2025

UNDERGRADUATE RESEARCH & CREATIVE ACTIVITIES SYMPOSIUM

April 22-25, 2025

UCR Center for Undergraduate Research & Engaged Learning

Schedule of Events:

Oral Presentations

EMERGING RESEARCH: Research projects that are in progress and of significant interest to the research community.

COMPLETED RESEARCH: Presentations on fully developed and completed empirical research projects.

CREATIVE ACTIVITY: Creative activities and performances that are the final product of scholarly creative activities.

Tuesday – April 22, 2025

9:30 AM – 10:45 AM	Emerging Research
11:00 AM – 12:15 PM	Creative Activities & Emerging Research
2:00 PM – 3:15 PM	Creative Activities & Emerging Research
3:30 PM – 4:45 PM	Creative Activities & Emerging Research

Wednesday – April 23, 2025

9:00 AM – 10:15 AM	Emerging Research
11:00 AM – 12:15 PM	Completed Research
1:00 PM – 2:15 PM	Completed Research
2:30 PM – 3:45 PM	Completed Research
4:00 PM – 5:15 PM	Completed Research

Thursday – April 24, 2025

9:30 AM – 10:45 AM	Completed Research
11:00 AM – 12:15 PM	Completed Research
2:00 PM – 3:15 PM	Completed Research

Schedule of Events:

Poster Presentations

All poster presentation sessions will be held in person in the Highlander Union Building, Room 302.

Friday – April 25, 2025

9:00 AM – 10:00 AM	Poster Presentations
11:00 AM – 12:00 PM	Poster Presentations
1:00 PM – 2:00 PM	Poster Presentations
3:00 PM – 4:00 PM	Poster Presentations

On behalf of the Division of Undergraduate Education, the Center for Undergraduate Research & Engaged Learning (CUREL), and our undergraduate researchers, we extend our sincere gratitude to the Office of Research & Economic Development (RED) for their generous support of the college awards recognizing the best poster and oral presentations.

We invite you to check our webpage in May to see the list of award recipients and celebrate their outstanding work.

The success of Undergraduate Research & Creative Activities Symposium is only possible through campus-wide collaborations. We look forward to continued growth and are already looking forward to next year—be sure to join us as we celebrate a major milestone: the 20th Anniversary Symposium!

Thank you to the campus community who make the symposium a great success each year!

OUR DEDICATED AND TALENTED STUDENTS!
UCR FACULTY AND STAFF

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STUDENT PRESENTERS

In alphabetical order of lead presenter by college:

Marlan and Rosemary Bourns College of Engineering

PRESENTER: JONATHAN ARREDONDO, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. YOUNJIN MIN, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: IMPACT OF SILICA NANOPARTICLE HYDROPHOBICITY ON DPPC MONOLAYER INTERFACIAL BEHAVIOR

The pulmonary surfactant, a complex substance comprising various compounds, lines the fluid lining of the alveoli air sacs in the lungs. It consists of approximately 80% phospholipids, with dipalmitoylphosphatidylcholine (DPPC) constituting about 65%. A deficiency of DPPC in the lungs can result in respiratory diseases, including Respiratory Distress Syndrome. Given its dominance, DPPC will serve as a model for understanding pulmonary surfactant behavior. As nanoparticle technology is further developed and used, these nanoparticles will ultimately be released into the environment. It is necessary to understand the various fundamental behaviors of DPPC at the air-water interface, and how those behaviors change when ultrafine particulates make their way into the alveoli and embed into the DPPC monolayer. Previous studies have shown that the introduction of nanoparticles into DPPC monolayers deviates the behavior from the norm. In this study, silica nanoparticles (SNPs) modified with organosilicon coupling agents with varying hydrophobicities were used as models for engineered nanoparticles (ENPs). Monodispersed 50 nm SNPs were synthesized and their surface was modified with organosilanes with different carbon tail lengths to obtain nanoparticles with different hydrophobicities. A pendant drop setup simulated the air-water interface in the alveoli where mixed DPPC/SNP monolayers were injected at the interface. Surface pressure-area isotherms and dilational rheology experiments were conducted for structural and thermodynamic analysis. Surface hydrophobicity of nanoparticles was shown to strongly control the interfacial dynamics of such phospholipidic layers.

PRESENTER: DANIEL CHOW, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
PROJECT TITLE: VINE ROBOTIC FINGERS

The goal of this project is to develop a soft robotic gripper for fruit harvesting. The gripper consists of multiple fingers that grow pneumatically from the tip of a flexible manipulator, which gently grasp and harvest select fruits. After developing the Robotic Vine Finger, tests are run to evaluate its operating capabilities. The Vine Robotic Fingers will undergo three tests: the Variable Pressure Test, the Load Bearing Experiment, and the Harvesting Efficiency Experiment. Each test performed will help determine the operational limits of the vine robot during normal operation. This project expects to yield data that evaluates the robot and clearly states its maximum capabilities and expected operating results. This

project, upon completion, aims to reduce costs and labor requirements, making the fruit-harvesting industry more efficient.

PRESENTER: JONAH DAMIAN, BIOCHEMISTRY
SECONDARY PRESENTER: VARUN VEMURI, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
PROJECT TITLE: FRESH-ENABLED 3D BIOPRINTING OF BICONTINUOUS INTERFACIALLY JAMMED EMULSIONS (BIJEL) FOR TISSUE ENGINEERING APPLICATIONS

One of the primary goals of tissue engineering is the development of functional scaffolds that replicate the structural and physiological behavior of native tissues/extracellular matrix (ECM). Recent literature has highlighted that two critical features of ECM are bicontinuous structures and interconnected porosity, both facilitating useful functions such as cell migration and infiltration. The challenge is that traditional scaffold fabrication methods struggle to create microscale bicontinuous interconnected porous architectures. One material that inherently possesses these characteristics is bicontinuous interfacially jammed emulsions (BIJELs). BIJELs are a class of materials formed by arresting the spinodal decomposition of immiscible oil and water phases, resulting in a bicontinuous structure with interconnected microchannels. However, current BIJEL fabrication techniques are limited to simple geometries such as fibers and membranes, which do not possess the macroscale complexity required for advanced tissue engineering applications - highlighting the need for a platform that can generate more complex shapes. This research addresses these limitations by combining BIJEL STrIPS fabrication with the Freeform Reversible Embedding of Suspended Hydrogels (FRESH) 3D bioprinting system. The goal of this work lies in developing a system capable of 3D bioprinting complex macroscale geometries with microscale porosity and interconnected architecture, enabling precise control over scaffold design at both the macro- and microscale. The methodology involves three stages: optimizing a baseline FRESH bath to generate BIJEL microarchitecture, enhancing the printability of BIJEL at a macroscale, and evaluating the cytocompatibility of the printed constructs through cell viability assays.

PRESENTER: HANNAH DELA CRUZ, MICROBIOLOGY
FACULTY MENTOR: DR. AMIT ROY-CHOWDHURY, ELECTRICAL AND COMPUTER ENGINEERING
PROJECT TITLE: HARNESSING MACHINE LEARNING TO DETECT EARLY-STAGE PARKINSON'S DISEASE

Parkinson's Disease is a neurodegenerative disorder characterized by impaired muscle coordination, which includes symptoms such as uncontrolled movement, loss of balance, and asymmetrical gait. Currently, disease detection is based on observations of abnormalities in such motor functions as assessed through clinical observation by movement disorder specialists. In this work, we seek to advance current methods for Parkinson's Disease screening by building a machine learning-based

technology to quantify the progression of disease given a patient's movement data from two different timepoints. We develop a pipeline which first computes spatiotemporal parameters using the DeepLabCut pose estimation platform (Mathis et al. 2018), followed by asymmetry detection using the Catch22 Matrix Profiler time series analysis program (Tafazoli et al. 2023). Preliminary results demonstrate the ability to identify abnormal motion sequences which may be indicative of disease progression. Finally, we will be developing a model to score the severity of the disease progression in a given subject by quantifying changes across time in the frequency and severity of movement abnormalities. This work aims to provide the research community with a non-invasive, automated tool for early detection of Parkinson's Disease symptoms, which will aid with improving clinical treatments and advancing the development of effective therapeutics.

PRESENTER: NICOLE D'SOUZA, NEUROSCIENCE
FACULTY MENTOR: DR. VASILEIOS CHRISTOPOLOUS, BIOENGINEERING
PROJECT TITLE: EFFECTS OF DEEP BRAIN STIMULATION ON THE FUNCTIONAL CONNECTIVITY OF THE SEPTOHIPPOCAMPAL NETWORK IN SCHIZOPHRENIC MICE

Schizophrenia is a neuropsychiatric disorder characterized by cognitive and behavioral impairments. Reduced N-methyl-D-aspartate (NMDA) receptor function plays a key role in its pathophysiology, with pharmacological blockade using MK-801 replicating schizophrenia-like symptoms in animal models. While deep brain stimulation (DBS) shows promise in treating neurological and psychiatric disorders, its effects on cognitive networks affected by NMDA receptor hypofunction remain unclear. Our lab has demonstrated that MK-801 administration reduces cerebral blood volume (CBV) in specific brain regions and also causes significant changes to functional connectivity (FC) within the septohippocampal network, which is essential for learning and memory. Additionally, medial septal nucleus (MSN) stimulation increases hippocampal CBV in a frequency-dependent manner, with low-frequency theta stimulation producing sustained effects. However, the impact of MSN stimulation on CBV and FC in the context of NMDA receptor antagonism is not fully understood. This study aims to (1) replicate previous findings of region-specific CBV reductions and FC disruptions in MK-801-treated mice and (2) investigate how electrical stimulation modulates functional connectivity within the septohippocampal in both MK-801-treated and control mice. Mice were implanted with a stimulating electrode in the MSN, while sagittal functional ultrasound imaging (fUSI) recordings from the right hemisphere captured stimulation-induced CBV changes. Continuous 40-minute recordings included baseline, intervention (gamma stimulation at 100Hz, ultra-high-frequency stimulation at 10kHz, or control), and post-stimulation periods. Raw fUSI data were preprocessed using low-pass filtering and motion correction.

PRESENTER: KENNETH ENCARNACION, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. SARAH PETTERS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: BUILDING OF PROTOTYPE REAL-TIME SUB-80-NM AIRBORNE NANOPARTICLE CHARACTERIZATION INSTRUMENT FOR LOCAL RESEARCH OF ULTRAFINE AEROSOL EFFECTS ON HUMAN HEALTH AND THE ENVIRONMENT

Ultrafine airborne nanoparticles, similar to viruses in size, significantly impact public health due to high surface-area-to-mass ratios. Common manufacturing processes already produce an influx of such particles into the environment, such as metallic waste nanoparticles from high-temperature metal working. While the rise of interest in nanotechnology brings great promise in advancing vital fields, such as cancer treatment in medicine, the increase of these materials poses a significant occupational and environmental risk if not understood from a cradle-to-grave perspective. Differential mobility analysis (DMA) is widely used to rapidly characterize particle size distributions. However, traditional instruments fail to reach adequate resolving power for particles smaller than about 80 nm in diameter. Using a prototype nano-DMA column under low-pressure, high-flow operation, we will investigate the viability of this prototype to provide real-time characterization of these particles. We are integrating a nano-DMA column into a custom instrument with a recirculating sheath flow, aerosol electrospray source, and aerosol electrometer detector. We expect to present a transfer function characterizing the relationship between sheath flow rate, particle size, and instrument voltage. We expect the high-flow operation, ranging from 100 to 1200 liters per minute, to provide significantly finer resolution than traditional DMAs, bridging the gap between DMA and mass spectrometry techniques. It is anticipated this work will advance the research of how ultrafine aerosols impact human health and the environment with an aim of eventual local implementation in the Inland Empire to study the effects of the worst air quality in the nation, especially on low-income communities.

