanding of gender for previous members of the community, this project demonstrates that theatrical performances of Shakespeare's works can influence and promote progress in gender education.

Historical Analysis of Blockbusting in Washington DC: Migration and Home Sale Patterns

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Preceding the disbandment of racially restrictive covenants post-1948, Washington DC experienced events of "blockbusting" in which realtors convince their residents to move out and sell their homes due to a racial/class minority population moving in. This study aims to analyze migration patterns and home sales from 1948 to 1971 within 8 neighborhoods (squares) and their associated lots in Washington DC. The District of Columbia Recorder of Deeds provided records of each square's home sale history. To conduct a data analysis of the selling history of the housing deeds, a 12-section data questionnaire was created and examined to capture migration/selling patterns. The 7 major sections in this study examined: if the lot was sold before1971, if resold in less than 6 months post-1948, if resold to a previous owner, if lot exist today, if addresses exist today, days between resale dates, if "middle person" exist (people that appeared the most in data). By compiling lots that contained a middle person it was demonstrated that 7/8squares resembled similar migration and home sale patterns. The migration and home sale patterns of 7/8 squares showed similar implications of 1. lots being resold by the same person(s)/previous owner(s) 2. lots being resold numerous times 3. lots sold less than 6 monthspost-1948 4. same-day sales 5. multiple lots being sold around the same dates 6. and a similar method of migration/home sale patterns. The migration and home sale patterns may be congruent with historical archives, newspapers, and narratives concerning blockbusting, housing segregation, white flight, and contemporary gentrification within Washington DC.

Hear My Voice: An Unraveling of the New American Identity

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According to the latest census, it is estimated that Hispanics and Latinos make up 18.2% of the United States population, making them the largest minority group in the country. Although a vast amount of research has been done on these shifting demographics and its entanglements with questions of representation and social justice, studies on the use of podcasts as a platform for the articulation of identity has been minimal. Thus, by focusing on the voices and representations of the Latino and Hispanic community, this study analyzes how the shifts of demographics within the United States are being represented and disseminated through podcasts. As the perceived image of the American subject evolves from that of a White-male-heterosexual standard to a more fluid multi-racial one. In this sense, I argue that exploring these shifts of representation and diversification both on technological formats of articulation is critical in recognizing and understanding the diverse voices in American identity.

Mobilization in Unprecedented Times: The Jakara Movement Serving Punjabi Speakers in California During COVID-19

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California's Central Valley is home to one of the largest Punjabi populations in the U.S., a large proportion of whom work in agriculture. In the beginning of the COVID-19 pandemic, there were limited translation services available for Punjabi speakers to access testing and vaccine information, resources, and financial relief. The Jakara Movement is a grassroots community-building organization working to empower, educate, and organize Punjabi Sikhs and other communities. The Jakara COVID Team was assembled to serve Punjabi speakers living in Fresno County in collaboration with UCSF's COVID-19 Equity Project. This collaboration expanded in December of 2020 to include a volunteer team of over twenty Punjabi students from universities across California. We employed the ethnographic methods of participant observation and conversational interviews to document the ways the Jakara Movement engages with the Punjabi population. Participant observation sites include virtual volunteer meetings (via Zoom) and vaccine clinics. Detailed field notes record content of meetings and vaccine events. Our analysis highlights the value of social media (e.g., Instagram and WhatsApp), provision of incentives (e.g., Door Dash gift cards and PPE bags), translation services through a bilingual appointment call line, and organization of vaccine clinic sites at local Gurdwaras. With the lack of culturally resonant resources during the COVID-19 pandemic, organizations like the Jakara Movement filled important gaps to promote health equity.

Echoes In Familiar Spaces: Audio Styling and The Audience's Invitation to the Worlds of Limetown and Within The Wires

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Podcasts are useful for influencing the way the audience thinks – audio drama especially lends itself to this application, with writers being able to cloak stronger political messages within the fictionalized worlds of their narratives. Podcasts like Limetown and Within The Wires can effectively tell stories about political and social issues through their involvement of the audience in the world of the work. The familiarity of the audience with the auditory styling of the podcast, as well as the clear audio signposting both podcasts use, also give the audience a touchstone to their everyday life that makes it less strenuous to situate themselves in the fictional world and focus on the narrative despite other potential distractions. Through close listening examinations of both podcasts, for both their scripting and the use of audio elements, I will discuss their impacts on the audience's perception of the narrative and the implications for audio drama and podcasting as a whole. While Within the Wires is slightly more effective in the use of formats that are fairly universal in their recognizability to the audience, Limetown is more familiar to those who have listened to other podcasts before; this combined with Limetown's similarities to the critically-acclaimed investigative journalism podcast Serial had significant impacts on each podcast's popularity.