PRESENTER: YUZE FU, COMPUTER SCIENCE AND ENGINEERING
FACULTY MENTOR: DR. QIAN ZHANG, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: CALICO SEMANTIC: IMPROVING LLM PERFORMANCE WITH SEMANTIC KNOWLEDGE CALIBRATION

Large language models (LLMs) have recently gained significant traction in software engineering. However, their effectiveness in software engineering tasks remains limited. Conventional methods for improving LLM performance, such as model fine-tuning, require substantial computational resources and large volumes of high-quality annotated data, which are not always available. CALICO Semantic builds upon CALICO, a novel approach that enhances LLM performance without needing model fine-tuning. CALICO compares LLM's response regarding the program's syntactic structure against the ground truth from the program's abstract syntax tree (AST) to identify knowledge gaps. CALICO then incrementally bridges these gaps through knowledge calibration, improving LLM performance. CALICO Semantic extends CALICO by calibrating LLMs' semantic knowledge with data flow graphs (DFGs). While AST describes a program's syntactic structures, DFGs capture the behavior and semantics of a program by modeling dependencies between variables and functions that capture how data propagates and

changes within a program. CALICO Semantic detects semantic knowledge gaps by generating queries to LLM regarding variables/functions' dependencies and data transformation within the program and comparing the LLM response to the ground truth. The process of rectifying knowledge gaps remains consistent with the original CALICO. This research aims to answer two key questions: (1) To what extent do LLMs comprehend semantic structures in software programs? (2) How does combining syntactic and semantic knowledge calibration impact LLM performance compared to CALICO's original approach?

PRESENTER: HERQ GEMENTERA, ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. GEORGIOS KARAVALAKIS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTORS: TROY HURREN
PROJECT TITLE: NOX ON THE FRONT DOOR: HOW HEAVY-DUTY VEHICLES IMPACT DISADVANTAGED COMMUNITIES

Heavy-duty (HD) on-road vehicles transport 70% of all freight and serve as the foundation of modern cities. However, they also contribute to 17% of nitrogen oxide (NOx) emissions in the United States, which disproportionately affects communities near heavy-duty vehicle traffic. California was among the first to enshrine environmental justice into law through AB 617, with multiple studies highlighting disparities in traffic-related pollutants exposure among ethnic communities. Data from CalEnviroScreen 4.0 shows that many regions within the South Coast Air Quality Management District (AQMD) bear some of the highest pollution burdens in California and qualify as disadvantaged communities. This study aimed to assess and characterize the environmental impacts of heavy-duty transportation NOx emissions on disadvantaged communities using real-world measurements from three types of vocational vehicles: transit buses, refuse haulers, and delivery vehicles. Emissions testing was performed using gaseous portable emission measurement systems (PEMS) during in-use operation for each vehicle. The vehicles selected drove their normal daily routes which included disadvantaged communities all throughout the South Coast AQMD. Similar vehicle routes for each vocation were chosen to ensure that discrepancies in emissions were attributed to factors such as vehicle technology and driving characteristics. It was found that newer technologies across all vocations resulted in lower overall NOx emissions, and a less disproportionate distribution of emissions resulting in less of a burden on disadvantaged communities. Results from this research can be used as a resource for practical short-term alternatives to reducing the pollution burden immediately on disadvantaged communities often composed of minority populations.

PRESENTER: JACOB HENSLEY, BIOENGINEERING
FACULTY MENTOR: DR. TINGTING XIANG, BIOENGINEERING
PROJECT TITLE: CHARACTERIZATION OF HEAT EVOLVED SYMBIONTS TO MITIGATE CORAL BLEACHING

Coral algal symbiosis is critical for coral reef survival due to its vital role in environmental stability. In coral reefs, the algal species, Symbiodiniaceae, is uptaken into the gastrodermal tissues of the cnidarian coral host, where symbionts continue standard photosynthetic functions. Simultaneously, the coral host transfers inorganic nutrients and protects the algae. Through this mutually beneficial relationship, coral and algae provide the foundation for reef ecosystems, increasing biodiversity, coastal protection, and marine food sources. As marine temperatures increase, this relationship degrades in a process known as bleaching, where algal symbionts are expelled from coral tissue, and corals that are incapable of recovering by algal repopulation will die. One such solution to this issue comes from Dr. Tingting Xiang, an expert in coral-algal symbiosis, as the Xiang lab has developed a technique to UV mutagenize Symbiodiniaceae SSB01, *Brevolium minutum*, strain. Through this protocol, the lab can generate mutant algal strains to study metabolic and symbiotic dynamics between SSB01 and its host Aiptasia, *Exaiptasia diaphana*. Using this novel protocol, multiple different mutant algal strains were generated such as CCMP-2556, *Durusdinium trenchii*, and GSM Mutant, Glucose-Sensitive Mutant, which require characterization of their thermal stress profiles. This project aims to characterize these mutants by introducing them into a heat stressed environment to determine thermal tolerance. During heat stress, symbiont population within coral hosts will be statistically quantified to analyze algal population over time. This experiment gives validation of heat tolerance within these mutants, highlighting the significance of genetic engineering approaches in coral reef preservation.

PRESENTER: ISAIAH HERNANDEZ, NEUROSCIENCE
FACULTY MENTOR: DR. ELENA KOKKONI, BIOENGINEERING
PROJECT TITLE: REFINING POSE CLASSIFICATION ALGORITHM FOR YOUNG PEDIATRIC POPULATIONS

Studying the patterns of human movement provides a window through which researchers can examine the underlying mechanisms of motor control. Disruption of neurological mechanisms exhibits visible changes in the quantity and quality of movement. In the context of human development, young children diagnosed or at risk for neurological disorders may present diminished quantity and quality in their movement patterns. As video recordings can be widely used across various settings (home, clinics, etc.), developing reliable methods for extracting and interpreting movement data from videos is essential. Video-based keypoint estimation algorithms, such as OpenPose, can provide 2D coordinates of various body keypoints. However, post-processing of these coordinates is needed to evaluate movement patterns and classify movement poses. This work aims to accurately categorize infant movement poses from open-source videos, using features computed from the 2D coordinates (i.e. joint angles). By splitting the body's joint angles using an artificial horizontal axis, it is possible to determine the infant's pose with accuracy similar to manual annotation. Additionally, the artificial horizontal axis would separate body segments (lower leg, upper leg, lower hip, and upper hip), enhancing spatial positioning

of each segment in the frame. We found that our system could accurately determine key infant poses and whether the infant was moving or not at each frame. The findings were validated by comparing our refined pose algorithm's output to manually annotated videos of infants crawling, walking, and cruising. The results of this study present an automated method for accurately assessing infant poses which could provide insight into classifying early patterns of human movement in very young children with and without neurological disorders.

PRESENTER: MANDY HSIEH, BIOENGINEERING
SECONDARY PRESENTERS: JARNETT ASUNCION, BIOENGINEERING AND MICHAEL SHIH, BIOENGINEERING
FACULTY MENTOR: DR. VICTOR RODGERS, BIOENGINEERING
PROJECT TITLE: INTERPRETING CROWDING EFFECTS ON EQUILIBRIUM PROTEIN KINETICS ANALYSIS

In biological studies in vitro and in vivo, techniques involving Förster resonance energy transfer (FRET) and FRET quantification use the interaction of CyPet-Ubc9 and its E2 ligase, YPet-PCNA, to determine the dissociation constant (K_D). Dipole-dipole resonance interactions, where energy transfers from an excited donor to an acceptor chromophore, allow the detection of molecular interactions to elucidate protein interactions in many regulatory cascades spanning signal transduction, medical diagnostics, and optical imaging. This study aims to explore how protein-protein interactions are affected by the crowded environment typically found within cells using FRET signals. An in vitro assay using a 96-well plate was conducted using varying concentrations of bovine serum albumin (BSA) to simulate crowded conditions and determine their effect on K_D values. FRET measurements were conducted in a solution phase to mimic the protein interaction affinity in living cells. In contrast, other K_D measurement methods such as radio-labeled ligand binding assay, surface plasmon resonance (SPR), or isothermal titration calorimetry (ITC) require extensive preparation or orientation on solid surfaces, making them less representative for such assessments. Emission wavelengths from CyPet-Ubc9 (414 nm to 475 nm) and YPet-PCNA (475 nm to 530 nm) were obtained to determine fluorescence signals along with K_D. A comparison between protein interactions in crowded and uncrowded settings was made with varying K_D value results. This investigation provides insights into protein interactions and cellular crowding, with potential implications for pharmaceuticals, bioseparations processes, and drug discovery targeting protein-protein interactions.

PRESENTER: MANDY HSIEH, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
PROJECT TITLE: 3D DIGITAL LIGHT PROCESSING BIOPRINTING OF FLEXIBLE AND CYTOCOMPATIBLE PGSA-BASED SCAFFOLDS FOR CARDIAC TISSUE ENGINEERING APPLICATIONS

Scaffolding materials for cardiac tissue engineering must be ion conductive as well as elastic, closely mimicking the native heart tissue. In addition, traditional materials used for cardiac tissue engineering are derived from natural polymers, adding complexity with material property control and challenges with immunogenicity. Although techniques for fabricating cardiac tissue-specific scaffolds have made significant strides in recent years, most scaffold fabrication methods, such as electrospinning, phase-separation, or extrusion printing, come with unique challenges ranging from poor processability to a lack of tailorability to specific applications. An emerging fabrication technique that addresses many of these challenges is digital light processing (DLP) bioprinting, which allows for the fabrication of a high-resolution 3D scaffold. This study aims to design a purely synthetic, elastic, and conductive cardiac tissue engineering DLP bio-ink based on bio-ionic liquid (BIL) functionalization of poly(glycerol-co-sebacate) acrylate (PGSA). PGSA, a highly elastic synthetic polymer with inherent biocompatibility, is augmented with BIL to incorporate bioactivity and ion conductivity, allowing for a bioactive scaffold. In addition, the utilization of DLP bioprinting allows for precise shape control of the scaffold, allowing for possible future applications in regenerative medicine or drug testing. Our preliminary findings show a high degree of printability and dimensional accuracy, allowing for the possibilities in a wide range of cardiac tissue engineering applications.

PRESENTER: NIDHI JAGADEESH, COMPUTER ENGINEERING
FACULTY MENTOR: DR. ZHAOWEI TAN, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: FUZZING IOT DEVICES IN LORAWAN SYSTEM

LoRaWAN is an emerging system that supports long-range communication with low-power sensors. Its prominent features make it prevalent in numerous critical usage scenarios including healthcare, public transportation, wildfire monitoring, and smart agriculture. Given its critical usage, it remains crucial to ensure the security and privacy of LoRaWAN. Unfortunately, it is shown by the research community that LoRaWAN is susceptible to various cybersecurity attacks.

To address this, I aim to propose a novel LoRaWAN-aware, fuzzing-based method to uncover weaknesses and vulnerabilities of LoRaWAN systems. So far, I have finished studying the existing fuzzing algorithms, such as mutation-based fuzzing, and understand the LoRaWAN system and protocols. I incorporate the idea to reduce testing time while increasing the coverage of the algorithm, as well as ensuring that the algorithm properly and efficiently handles responses from the System Under Test (SUT). This involves targeting the MAC layer by manipulating existing LoRaWAN frames, specifically fuzzing the CUPS communication between the gateway and network server by altering fields such as the

header, security parameters, and timing-related data. To improve the productivity of the algorithm, I will adapt a dynamic fuzzing approach and modify the mutation depending on the response from the SUT. My experiment aims to find an automated, systematic approach to detect new loopholes for LoRaWAN to aid in ensuring its security.

PRESENTER: RYAN JOHNSON, BIOENGINEERING
FACULTY MENTORS: DR. HUINAN LIU, BIOENGINEERING AND DR. PATRICIA HOLT-TORRES, MICROBIOLOGY
PROJECT TITLE: ANTIMICROBIAL EFFECTS OF MAGNESIUM OXIDE (MGO) ON PSEUDOMONAS AERUGINOSA BIOFILMS

Magnesium oxide nanoparticles are known to have bactericidal properties against many strains of bacteria that are commonly present in nosocomial infections such as *Escherichia coli* (*E. coli*) and *Staphylococcus epidermidis* (*Staph epi*). While other heavy metal compounds like silver oxide have shown bactericidal properties towards P. Aeruginosa, these compounds are unable to metabolize within the human body. However, magnesium is a light metal that can fully metabolize in the human body, making it an ideal treatment option rather than heavy metal alternatives. While we have various medications for treating microorganisms, biofilms pose a more challenging task. Biofilms form whenever bacteria adhere to a surface using extracellular polymeric substances. These substances act like glue and hold the bacteria on the surface and cause other bacteria to attach as well. This can be for several reasons mainly to avoid threats that would kill individual cells but not a biofilm. This can make it very challenging to treat biofilms because if the treatment is not potent enough the bacteria may regard it as a threat and surround the treatment in a layer of cells causing the treatment to lose efficacy. We hypothesize that by exposing Pseudomonas to MgO nanoparticles the biofilm will be disrupted. After conducting the experiment, we saw that wells exposed to MgO nanoparticles appeared to have biofilm reduction.

PRESENTER: LAYLA KASSIR; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
ADDITIONAL CONTRIBUTORS: GRACE TIRADO AND YUNSHU ZHANG
PROJECT TITLE: IMPACT OF VITAMIN D3 ON PDAC STROMAL DENSITY AND CHEMOTHERAPY DELIVERY

Pancreatic ductal adenocarcinoma (PDAC), a common form of pancreatic cancer, is highly resistant to immunotherapies due to its dense fibrotic stroma and immunosuppressive tumor microenvironment (TME). Vitamin D analogs have been shown to reduce fibrosis and enhance chemotherapy delivery in PDAC. We hypothesize that Vitamin D3 treatment will improve chemotherapy efficacy and reduce pancreatic cancer cell proliferation. To test this, we developed three-dimensional PDAC cell cultures using two distinct cell lines: BxPC-3 (high Vitamin D receptor expression) and Panc-1 (low Vitamin D receptor expression). Each culture was co-cultured with mouse embryonic fibroblasts (NIH 3T3) and

human microvascular endothelial cells (HMEC1) and maintained in HMEC1 media with 0.05% L-Ascorbic Acid (LAA) for two weeks. Cultures were then treated with 150 µL of 0.1% Vitamin D3 solution and 1.5 µL of gemcitabine for an additional two weeks. Successful replication and imaging of cell cultures were achieved. Future work will focus on analyzing the impact of Vitamin D3 on stromal density and chemotherapy delivery.

PRESENTER: MY LINH LE, BIOENGINEERING
SECONDARY PRESENTER: CHELSY CERVANTES, BIOENGINEERING
FACULTY MENTOR: DR. JIAYU LIAO, BIOENGINEERING
PROJECT TITLE: FRET-BASED SYNTHETIC BIOLOGY APPROACH FOR SUMOYLATION CASCADE IN BACTERIAL CELL AND UBIQUITIN E3-SUBSTRATE INTERACTION ASSAY

Post-translational modifications, SUMOylation and Ubiquitination, play critical roles for protein activities and half-life regulations in physiological and pathological processes, such as cancers, immune responses, diabetes, and neurodegenerative diseases. During SUMOylation, it requires an activating enzyme E1, conjugating enzyme E2, and E3 ligase to catalyze the reaction to attach SUMO peptide to substrates. E3 is especially important because it enhances substrate specificity and promotes reactions in vivo. Using synthetic biology techniques, we reconstitute the SUMOylation cascade into bacterial cells, aiding research efforts on SUMOylation to be more efficient. We determine the activities of each SUMOylation enzyme in the polycistronic SUMO pathway using the substrate YPet influenza A virus (IAV) M1 proteins and quantitative FRET (qFRET) assays developed in our lab. The synthetic biology approach for polycistronic SUMO cascade is a novel strategy to reconstitute the reaction cascade in bacterial cells, which has great potential to determine different E3 ligases and substrates. In addition, we also apply the qFRET technology to determine ubiquitin E3 ligase-substrate interactions for PROTAC and Molecular Glue assays of protein degradation. We fused Ubiquitin E3 ligase, Von Hippel-Lindau disease tumor suppressor with the FRET donor, CyPet, and human Androgen receptor with the FRET acceptor, and screened 15 bacterial strains to determine their expression. We successfully expressed and purified these proteins for further studies. In summary, using a qFRET technology, we developed a novel synthetic biology approach for SUMOylation cascade in bacterial cells and expressed ubiquitin E3 ligase and substrate for protein degradation assays for cancer treatment.

PRESENTER: SAMANTHA LI, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. SARAH PETTERS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: VOLUME ADDITIVITY OF NANOSCALE AEROSOL MIXTURE

Nanosized aerosols are subject to elevated internal pressure that can influence reaction rates, reaction mechanisms, and the viscosity of organic aerosols. Accurate models of interlinked physicochemical

properties are essential for understanding and predicting aerosol formation and growth. Although results have shown that factors such as constriction, irregularity, or excess volume of mixing can introduce errors in particle diameter measurements, particle density estimates remain crude, and conservation of density is typically assumed. In this work, we present a multidimensional framework to predict the role of surface tension and changing partial molar volume on aerosol uptake and growth processes. We incorporated measurements and interpolated datasets from chemical oceanography and atmospheric chemical thermodynamics and track mixing energy and growth-factor-dependent partial molar volumes. Activity models including an empirical model of thermochemical properties of seawater and the Extended Aerosol Inorganics Model (E-AIM) were used to determine the energy of mixing. The Laplace equation was used to estimate internal pressure based on surface tension and water uptake. The compressibility of pseudo-binary aqueous mixtures was found to be dependent on the composition. We discuss recommendations for mass- and diameter-based metrics of particle growth. Results also vary as a function of the composition-dependent surface tension and composition-dependent particle growth by hygroscopic water uptake.

PRESENTER: FIDELIA LOPEZ, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. SARAH PETTERS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: NANOPARTICLE GENERATION IN SPRAY PROCESSES: CORRELATING SURFACE TENSION WITH PARTICLE SIZE DISTRIBUTION

Spray processes are commonly used to produce aerosol particles in many contexts, ranging from pesticides to naturally occurring sea spray. This study investigates how bulk solution concentration influences particle size distribution, focusing on nanoparticle generation. We integrate data from prior research utilizing a Cloud Condensation Nuclei Counter with new measurements from advanced aerosol instrumentation in the Atmospheric Nanophysical Chemistry lab. Our methodology involves generating aerosol particles from ammonium sulfate solutions using an atomizer, followed by a size distribution analysis with a Scanning Mobility Particle Sizer (SMPS). Results reveal a clear correlation between increasing solution concentration and larger particle diameters, likely influenced by solute loading and surface tension effects during atomization. These findings contribute to a deeper understanding of aerosol generation and their environmental implications. The ability to predict particle size distribution based on solution concentration can improve the modeling of atmospheric aerosol behavior and inform strategies to take action on nanoplastic pollution. Additionally, this research provides valuable insight into how nanoparticles are transferred from surface waters into the atmosphere, with potential consequences for climate, air quality, and human health. By enhancing our understanding of spray-generated aerosols, this work supports the development of predictive models for particle dispersion as an effort to address environmental pollution and aerosol-related health risks.

PRESENTER: VINESH MANIAN, MATERIALS SCIENCE AND ENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
PROJECT TITLE: BIDIRECTIONAL SOFT SHAPE MEMORY ALLOY ACTUATORS FOR SURGICAL ROBOTS

We present a catheter robot consisting of a steerable tip with two degrees of freedom enabled by the actuation of a novel soft shape memory alloy (SMA) actuator. The SMA actuator is a continuum body made of silicone hosting an SMA bending wire and a pre-stretched elastic rubber band. By regulating electric current through the SMA wire, the temperature and recovery force of the SMA wire can be regulated to control the bending configuration of the actuator bidirectionally. The SMA wire is specially designed and trained to contain parallel segments so that the motion stability and force output can be enhanced with relatively low current. We present the methods on how to design and fabricate the SMA wire and soft actuator, and integrate the SMA actuator into a catheter, as well as the modeling, characterization, and testing results of the SMA actuator and the catheter. The bending range is 130 degrees and the working bandwidth is 20 C to 70 C. A feasibility study demonstrated that the SMA actuated catheter can be navigated through a vasculature phantom simulating navigation into selected arteries smoothly within 30 seconds.

PRESENTER: ADARSH MATTAPPALLY, BIOENGINEERING
FACULTY MENTORS: DR. IMAN NOSHADI, BIOENGINEERING AND DR. PRINCE OKORO, BIOENGINEERING
PROJECT TITLE: PHYSICAL CHARACTERIZATION OF TRANSGLUTAMINASE CROSSLINKED PORCINE GELATIN HYDROGELS FOR NEUROREGENERATIVE APPLICATIONS

Neurodegenerative diseases necessitate innovative strategies for neural tissue engineering, as many existing approaches struggle to effectively restore damaged neural networks. This investigation examines the use of microbial transglutaminase (MTGase) in enzymatic crosslinking of porcine gelatin-based hydrogels, providing a promising scaffold platform for neural tissue regeneration. Enzymatic crosslinking is primed to outperform photocrosslinking due to its minimal invasiveness, mild reaction conditions, and reduced risk of cellular phototoxicity. Gelatin hydrogels were formulated at varying concentrations (3%, 5%, and 7% w/v) combined with MTGase (1 and 5 U/mL) at 37°C, achieving rapid polymerization within 30 mins under physiologically relevant conditions. Mechanical characterization via compression testing revealed key compressive moduli and fracture thresholds. Degradation profiles were assessed by incubating lyophilized hydrogels in PBS at 37°C and tracking mass changes over 14 days, while swelling behavior was monitored by measuring the equilibrium swelling ratio, ensuring scaffold stability and structural integrity. Notably, we observed gelation in as little as five minutes using 3 wt% gelatin, yielding compressive moduli of approximately 1–2 kPa, a range suitable for neural tissues. Swelling and degradation profiles indicated polymer- and enzyme-dependent behavior, underscoring the tunability of these scaffolds. These findings validate the stability and compatibility of MTGase-crosslinked gelatin hydrogels for neural applications, advancing their potential as biomimetic scaffolds in

neural cell culture systems and illuminating new opportunities for therapeutic interventions aimed at neurogenesis.