The Impacts and Legacy of Shakespeare Reinvention

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Since beginning her work with the Harlem Shakespeare Festival, Debra Ann Byrd has pioneered Shakespearean production by centering marginalized voices in the arts. Actors and participants have been able to open dialogues about cultural diversity, understanding, and unity by using Shakespeare as a canvas for confronting lifelong battles with racism and discrimination. This phenomenon has led to increased interest within academic circles to revisit Shakespeare from the perspectives of representation, race, cultural diversity, and social justice. Surprisingly, in an industry where emotions are a vital part of the creative process, a scant amount of studies have approached the analysis of this process from an affective lens. Thus, this study examines the emotional spectrum of Byrd's work and the Harlem Shakespeare Festival, observing the emotional costs and significance regarding possible contributions to social change. Through interviews that I conducted with actors and participants in conjunction with the examination of physical and digital content, I was able to dive into the communal and interpersonal impacts of Shakespearean reinvention. While an emotionally costly experience for those involved as they engage with and resolve trauma relating to their identities, I argue that the emotional benefits and costs of using Shakespeare as a means of explaining history and reclaiming identity presents an opportunity to utilize Shakespeare across communities in a distinctive way – raising social awareness, repairing emotional damages, and enlightening generations with empathetic education.

Living Histories of the Central Valley: A People's Guide to Shafter, California

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In order for students to develop the skills needed for them to understand the world and their place in it, they must first learn to navigate their own history while also using the appropriate academic tools. By utilizing Refugee Teaching, we are allowing refugees and immigrants to be a voice of their own as they share their experience sand histories. This project focuses on The Mexican Colony or La Colonia Mexicana in Shafter, California, an area that once stood as a strong symbol of the Mexican community in this city but is now often excluded and stigmatized. Drawing from interviews and archival methods, this project highlights the experiences of Mexican immigrants and Mexican-Americans. This includes in justices experienced due to racism and environmental racism. The findings of this study will be added to a guidebook that focuses on significant historical sites in the city of Shafter that are often marginalized. In doing so, histories of immigrants and refugees that have been erased will be amplified and further more, this guidebook could be used to create an ethnic studies curriculum for students that centers oncommunities of color.

Deconstructing Race on the 21st Century Shakespeare Stage

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Historically, the theatre as a social space has gained a reputation as an unwelcoming place to non-white performers and visitors. Shakespeare's works, in particular, have been deemed as "white property" by some scholars, and their performance by actors of color has been entangled with a long and often painful history of identity crises and issues of representation. In this sense, Shakespeare has been linked to white supremacy, as performances and companies encouraged segregation while suppressing actors of color's voices. Thus, this study examines the voices of those actors and how recent adaptations of Shakespeare promote diversity in the theatre community and beyond. This study is composed of an analysis of a series of interviews with an array of Shakespeare performers from diverse ethnic backgrounds, specifically those who participated in the Los Angeles Women's Shakespeare Company under the direction of Lisa Wolpe. I argue that Wolpe's career and contributions to theatre, as a social space, challenges the standards of diversity and representation in classical theatre. As such, this study situates the voices of actors of color within an evolving theatrical stage and highlights the contributions of Wolpe's work to such evolution as Shakespeare's work is adapted to respond to today's diverse societies.

Chiles Voice: Hollers through audio

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For my research contributions, I oversaw the historical research and collection of audio material for the production of a fictional audio drama podcast. This audio drama retells the historical election of Salvador Allende in Chile in 1970 and his subsequent ousting from power in 1973. Our podcast renarrates how he came to power through the fictionalized narrative of a Chilean immigrant that is becoming a naturalized citizen of the United States and remembering his past political ideals. The idea of having a politician with a Communist background come into power is generally feared in the United States. If one were to have praised leaders like Allende during the Cold-War, others often would have questioned your identity and political loyalty. This begs the question who can be classified as an American? Are naturalized citizens just as American? What motives drives people to flee their country of origin? Delivering this narrative through auditory means engages audiences to learn and contemplate the nuances of historical events differently than through traditional classroom means. More importantly, this podcast format is not only suited for classrooms, but for the general public to engage with too. This research, as such, explores audio-drama as an alternate method of pedagogy in which mixing fictionalized story-telling with historical material compels audiences to both revisit original recordings of past events and to empathetically reconsider their lessons through immersive listening.

Living Histories of The Central Valley: From Stories to Classroom Curriculum

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History is often told through the Eurocentric lens. This makes it difficult to truly understand the stories and histories of those who find themselves in minority groups. This is why it is important to listen to the stories of those in our community, those who find themselves most ignored and often unheard. This project consisted of interviews with a few members of the Mexican-American community in Madera, California and getting their narratives on the significance of sites familiar to them like neighborhoods, apartment complexes, and homes and why these places that are often overlooked are actually important. Their stories and reasoning for the significance of these sites that are usually considered insignificant allows us to get a deeper insight on why so many of these places are neglected as part of a greater historical picture. The participants stories of neglect and feelings of community showcase that while seemingly normal locations are found everywhere, there is always a story to tell behind a place as history is created everyday through their interactions and experiences. Their stories help us think beyond what we see and will be incorporated into the development of future ethnic studies curriculum for Merced Unified School District.