PRESENTER: ADRIANNA MENDOZA, BIOENGINEERING
FACULTY MENTOR: DR. JIN NAM, BIOENGINEERING
PROJECT TITLE: ENHANCED CRYOPRESERVATION OF FUNCTIONAL NEURONAL NETWORKS

Cryopreservation enables long-term storage of biological constructs at ultra-low temperatures, preserving cellular integrity and function. However, current techniques fail to fully recover cell viability and functionality at the tissue level, limiting applications in basic biology studies as well as regenerative medicine. This study investigates the role of hydrogel scaffolds in optimizing the cryopreservation of neuronal networks to enhance post-thaw viability and functionality. Given that scaffold mechanical properties influence cell membrane stiffness, we hypothesize that hydrogel-modulated membrane mechanics affect susceptibility to ice crystal damage during freezing. Neuronal networks cultured within hydrogels were subjected to cryopreservation using various cryoprotectants, freezing rates, and thawing conditions. Post-thaw recovery was assessed via immunofluorescent staining for actin cytoskeleton integrity and electrophysiological assays for functional activity. Preliminary data suggest that hydrogels facilitate cryoprotectant distribution and mitigate structural degradation, improving post-thaw recovery. Therefore, this result provides a means to establish an optimized cryopreservation method for neuronal tissue engineering, with implications for neurodegenerative disease treatments and nerve injury repair.

PRESENTER: HELEN NGUYEN, ENVIRONMENTAL ENGINEERING
SECONDARY PRESENTER: MELAN PENGLIN, CHEMICAL AND ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. GEORGIOS KARAVALAKIS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: REVEALING THE HIDDEN POLLUTANT: IN-USE AMMONIA EMISSIONS FROM LIGHT-DUTY GASOLINE EMISSIONS

Ammonia emitted in the atmosphere contributes to secondary aerosol formation, adversely affecting human health and the environment. Light-duty gasoline vehicles are primary sources of on-road ammonia emissions, generated as by-products of pollutant reduction and oxidation in the three-way catalyst (TWC). In this study, tailpipe ammonia emissions were characterized by equipping eight different light-duty gasoline vehicles with a tunable diode laser spectroscopy measurement system specifically tuned for the wavelength of ammonia absorption. GPS and OBD data were also recorded. The vehicles, ranging from model years 2009 to 2019 with mileage between 21,000 and 135,000 miles, were driven on a route representative of typical daily commutes in the South Coast Air Basin, California. The route included a cold-start and varying amounts of urban and highway driving. It was found that cold-start conditions can produce over 12 times the amount of ammonia per mile driven as compared to when the engine and aftertreatment system is up to operating temperature. Ammonia emissions were

found to increase linearly for most vehicles as a function of acceleration. Additionally, overall ammonia emissions could increase up to nine times due to vehicle model year and usage. While tailpipe ammonia emissions are not yet regulated by the US EPA, this study helps better understand real-world tailpipe ammonia emission factors and how well current gasoline vehicles are able to control these emissions.

PRESENTER: CONNOR NIEH, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: QUANTIFYING TOXIC DOSAGES OF PFAS ON TRANSGENIC ADIPOSE-DERIVED STEM CELLS

Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are perfluorinated alkyl substances (PFAS) known to disrupt cellular function and impair wound healing, particularly in adipose-derived stem cells (ASCs). Given their persistence in the environment and bioaccumulative nature, understanding their cytotoxic effects on ASCs is crucial. Recent studies have shown that ASCs expressing Mitochondrial Abundant Heat Soluble (MAHS) proteins exhibit enhanced resistance to environmental stressors, suggesting a potential protective mechanism against PFAS-induced toxicity. Additionally, ASCs expressing Cytosolic Abundant Heat Soluble 3 (CAHS3), a cytosolic stress-response protein, are being investigated for their potential role in increasing cellular resilience. Previous studies used cell counts to assess colony viability in response to PFAS exposure for ASC52telo cells. Results demonstrated no loss in cell viability for ASCtelo52 cells following 48-hour exposure to PFOS 40 µM and PFAS 125 µM. This study aims to determine the PFOS and PFOA dosage required to induce rapid loss of cell viability within 48–96 hours in ASCs expressing GFP (control), MAHS, and CAHS3. ASCs expressing all proteins were successfully cultured and work on quantifying toxic dosages is ongoing. Understanding the protective effects of MAHS and CAHS3 proteins may provide novel strategies for mitigating environmental toxin-induced cellular damage and improving ASC therapeutic potential.

PRESENTER: ARIA OCAMPO, CHEMICAL ENGINEERING
SECONDARY PRESENTERS: KRISTA PETERSON, ENVIRONMENTAL ENGINEERING; GABRIELLE MALLARE, ENVIRONMENTAL ENGINEERING; AND MATISSE RIOS, ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. AMANDA RUPIPER, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: BIOCHAR-BASED ADSORBERS FOR GASEOUS AMMONIA REMOVAL: A SUSTAINABLE ALTERNATIVE TO WET SCRUBBERS

Ammonia (NH_3) poses several human health and environmental challenges including being a precursor to $PM_{2.5}$: a pollutant known for causing respiratory and cardiovascular illnesses. Livestock operations are major sources of NH_3, which are traditionally controlled with wet/acid scrubbers that generate secondary acidic wastewater streams. We propose biochar adsorption as an alternative solution to be used in dry scrubbers. Using three renewable feedstocks, we produce and characterize biochar under

varying pyrolysis temperatures (400-600°C) and times (15-60 minutes). We test the biochar adsorbents in a stationary adsorption column to determine ammonia adsorption capacity (mg of NH_3 removed per g of biochar). The procedure involves a full design of the experiment as well as fitting a Langmuir isotherm to measure adsorption capacity, and a final optimization to determine the most viable biochar. Tentative adsorption capacities for poultry litter, rice straw, and wood chips are: 35.18, 36.75, and 19.42 mg NH_3/g biochar respectively. In comparison, granular activated carbon (GAC) has a known ammonia adsorption capacity of 0.2-1.8 mg NH_3/g. The results from this study suggest that biochar is a viable alternative to traditional NH_3 control technologies. The next step of this study is to conduct a field test using a pilot-scale air scrubber that uses the most efficient biochar.

PRESENTER: DHYAN PATEL, BIOENGINEERING
SECONDARY PRESENTER: JACOB MAPA, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHASI, BIOENGINEERING
PROJECT TITLE: BIOPRINTABLE BIOIONIC LIQUID HYDROGELS FOR NEURAL TISSUE ENGINEERING

Progress in neural tissue engineering demands biomimetic scaffolds that closely mimic the inherent electrical conductivity of native neural tissues, thereby promoting bioactivity. This study investigated conductivity and printability of bio-ionic liquid-conjugated gelatin methacrylate (BioGel) hydrogels for neurological applications. Although previous work demonstrates remarkable conductivity with porcine-based BioGels, preliminary results suggest that fish-derived BioGels provide a softer matrix and reduced thermosensitivity, rendering them particularly advantageous for bioprinting. We specifically explored the ionic conductivity of fish BioGel hydrogels and their printability via a digital light processing (DLP)-based bioprinter. Conductivity was characterized using electrochemical impedance spectroscopy (EIS) with a three-electrode system. To simulate native neural tissue's conductivity (0.15–0.3 S/m), various compositions were systematically tested, encompassing diverse bio-ionic liquid (BIL) concentrations from 0% to 6% (w/v) in 2% increments and distinct BIL types (bicarbonate and bitartrate) while fish gelatin methacrylate was maintained at 7% (w/v). Statistical analysis revealed a significant increase in ionic conductivity with rising BIL concentrations, with bitartrate exhibiting higher conductivity. Subsequently, DLP bioprinting was employed to assess and refine the hydrogel's printability. Computer-aided design (CAD) models of varying complexity, from simple lattices to high-fidelity, intricate brain-like structures were methodically printed. Compositional ratios and selected machine parameters were adjusted to precisely determine ideal settings for printing the hydrogel at optimal resolution. This investigation yielded robust, electroactive scaffolds with physiologically relevant conductivity for neural applications while optimizing bioprintability.

PRESENTER: NIMRAH SALEEM, COMPUTER SCIENCE AND ENGINEERING
FACULTY MENTOR: DR. WANTONG LI, ELECTRICAL AND COMPUTER ENGINEERING
PROJECT TITLE: EXPLORING NEURO-SYMBOLIC ARTIFICIAL INTELLIGENCE FOR BIONIC VISION

From self-driving cars to solving physics problems, Artificial Intelligence (AI) possesses the advanced technological ability to reason in a way comparable to humans. At its core, AI uses mathematical algorithms to produce an output from given inputs chosen by the user. AI is implemented through various approaches such as Symbolic AI that solves problems using logical reasoning and predefined rules but fails for data it does not recognize or have rules for. Neural network is another approach that can recognize patterns to make skilled inferences but lacks interpretability of how an output was reached. Therefore, it is risky to incorporate AI to healthcare where accuracy and interpretability is crucial. However, neuro-symbolic AI is a revolutionary AI learning paradigm that incorporates both approaches by being able to solve new or complex problems, and being explainable as to why it produced an output. Since neuro-symbolic AI is superior in this way, it can be applied to healthcare such as in the field of retinal prosthesis. For people with severe blindness, the bionic eye is a device that attempts to restore vision by analyzing its surroundings and stimulating signals to the brain that will be interpreted as vision. Neuro-Symbolic AI can be an asset to the bionic eye as it features strong analytical skills for large datasets with the added layer of interpretability to validate its output. Therefore, this research will analyze and evaluate neuro-symbolic AI and its application to bionic vision by creating and testing an original neuro-symbolic program.

PRESENTER: NIL SANLI, BIOENGINEERING
FACULTY MENTOR: DR. HUINAN LIU, BIOENGINEERING
PROJECT TITLE: IDENTIFYING THE RESISTANCE OF *E. COLI* AGAINST MAGNESIUM OXIDE NANOPARTICLES

Infection of implanted medical devices is a major clinical complication that affects millions of people worldwide and costs 5-10 billion dollars per year to treat. Most infections involve biofilms that are resistant to antibiotics as they often cannot penetrate biofilm formations. Therefore, new biomaterials are needed to reduce or eliminate microbial adhesion and infections of medical devices. When looking for biomaterial nanoparticles, along with their antimicrobial properties, we also have to consider their toxicity. Magnesium oxide nanoparticles (nMgO) have antimicrobial activity and can be metabolized and fully reabsorbed in the body. nMgO has been shown to kill both planktonic bacteria and disturb nascent biofilm. We hypothesize that the action mechanisms of nMgO against planktonic bacteria can be integrated into medical devices to evoke antimicrobial responses without harming host cells. Previously, the minimum bactericidal concentration (MBC) was determined for *Escherichia coli (E. coli)*. To benefit from the antimicrobial properties of nMgO, we need to determine whether *E. coli* gains resistance when repeatedly exposed to develop resistance to nMgO exposure. Here, we used spectrophotometry to measure the growth of Gram-negative *E. coli* after exposure to nMgO. After testing the efficacy of MgO nanoparticles on E. coli, we determined that there was a reduction in bacterial growth, indicating a

resistance mechanism. It is anticipated that the results of this study will be used in downstream clinical applications and orthopedic device implantations.

PRESENTER: ARUSHI SHAH, BIOENGINEERING
FACULTY MENTOR: DR. BAHMAN ANVARI, BIOENGINEERING
PROJECT TITLE: OPTIMIZED FABRICATION OF A DUAL-MODAL AGENT FOR MAGNETIC RESONANCE IMAGING AND NEAR-INFRARED FLUORESCENT IMAGING

Indocyanine green (ICG), an FDA-approved near-infrared dye, is a commonly used fluorescence agent for surgical and imaging applications. Gadobenate dimeglumine (Gd-BOPTA), a gadolinium-based MRI contrast agent is used to detect early stages of abnormalities present in certain types of tissues such as the liver. Using both ICG and Gd-BOPTA as a dual imaging approach can potentially help identify abnormalities such as cancer by MRI pre-surgery, and subsequently aid surgical resection of small tumor nodules by fluorescence imaging. Erythrocyte ghosts co-loaded with indocyanine green and Gd-BOPTA present a promising platform for delivering both the MRI and optical contrast agents. This study aims to determine the optimal loading concentrations of ICG and GD-BOPTA to maximize both fluorescence imaging and MRI contrast. The optimized particles will be identified using fluorescence spectroscopy and MRI, and evaluated for the efficacy of dual-mode imaging using appropriate animal models in our future studies.

PRESENTER: TRINITY SHAKER, BIOLOGY
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
PROJECT TITLE: POST-PROCESSING OPTIMIZATION OF MILLIMETER-SIZED BICONTINUOUS INTERCONNECTED POROUS SCAFFOLDS FOR NEURAL TISSUE ENGINEERING

Innovations in tissue engineering have highlighted the need for bioengineered scaffolds that sustain cell viability, particularly essential in recapitulating intricate microenvironments akin to those found in neural tissues. Bicontinuous Interfacially Jammed Emulsions (BIJEL) scaffolds incorporate CTAB (cetyltrimethylammonium bromide)-functionalized silica nanoparticles, which act as a stabilizer by reducing interfacial tension between two immiscible phases. This facilitates the formation of textured interfaces within an interconnected microporous network, which we have shown robustly facilitates human iPSC-derived neural stem cell adhesion, proliferation, and differentiation, yet scaling remains challenging due to potential cytotoxic effects. A critical step in addressing these issues is refining post-synthesis processing to minimize residual CTAB. This project focused on optimizing a CTAB extraction protocol, enhancing scaffold compatibility while maintaining structural integrity. To achieve this, different treatment formulations and environmental parameters were evaluated to improve ethanol-based CTAB removal. The CTAB content in the post-processing ethanol solution was measured via UV-

visible spectroscopy to gauge the extent of CTAB elimination from the scaffold. Our results showed agitation and elevated temperatures enhanced CTAB removal from BIJEL constructs. Future work will evaluate cell viability on treated scaffolds using metabolic activity and live/dead imaging assays, ensuring persistent biocompatibility for neural applications. The findings will significantly inform the development of a scalable BIJEL scaffold fabrication protocol that supports cell viability, marking a significant step forward for its usage as an advanced 3D neural tissue model in neural stem cell research and regenerative medicine.

PRESENTER: MURPHY SHAO, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. XIAPING HU, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: JASON LANGLEY
PROJECT TITLE: RECONSTRUCTION OF THE CORTICOSPINAL TRACT USING SPATIAL CONSTRAINTS DERIVED FROM R_2 MAPS

The corticospinal tract (CST) is a white matter pathway associated with voluntary motor function. Degeneration of CST is a principal feature of amyotrophic lateral sclerosis and integrity of CST is related to post-stroke rehabilitation outcomes. Reconstruction of CST using DTI-tractography methods is challenging due to crossing fibers and bottleneck regions. Here, we assess whether the inclusion of tissue R_2 can improve the reconstruction of CST in DTI-tractography.

Methods: In R_2 maps, CST is a hypointense region connecting the brainstem with the motor cortex. A constraint mask was created using R_2 maps from 14 participants and used as a spatial constraint in DTI-tractography. Tractography was performed using protrackx2 with bilateral seed regions in the brainstem with the motor cortex as the target region. Tractography was first performed without the constraint mask and then with the constraint mask. All masks were defined in the Montreal Neurological Institute standard space and mapped to individual subject space.

Performance of tractography was assessed by measuring the Dice similarity coefficient between the Johns Hopkins CST atlas and tracts derived with and without the R_2-constraint mask, respectively.

40 participants from the Human Connectome Project S500 dataset were used for DTI-tractography.

Results: Coherence with the Johns Hopkins CST atlas was greater with tracts derived using the R_2-constraint mask (mean DSC=0.52, s.d. DSC=0.05) as compared to tracts derived without using the R_2-constraint mask (DSC=0.39, s.d. DSC=0.04; P<10-3, two-tailed paired t-test).

PRESENTER: SHUBHRA SINGHAL, BIOENGINEERING
SECONDARY PRESENTER: YASMIN ELTWAFSHA, BIOENGINEERING
FACULTY MENTOR: DR. CHUNG-HAO LEE, BIOENGINEERING
PROJECT TITLE: EVALUATING CLEARING AGENTS, FIXATION, AND DURATION EFFECTS ON CARDIOVASCULAR TISSUE IMAGING METHODS WITH CONFOCAL MICROSCOPY

Tissue clearing protocols are typically designed for the central nervous system and require major adjustments for studying other tissues. This makes effective optical clearing of cardiovascular tissue challenging. This study aims to understand the confocal imaging responses of porcine left anterior descending artery (LADA) by examining two clearing methods—benzyl alcohol benzyl benzoate (BABB) and glycerol —along with formalin fixation, varying fixation times, and extended BABB storage. We compared tissue characteristics under different conditions, focusing on preservation and transparency across different imaging depths. We observed that optical clearing with glycerol results in low tissue transparency compared to clearing with BABB. That is, tissue clearing with BABB significantly enhances the transparency of the LADA, enabling strong signal intensities at deeper tissue layers. In addition, we observed that BABB preserves fluorescent molecules even after extended tissue storage. Finally, fixing LADA tissue in formalin for 30 minutes or more did not improve imaging results. However, formalin fixation improved tissue preservation when combined with glycerol-clearing but reduced transparency and signal intensity when used with BABB, compared to non-fixed BABB-cleared tissues.

PRESENTER: JANNA SOLIMAN, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: WOUND MODELS IN TARDIGRADE-MODIFIED SENESCENT ADIPOSE DERIVED STEM CELLS

Normal wound healing typically progresses through four stages: coagulation, inflammation, proliferation, and maturation, resulting in functional tissue regeneration. However, aging increases incidence of chronic wounds that do not progress through these stages, instead halting the inflammatory stage and resulting in nonfunctional tissue. Here, we wished to test an *in vitro* quantitative wound healing model to compare healthy and aged Adipose-derived Stem Cells (ASCs) modified with tardigrade transgenes. ASCs were transduced to express either the tardigrade gene Mitochondrial Abundant Heat Soluble (MAHS), or green fluorescent protein (GFP) as a control gene. Cellular senescence was induced using 5 mM thymidine for 48 hours. To create consistent wound models, polydimethylsiloxane (PDMS) (Slygard 184, Dow Corning) was cut into 5 mm-diameter, 2 mm-tall cylinders and adhered to the wells of a 24-well plate. All cells were seeded at a density of 30,000 cells per well. Cells were cultured for 48 hours to reach full confluence before removing the PDMS. Following wound induction, cells were replenished with fresh media and migration into the circular wound area was tracked using confocal microscopy. Images were collected at 24-hour intervals, and wound closure rates were quantified using a custom MATLAB script.

PRESENTER: HANA THAI, BIOENGINEERING
SECONDARY PRESENTERS: JARNETT ASUNCION, BIOENGINEERING; KATRINA CHU, BIOLOGY; SIKANDER NARANG, BIOENGINEERING; AND MICHAEL SHIH, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
PROJECT TITLE: DIRECT FUNCTIONALIZATION OF CARBOXYMETHYL CELLULOSE FOR BIOMATERIAL FABRICATION

Functionalized polysaccharides represent a promising system for investigation in biomaterial applications, offering potential for addressing limitations such as high swelling ratios and low porosity. On their own, however, these polymers often present challenges such as poor adhesivity, limited conductivity, flexibility and elasticity. Our previous research demonstrated that photocrosslinkable polymers functionalized with bio-ionic liquids (BILs) show promising potential for biomaterial synthesis, providing increased adhesivity and conductivity to a wide range of polymeric backbones in a concentration-dependent manner. Incorporating BIL additives could address the aforementioned limitations seen in polysaccharides, such as cellulose-derived biopolymers, while enhancing key physical characteristics, particularly in conductivity and structural integrity. As such, we propose synthesizing a novel biomaterial consisting of functionalized carboxymethyl cellulose (CMC) derivatives with ionic molecules, such as choline ionic liquids, and crosslinking side chains using direct esterification methods. Our methodology involves optimizing one-pot direct functionalization of CMC, followed by comprehensive characterization of macro- and micro-physiological properties. Material characterization employs Fourier-Transform Infrared spectroscopy (FTIR) and Nuclear Magnetic Resonance (NMR) for sidechain verification, scanning electron microscopy (SEM) for structural analysis, and three-point probe electrical characterization for conductivity assessment. Through this research, we aim to develop a composite polymeric biomaterial system that is able to enhance the native properties of polysaccharide-based polymers for tissue engineering purposes.

PRESENTER: KAYLA TRAN, BIOCHEMISTRY
FACULTY MENTOR: DR. ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: RE-ESTABLISHING CNIDARIAN-SYMBIODINIACEAE SYMBIOSIS USING ALGAL BEADS

Coral reefs are a diverse ecosystem, home to many marine species. An essential feature of coral reefs is the symbiosis between Symbiodiniacaea algae, a family of dinoflagellates, that form mutually beneficial relationships with animals in the phylum Cnidaria, like corals. The algae uses the coral's metabolic waste to perform photosynthesis, and in turn provides the coral with food and energy. However, temperature stress and pollution can cause the algae to be expelled from the coral, making the coral more susceptible to death. This process is called coral bleaching. The death of coral reefs not only leads to the death of its inhabitants, but it can also harm local economies that rely on fisheries and tourism. If algae can be reintroduced into bleached coral, the algae can repopulate and prevent the coral from dying. In this project, we used the sea anemone Aiptasia as a model for coral since it shares the Cnidarian-Symbiodiniaceae symbiosis but is easier to grow and manipulate in the laboratory. The goal of this

project is to deliver algae back to coral by trapping algae in hydrogel beads. To achieve this, I (1) tested two different hydrogel gel types for their durability, accessibility, and speed to trigger a feeding response in the anemone, (2) recorded the proliferation of algae in the Aiptasia post-feeding, and (3) recorded the health of the Aiptasia post-feeding. If successful, this technology will be able to guide algae to bleached coral with high efficiency, and restore bleached coral reefs before they die.

PRESENTER: LOHITA VADLAMUDI, BIOENGINEERING
SECONDARY PRESENTER: YASHVI PATEL, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING

PROJECT TITLE: OPTIMIZING BICONTINUOUS INTERFACIALLY JAMMED EMULSION (BIJEL) FIBER EXTRUSION FOR CONSISTENT AND REPRODUCIBLE SCAFFOLD FABRICATION

Bicontinuous interfacially jammed emulsions (BIJELs), an emerging class of stabilized emulsion-based materials, offer applications in the field of tissue engineering due to their unique interconnected porous microstructure, which is beneficial for cell attachment and cell proliferation. The conventional BIJEL fabrication method of thermal induced phase separation (TIPS) offers limited control over the resulting BIJEL's porosity and macrostructure, both important parameters for most applications. An alternative method for the controlled fabrication of BIJELs is microfluidic-facilitated solvent transfer-induced phase separation (STrIPS). With this method of BIJEL fabrication, a ternary precursor solution is injected through the center of a concentric microfluidic device in which a STrIPS-facilitating solution enables the removal of a cosolvent. This removal of the cosolvent allows for spinodal phase separation and, in turn, BIJEL fabrication. This method allows for a great degree of tunability of BIJEL microstructure and macrostructure with modifications to the microfluidic device or the flow rates used with them. This study investigates the influence of two parameters, inner capillary diameter and ternary solution flow rate, to achieve a more consistent morphology of the fiber. In the first phase of the study, the microfluidic device's inner capillary's diameters were altered in diameter, and in the second phase, the flow rate of the BIJEL precursor solution was altered in increments of 0.5 ml/hr. With both of these variables' alterations, we observed a controlled variation in BIJEL fiber diameter and alterations to the BIJEL microstructure's porosity.

PRESENTER: STEVEN VU, BIOENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
ADDITIONAL CONTRIBUTORS: KYUNGJOON LEE, MECHANICAL ENGINEERING; PARMIDA AFSHARI NEJAD, MECHANICAL ENGINEERING; AND SOPHIA SEVIC, BIOENGINEERING
PROJECT TITLE: DESIGN, MANUFACTURING, AND CHARACTERIZATION OF A MESOSCALE HYDRAULIC SOFT ROBOTIC CATHETER

Pulmonary embolisms (PE) contribute to approximately 60,000 to 100,000 deaths per year in the United States. However, current treatments using existing micro catheters involving flow diverters or coils lack the flexibility and maneuverability needed to reach occlusion sites in complex blood vessel networks. Helical fiber-reinforced soft robots, which offer torsional rotation with reduced fabrication times while maintaining flexibility, have only been produced at a macroscale due to the challenges of microscale fabrication. We propose a novel mesoscale, hyperelastic, hydraulically powered steerable tip. With a diameter of three millimeters, the device is bi-segmented, featuring a proximal tip capable of 360-degree torsional rotation and a distal tip designed for bending up to 90 degrees. Each segment can be actuated independently or simultaneously, allowing precise navigation through tortuous vessels with an aim to break apart PE via mechanical force while minimizing damage to blood vessel tissue. This design eliminates the need for manual catheter rotation by integrating a hydraulically powered rotating proximal tip. Fabricated using a silicone-based composition, the device provides an innovative, atraumatic, and cost-effective alternative to catheter-directed thrombolysis for PE treatment.

PRESENTER: ANNABELLE YANG, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
PROJECT TITLE: DESIGN AND CONTROL OF SOFT FABRIC UNIVERSAL BENDING ACTUATOR FOR FRUIT HARVESTING

Rigid-link robots have been used in the agricultural industry to automate redundant operations; however, their inflexible structure limits the target range in complex environments such as tree canopies. The produce may not be on the exterior surface or require a costly rigid arm with a high degree of freedom. The bending manipulation of soft robots can navigate around obstacles like branches, enabling the retrieval of produce while minimizing breakage. We have a fabric-based soft actuator with three pneumatic modules for universal bending. The center vacuum tube design is attached to a suction cup to retrieve the produce. Its low cost, ease of fabrication, customizability, and use of commercially available material make this soft robot a prospective common application. A pressure control board is built for stiffness modulation to dynamically control the contact position. The next direction is to characterize the actuator's angle and spatial range capabilities with and without the load. This will be tested in vertical and horizontal orientations to account for the difference in torque. This data allows the setup of a feedback-controlled system for real-time adjustments to account for inconsistencies due to the flexible nature of soft robots.

PRESENTER: BRYCE YEH, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: EVALUATING THE EFFECTS OF THE TARDIGRADE DERIVED CYTOPLASMIC ABUNDANT HEAT SOLUBLE PROTEIN ON ADIPOSE DERIVED STEM CELL TOLERANCE TO MEMBRANE STRESS

Human adipose derived stem cells (ASC) are multipotent stem cells that are commonly used in regenerative medicine treatments. There has been recent interest in improving the ability of therapeutic cells to tolerate stress. In this study, ASCs were transgenically modified to express the cytoplasmic abundant heat soluble (CAHS) protein, a tardigrade protein associated with their tolerance of desiccation. Dimethyl sulfoxide (DMSO) is commonly used as a cryoprotectant, but it also has a toxic effect by disrupting the cell membrane. We wished to determine if CAHS expressing ASCs have a higher survival rate compared to control ASC GFP cells under DMSO induced stress. The cells were plated in a 48 well plate at a 10,000 cell per well density. The cells were exposed to 0%, 1%, 3%, 5% DMSO concentration for 72 h. The cells were then fixed and stained with DAPI and phalloidin and imaged under a confocal to assess cell survival. Survival rate was quantified using custom image analysis scripts in MATLAB. All experiments were conducted in triplicate. The findings from this study will provide insight on the role of the CAHS protein in maintaining membrane integrity.

STUDENT PRESENTERS

In alphabetical order of lead presenter by college:

College of Humanities and Social Sciences

PRESENTER: ANA ACEBO, PSYCHOLOGY
FACULTY MENTOR: DR. WEIWEI ZHANG, PSYCHOLOGY
PROJECT TITLE: THE CORRELATION BETWEEN VISUAL WORKING MEMORY PRECISION AND PATTERN SEPARATION

Visual working memory (VWM) refers to the cognitive process that temporarily hold visual information to support higher-level functions, such as decision-making. VWM representations are characterized by capacity and precision. Recently, the pattern separation process, by which the mnemonic inputs are converted into non-overlapping outputs, has been suggested as a key mechanism for VWM precision. According to the hypothesis, the pattern separation and VWM precision share the common computational resource. In this research project, we aimed to test this hypothesis by imposing a competition between WM precision and the pattern separation using a dual task paradigm. In this setup, participants completed a change detection task (CD) while concurrently performing the mnemonic similarity task (MST). Specifically, participants are required to maintain line orientations temporally in the CD task. During the retention period, they had to identify whether an image from the MST test phase was the same as the studied image, similar to it, or completely new from the MST study phase. It was predicted that the high demands for pattern separation by the similar images would reduce VWM precision. The experimental data collected by behavioral experiments supported this prediction, showing a decline in CD task performance during the high demand for the lure discrimination in the MST task. These findings align with the hypothesis of the significant role of pattern separation process in VWM precision.

PRESENTER: SAMANTHA AGUSTIN, PSYCHOLOGY
FACULTY MENTORS: DR. KATE SWEENY, PSYCHOLOGY AND DR. OLIVIA KARAMAN, PSYCHOLOGY
PROJECT TITLE: THE ROLE OF ATTACHMENT STYLE IN WORRY AND PERCEIVED SUPPORT

Adult attachment styles affect how people seek and give support within romantic relationships, especially during stressful times. Uncertain waiting periods are common experiences that present unique challenges to health and well-being, and recent research reveals they pose challenges for romantic partners attempting to provide effective support. The present study examined attachment styles' role during the wait for results on a major professional exam, focusing on the exam-taker's worry and feelings of support from their romantic partner. Law graduates taking the July 2016 California bar exam (N = 125) and their romantic partners (N = 66 dyads), completed surveys prior to the bar exam and

periodically during the wait for exam results. Exam-takers who were more anxiously attached worried more, and exam-takers worried more when their partner was more avoidantly attached. Furthermore, exam-takers who were more anxiously attached and exam-takers who were more avoidantly attached felt less supported by their partner during the wait for exam results. Partners' attachment style did not predict how supported the exam-taker felt. The results suggest that being anxiously attached makes waiting more challenging, as does having a romantic partner who is avoidantly attached. When it comes to perceived support, the partner's attachment style doesn't seem to matter; however, it appears that an insecure attachment leads people to perceive less support from their partner when they're waiting for important news, regardless of their partner's attachment style. Our study reveals the importance of considering adult attachment styles when assessing emotional experiences and perceptions of support during stressful waiting periods.

PRESENTER: DOMINION AIKU, POLITICAL SCIENCE
FACULTY MENTOR: DR. KIM DIONNE, POLITICAL SCIENCE
PROJECT TITLE: #ENDSARS EFFECT ON YOUTH VOTER TURNOUT IN NIGERIA

In recent years, Nigerian youth have become more involved in politics and voting. Traditionally, young Nigerians have been disengaged from government-related matters, so this shift in participation is quite notable and impactful. My research question is, "How did the #ENDSARS movement influence political engagement and voter turnout among Nigerian youth in subsequent elections?" I will argue that the #EndSARS protests sparked a more politically aware youth, with many young Nigerians calling for more accountability and change. Youth-led groups, influencers, and civil society organizations were crucial in encouraging young people to register and vote. Younger voters, especially those between 18 and 35, were more motivated by a desire for change and frustration with the current situation. For this research, I am using methods such as reviewing Afrobarometer data, examining changes in youth voter turnout in Nigeria over time, analyzing the 2023 presidential election, and studying 9 waves of data. My findings will demonstrate that the #ENDSARS movement indeed influenced youth voter turnout, leading to an increase compared to the 2019 election. It played a crucial role in raising political awareness among Nigerian youth, and its lasting impact continues to drive greater participation in the electoral process.

PRESENTER: DONNA ARTEAGA, PSYCHOLOGY
FACULTY MENTOR: DR. HAYDEN HENDLEY, PSYCHOLOGY
PROJECT TITLE: ENHANCING CAREER READINESS IN INTRODUCTION TO PSYCHOLOGY

Career readiness is an essential skill for college students to have since not all undergraduate students choose to pursue graduate studies. For students who choose to work right after graduation, it is crucial to be work-ready to enact a smooth transition from school to work. The American Psychological

Association (APA) released Guidelines for the Undergraduate Psychology Major, which underscores the importance of and need to build transferable skills. Examining the impact of incorporating career readiness education to the curriculum of an Introduction to Psychology class may serve two purposes. One, it may identify techniques to fill the gap identified by the APA by preparing undergraduate students for the workforce. Second, it may influence student motivation to succeed in the course, as previous studies have found a positive correlation with external motivation and skill and career competence. The current study uses a pre- and post-survey design to examine the effect of career readiness activities on student motivation and career readiness in an Introduction to Psychology course. Students were presented with four recorded workshops from the Career Center throughout the span of 10 weeks and engaged in related activities during their discussion sections. We hypothesize that exposure to the Career Center workshops will increase students' career readiness and motivation in Introduction to Psychology. This study is one of the first to investigate a potential technique for increasing career readiness and motivation in a diverse, large-enrollment course, and aims to enhance psychology major's and non-psychology majors' academic experience through innovative approaches to teaching.

PRESENTER: NATHAN AYALA, HISTORY
FACULTY MENTOR: DR. KIRIL TOMOFF, HISTORY
PROJECT TITLE: SOVIET CULTURAL EXCHANGE IN MEXICO: AN EARLY COLD WAR PERSPECTIVE

The relationship between the Soviet Union and Mexico evolved at various points during the 20th century. Despite pressure against it, Mexico was the first country in the Americas to recognize the Soviet state. However, these initially somewhat warm feelings came into conflict when Soviet internationalism clashed with Mexican nationalism and American imperialism. Relations were severed in 1930, and they were not re-established until 1943. This project examines the evolution of relations between 1943 and 1959. The Cold War was a series of military, political, and geostrategic struggles, as well as a conflict between two fundamentally different cultures and ideologies. This project seeks to analyze Soviet cultural exchange in Mexico during the 1940s and 1950s. Through publications and other forms of cultural exchange, Soviet internationalist policy gained notable support among prominent political and cultural figures in Mexico. While this era of Soviet international relations is often dismissed in favor of the idea of Stalinist isolationism, this study argues that many of the changes in the Khrushchev era had their foundations in the late Stalin period. Ultimately, this study aims to examine the Cold War from a multipolar perspective, focusing on the agency of both Mexico and the Soviet Union. It also seeks to answer the question: What role could a country like Mexico, belonging to the sphere of middle powers, play within the framework of the global strategies of the great powers?

PRESENTER: SOFIA BARBER, HISTORY
FACULTY MENTOR: DR. MICHELE SALZMAN, HISTORY
PROJECT TITLE: FOOD AND THE ROMAN EMPIRE: VIRTUE AND STATUS

Roman society used dietary habits as a way to establish and reinforce status, especially within the upper class. What you ate and how you ate it was a determining factor in how virtuous you were considered. Within the upper class of Rome, there were two opposing camps on how to view food and dietary culture. The first, revealed and ridiculed in the satiric works of Petronius and Juvenal in the late 1st century AD, embraced luxury foods; these were wealthy members of the Roman aristocracy who used their ability to buy exotic foods as a marker of prestige. The second camp, represented by Stoic writers like Seneca and intellectuals like Valerius Maximus and Pliny the Elder, looked down upon the utter gluttony of the upper class with disgust and prided itself on being morally pure because of giving up extravagant food. These thinkers encouraged Romans to adopt a plain style of eating and living. Analyzing how Roman critical thinkers thought about food opens a window into how they decided who was truly considered "elite" in this ancient society. It is remarkable that certain parts of the Roman upper class sought to distinguish themselves through virtue rather than wealth.

PRESENTER: EVER BLAINE-JOHNSON, ENGLISH
FACULTY MENTOR: DR. JACQUES LEZRA, HISPANIC STUDIES
PROJECT TITLE: *THE MODERN SUBLIME*

To feel deeply is an act of defiance in an era that prioritizes detachment and irony. This collection of Romantic era inspired poetry insists on the value of emotional surrender, wonder, and the sublime. Rooted in John Keats concept of negative capability, the poetry within this work does not seek resolution but revels in the uncertainty of human experience. Nature emerges as a haven from digital alienation, while the lyrical voicing lingers in states of awe, dissolution, and longing.

The creative process in this project was guided by a conscious rejection of rigidity, favoring an organic form and the use of sensory-driven language. These poems embrace fluidity, resist prescriptive meaning, and extend an invitation to the reader to experience moments of raw feeling. They do not attempt to replicate the greatness of Romanticism, but rather continue its unfinished conversation, one in which beauty is neither ornamental nor passive but something to be inhabited and lived through.

One poem reads "longing is not to lose, nor thirst in vain / beauty lives where questions still remain," articulating the collections guiding impulse: uncertainty is not a failure but a condition of beauty itself. Early readers of the collection have described the work as immersive, nostalgic, and at times slightly unsettling, which affirms the intent. *The Modern Sublime* is a reclamation of feeling, and an insistence that poetry can still move, haunt, and make us feel as if we are standing at the edge of something vast and unknowable.

PRESENTER: CAMILLE-FAYE CABEBE, PSYCHOLOGY
FACULTY MENTOR: DR. ELIZABETH DAVIS, PSYCHOLOGY
PROJECT TITLE: NAVIGATING EMOTIONS TOGETHER: HOW PARENTS' AND CHILDREN'S EMOTION REGULATION STRATEGIES FOSTER CONVERSATIONS ABOUT FEELINGS

Parents' self-expression and emotion regulation (ER) affect how children regulate their emotions. If parents do not regulate their emotions, their children may be more likely to be dysregulated and feel uncomfortable discussing their feelings, particularly negative ones. Conversely, parents who socialize and engage with their children raise children with lower-intensity anger and sadness. Studies have explored how parents and children with similar ER skills navigate negative emotions but not in real-time shared emotional interactions. The primary goal of this research project is to investigate the extent to which adults' ER patterns correspond to those of their children, aiming to understand how dynamics shape emotional development. We will study 55 predominantly Latinx/Hispanic parent-child dyads with a child between the ages of 7-12, (M = 10.11 years, SD = 1.94; 30 girls) who participated in a cross-sectional, multi-method lab study of family emotional functioning. Each member of the dyads separately completed semi-structured interviews exploring their relationships, intrapersonal ER (how they regulate their emotions), and interpersonal ER (how they help others regulate emotions) in stressful, fearful, or worrisome situations. Each dyad member's ER responses will be coded to find similarities within each dyad for intra- and inter-personal strategies (e.g., praying for help and hugging a family member). After separately watching a scary movie, participants discussed their feelings in a dyadic conversation. Behavioral global coding assessed children's and parents' engagement individually and dyadically during the movie discussion. We hope to see similarities between ER strategies that create comfort in discussing feelings.

PRESENTER: SAMANTHA CASTILLO, PSYCHOLOGY
ADDITIONAL PRESENTER: YASS BABAZADEH, NEUROSCIENCE
FACULTY MENTOR: DR. DAVID ROSENBAUM, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: HUNTER B. STURGILL, PSYCHOLOGY
PROJECT TITLE: BIMANUAL HAPTIC SEARCH

In daily life, we feel for objects often without vision using our sense called Haptics. Much of the research that has been done has focused on single-handed searches. We investigated searching with two hands, asking if there is a clear advantage, disadvantage, or no difference in performance compared to single handed searches. Participants searched for a unique target amongst uniformed distractors with their left hand only, right hand only, or with both hands simultaneously. We were interested in the times for both hands to complete the search compared to the times for each single hand. Additionally, how might times vary when the feature of the unique target was length or texture. When the hands are feeling for the same feature (both length, both texture) would search times be different than when the hands are feeling for separate features (one length, the other texture)? Searches with both hands showed

significant advantages in time and accuracy compared to the sum of the mean left-hand-only times and mean right-hand-only times. Also, there was no appreciable difference between both hand times when the hands were searching for the same vs different features. This suggests that the advantage of searching bimanually isn't due to the feature of the target being the same between both hands. Future research will investigate the role that action coupling plays in the bimanual search advantage. These findings can improve efficiency in the workplace. It can also inform software for robotics and prosthetics, along with aiding rehabilitation processes.

PRESENTER: LINDA CASTRO, BIOLOGY
FACULTY MENTOR: DR. KIM DIONNE, POLITICAL SCIENCE
PROJECT TITLE: SKIN TONE AND SATISFACTION WITH HEALTHCARE SERVICES IN MEXICO

We build on earlier research on race and health, we first replicated a study examining satisfaction with health services and ethnoracial self-identification in Mexico. Our contribution is to consider both ethnoracial self-identification and a measure of skin tone as potential factors shaping Mexicans' experiences with and evaluations of public health services. We examined data from the Americas Barometer, a scientifically rigorous comparative survey study with stratified nationally representative samples drawn of voting-age adults in each of the 34 countries where they work. More specifically, we analyzed Americas Barometer survey data collected in Mexico in 2023 (N=1,622). In addition to running cross-tabulations of health service access and satisfaction with ethnoracial self-identification and skin tone, we also used multivariate regression analysis and other statistical methods to explore how race may influence access to and satisfaction with public health services. Our initial results were inconclusive due to the limited number of participants with darker skin tones. This limitation led us to incorporate propensity score matching into our ongoing research for further analysis. Additionally, we plan in the future to conduct our own in-depth survey in Mexico to expand on these findings.

PRESENTER: KAYLEE CHEUNG, BIOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: HAILEY ROUSEY AND HANZHI WANG
PROJECT TITLE: COMPARING TWO SYSTEMS FOR MEASURING INFANT BODY POSITION

Infants change position many times throughout the day, so measuring these positions is essential for tracking their motor experience. Sensors are relatively new to this field of research, as video recordings were previously the primary and more commonly used method for tracking motor development. Therefore, it is important to evaluate the data provided by these new technologies to advance our understanding of motor tracking. We compared the Inertial Movement Unit tracker leggings (Franchak et al., 2021) and the Smart Jumpsuit design (Airaksinen et al., 2020). Both systems assess moment-to-

moment data in similar ways from wearable inertial sensors, but Franchak et al. (2021) sensors are less tethered to a device and record for longer periods of time, whereas Airaksinen et al. (2020) system features a user-friendly design meant for clinical use. Since motor development is closely linked with neurological development (Airaksinen et al., 2023) the data collected can assist in informing a hypothesis about the infant's future neurological state. In this study, we have participants aged 8-24 months come into the lab and test the two systems to determine the differences of functionality and how each system might be best utilized. We expect both systems to be accurate in determining the timing precision, identifying the positions the infants are presenting, and correlating the findings to the video recording of that session. In this way we will be able to determine the differences between the two systems and potentially explore what body positions are best detected by each system.

PRESENTER: SONIA CHIAPPE, HISTORY
FACULTY MENTORS: DR. GEORG MICHELS, HISTORY AND DR. MOLLY MCGARRY, HISTORY
PROJECT TITLE: A MODEL OF WAR PHOTOGRAPHY: THE LEGACY OF LEE MILLER

My research discusses the pioneering role of the American photographer and war correspondent Lee Miller. Miller lived in England at the start of World War II and began taking photos and documenting German air attacks on London during the Blitz for *Vogue* magazine. She later went to France to join the war effort and photographed life under the German occupation. Drawing on Miller's photos and articles published in *Vogue*, her personal letters, and dispatches, I argue that Lee Miller intended to empower women in two important ways. First, she wanted to demonstrate that women are capable of bearing witness to the horrors of war and are not too weak or emotionally fragile to do so. Miller exposed the crimes of the Holocaust and showed the impact of war on innocent victims. Second, she consciously photographed women in the various military and other roles of importance to the war effort. By taking these photos and publishing them in a high-profile magazine like *Vogue*, she showed that women could play a vital role in defending democracy and fighting tyranny. To serve as a war correspondent, Lee Miller, like other female journalists, had to surmount many sexist assumptions about women's mental and physical capacities. These prejudices were still in place after the war, and many female journalists were dismissed from their positions once hostilities ended. Nonetheless, they paved the way for female journalists working today in war zones around the world.

PRESENTER: TABITHA CONSTANTINO, PSYCHOLOGY
FACULTY MENTOR: DR. LIZ DAVIS, PSYCHOLOGY
PROJECT TITLE: AN ANALYSIS OF EMOTION REGULATION AND EXPRESSION BETWEEN CHILDREN AND THEIR PARENTS

Emotion expression and regulation between children and parents is a highly researched topic within the field of psychology. The topic is important to study, as a greater understanding provides valuable insight into the cognitive processes of divulging feelings. This literature review will examine the different factors that may contribute to emotion sharing, including home environment, emotion regulation strategies, reactions to expressed emotion, and attachment style. The goal of this paper is to outline the complex nature of parent–child dynamics, identifying many possible explanations for parent–child dyadic emotion behavior. The reviewed set of studies emphasizes the importance of a child's upbringing and early life experience, parenting behavior, and the closeness of a parent and their child. Researchers also acknowledge the importance of parents' education level and upbringing, suggesting that their sharing of emotion is closely related to their child's. Future research is needed regarding populations outside of the United States, culture-specific phenomena, and more longitudinal and adoption study designs.

PRESENTER: RYAN CORFMAN, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: THE FEARS OF THE ANTI-FEDERALISTS

After winning the American Revolutionary War (1775 – 1783), the Patriots had to decide how they would govern themselves and protect the freedoms which they had fought for. In the 1780s, two schools of thought quickly emerged, the Federalist and the Anti-Federalist. The Federalists rallied for a strong centralized government and advocated for the approval of the newly written Constitution, while the Anti-Federalists pushed for stronger, state-oriented government. Each side wrote pamphlets and political tracks to persuade the American public to their side. Perhaps the most well-studied and known of these political tracks are the *Federalist Papers*—written by Alexander Hamilton, John Jay, and James Madison— which called for drastic changes and embraced the new American government. This poster explores the opposition: the Anti-Federalists. The Anti-Federalists feared a strong centralized government, which they argued would lead to corruption and tyranny. They sought to protect the very freedoms Americans had fought to acquire, in particular individual rights. This project argues that only by looking at the Anti-Federalist can we grasp the fears of the American people as they sought to form a new nation. Centering the understudied writings of the Anti-Federalists, this poster uncovers the concerns, compromises, and fights that helped shape the emerging American government.

PRESENTER: ANGEL CORONA, LATIN AMERICAN STUDIES
FACULTY MENTOR: DR. ALFONSO GONZALES TORIBIO, LATIN AMERICAN STUDIES
PROJECT TITLE: CLAROSCURO CRISIS: THE FLUCTUATING POLITICAL ECONOMY OF JARDINEROS IN THE INLAND EMPIRE

The work of 'jardineros', also known as Hispanic gardeners or landscapers, is a crucial part of Southern California's informal economy. Since the 20th century, this form of labor has been a significant opportunity for migrants as a source of income and social mobility. The limited research on jardineros and the stability of their work through contemporary political, economic, and social crises has created a gap in establishing how their value and environment shifts. These crises include increasing migration, climate change, expanding logistics, and the COVID-19 Pandemic. This combination forms part of a phenomenon I term a 'claroscuro' crisis, which is the clear and unclear conditions produced by the complexities of neoliberalism. How are changing material conditions reshaping the environment of suburban lawn maintenance/landscaping markets and affecting Mexican and Central American jardineros? This case study draws upon physical observations affecting jardineros, analysis of historical patterns in the literature of gardening in California, and direct survey data produced in the Inland Empire on labor conditions of Mexican and Guatemalan nationals. The research on the conditions of migrant jardineros serves to add more understanding on the study of alienated labor, migration and the political economy of informal labor markets.

PRESENTER: CONNOR CREACH, HISTORY
FACULTY MENTORS: DR. ALEJANDRA DUBCOVSKY, HISTORY AND DR. GEORG MICHELS, HISTORY
PROJECT TITLE: CULTURAL RESISTANCE AND SURVIVAL: NATIVE HAWAIIAN ADAPTATION TO AMERICAN COLONIALISM, 1898-1959

Between 1898 and 1959, Native Hawaiian resistance to American colonialism served two interconnected purposes: first, preserving cultural identity in the face of attempted systemic erasure; and second, challenging the legitimacy of U.S. rule through protest and political organization. While most of the existing scholarly literature focuses on the latter aspect, my research aims to focus on the former. The experience of annexation served as a powerful cultural turning point for Native Hawaiians to rally around the cause of self-preservation. In response, Native Hawaiians adapted their traditional cultural practices according to American legal and economic pressure while reinterpreting these practices as acts of resistance. Performance arts such as hula, mo'olelo, mele, and surfing—while often commodified for the growing tourism industry—became tools for cultural survival. They also served as vehicles of subversion, allowing Native Hawaiians to maintain their heritage under the guise of assimilation and acculturation. This research aims to examine how these new subversive forms of cultural expression not only preserved Native identity but also challenged the dominant colonial narrative. Drawing on Native Hawaiian newspapers and oral histories, I show that resistance was not confined to political activism alone but also remained embedded in the very practices white missionaries and businessmen sought to erase.

PRESENTER: EVELYN CRUZ, ANTHROPOLOGY
FACULTY MENTOR: DR. CATHERINE GUDIS, HISTORY
PROJECT TITLE: LOGISTICS INDUSTRY ERASURE OF COMMUNITY SPACE

I will present a poster titled "Logistics Industry Erasure of Community Space." The poster will focus on the once-booming Pro-Swap-Meet in San Bernardino that was shut down after 20 years of being in operation on October 24/25, 2021. Its location made it easily accessible to many in the areas between Colton and San Bernardino, with many people driving from areas like Moreno Valley and further. It was especially accessible to the neighborhood in which the now BNSF lot resides. The lot now brings increased truck traffic and noise to the once-peaceful neighborhood. The Pro-Swap-Meet was a source of income for the many vendors who had been selling there for multiple decades. It was also a place for friends, families, and neighbors to gather and buy affordable products. The poster will display quotes from interviewee's, that have been interviewed for about 15 to 20 minutes each. Participants include swap meet goers, vendors, and people of the neighborhood who are left to deal with the consequences of the BNSF lot being in their backyards. There will also be a segment for comments about the swap meet from people who did not belong to the neighborhood but that still enjoyed going to the swap meet. The poster will include various pictures of the swap meet in its prime and what is now left of it. It may also include new paper clippings or screenshots of social media posts covering the closure of the swap meet.

PRESENTER: DANIELA CRUZ; THEATRE, FILM, AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. KEUNPYO ROOT PARK; THEATRE, FILM, AND DIGITAL PRODUCTION
PROJECT TITLE: *BEFORE YOU FALL* SHORT FILM

Before You Fall is a 10-minute long short film about a sister and the death of her younger brother, inspired by one of the stories from the book *Mecca*, written by Susan Straight. The plot follows the aftermath of Mary and her family when she witnesses the fatal shooting of her younger brother Edward at the hands of a police officer after a school basketball game. She has to face the positive and negative consequences of the community. Facing the pressure of public's opinions and discrimination of the event, Mary has to defend her family's reputation and overcome the pain of her loss. Will melancholy stop Mary from living her life and moving forward? This short film is a University Honors Capstone Project directed and written by Daniela Cruz featuring a UCR undergraduate student-led crew. The impact of the authorities' abuse of power and lack of accountability reflect the patterns of violence and civil rights violations that affect minorities and the lives of those who are indirectly impacted by them such as family members and friends. Directing this project gives representation to African American and Hispanic communities by highlighting the discrimination and racial prejudice that is immersed in our law enforcement system in the U.S while highlighting the love of a mother and a family.

PRESENTER: MARK CUEVAS, PSYCHOLOGY
ADDITIONAL PRESENTER: AMBER SUMMERS, PSYCHOLOGY
FACULTY MENTORS: DR. AARON SEITZ, PSYCHOLOGY AND DR. MARCELLO MANIGLIA, PSYCHOLOGY
PROJECT TITLE: THE INFLUENCE OF SLEEPINESS AND ALERTNESS ON VISUAL PERCEPTION AND LEARNING

Sleepiness and alertness play a critical role in learning and cognitive performance. In the context of perceptual learning (PL), where individuals improve their ability to process sensory stimuli through practice, these factors may influence training outcomes. This study examines the relationship between sleepiness, alertness, and performance in a contrast detection task. Participants (n = 102) were trained on a visual task and asked to fill out a questionnaire on their level of alertness and sleepiness using a 5-point Likert scale. To assess the impact of these states on performance, we will conduct within-participant analyses, comparing performance in the visual task across sessions with self-reported sleepiness and alertness levels. Further, we compare the most sleepy and most alert 20% of participants to the least sleepy and least alert 20% using independent t-tests. Additionally, paired samples t-tests will be used to evaluate changes in performance across time from the first training session to the last. By examining how fluctuations in sleepiness and alertness influence perceptual learning, this study aims to provide insights into the cognitive mechanisms underlying learning efficiency and the role of mental states in skill acquisition.

PRESENTER: KAYLA DANIEL, ETHNIC STUDIES
FACULTY MENTOR: DR. JALONDRA DAVIS, ENGLISH
PROJECT TITLE: THEORIZING BLACK FEMALE LIMINALITY IN *BROWN GIRL IN THE RING*

This paper presents a theorization of the space in between Black girlhood and Black womanhood through the analysis of Ti-Jeanne in Nalo Hopkinson's 1997 novel *Brown Girl In The Ring*. Black feminist theory and Black girlhood theory offer a framework to understand the experiences of Black girls and women. However, what theory exists for the space in between Black womanhood and Black girlhood? With the work of Patricia Hill Collins, Nazeera Sadiq, Christina Sharpe, and Ruth Nicole Brown I seek to offer an argument that highlights the limitations that Black feminist theory and Black girlhood theory have in articulating the liminal space and experiences that Black female characters like Ti-Jeanne embody. Considering this reality, I propose a new position that takes into account the complicated agency that comes with the age in between woman and girl and hope to spark the conversation that highlights the complications and contradictions wrapped up in age for Black female subjects in literature and beyond.

Keywords: Black girlhood, Black womanhood, liminal, age, agency, speculative fiction

PRESENTER: ISABELLA DAY, CLASSICAL STUDIES
FACULTY MENTOR: DR. DENVER GRANINGER, HISTORY
PROJECT TITLE: TRAGIC WOMEN THROUGH THE LENS OF GREEK CREATION MYTHS

This research explores how Greek tragedians utilize creation myths to draw parallels between the suffering and fate of women in tragedy and women in foundational myths of creation. Women in these narratives are often striving for something beyond their reach—honor, justice, glory, knowledge, etc.—and are often condemned and villainized for their actions. Many scholars have called into question female morality in Greek tragedies and how the role of women and their actions in many of these plays serve as disruptive to the idea of what it meant to be a virtuous woman in Greek society. For example, in *Antigone*, Antigone defies civic laws, acting in a way she believes to be justified and warranted by the Gods even though it goes against what is deemed to be lawful by the city. Antigone compares herself to Niobe of Thebes, likening both their fate and suffering which creates a narrative frame in which we are to view these women and the implications of their actions. This employment of comparison by the tragedians between a woman in Greek society and a woman from a mythological story of creation reinforces the cycle of eternal suffering and punishment for women who strive for unattainable ideals even if their motivations are justifiable and morally defensible.

PRESENTER: DANYELLE DO, PSYCHOLOGY
FACULTY MENTOR: DR. REBEKAH RICHERT, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: ASHLEY MARIN
PROJECT TITLE: EXPLORING THE INFLUENCE OF WORKING MEMORY AND THEORY OF MIND ON EARLY COUNTERFACTUAL REASONING

Counterfactual reasoning (CR), the ability to reflect on how past events could have occurred differently, develops with age in childhood (Rafeteseder et al., 2010). This study examined whether Working Memory (WM) and Theory of Mind (ToM) influence the likelihood of making at least one CR response and the number of responses children provide to a given scenario (i.e., considering ways they could have broken a glass while setting the table). 124 children (ages 4.48–8.69, M = 6.20, SD = 0.91; 62.9% female) completed a ToM and digit span task. A statistically significant binary logistic regression model predicted the likelihood of providing one CR response, $\chi^2(3) = 30.78$, $p < 0.001$, explaining 33% of the variance (Nagelkerke $R^2 = 0.33$). WM was a significant predictor (B = 0.44, SE = 0.20, p = 0.030, OR = 1.56), suggesting that children with higher WM scores were 1.56 times more likely to generate at least one CR response. ToM was also significant (B = 2.84, SE = 0.83, $p < 0.001$, OR = 17.07), indicating that children with higher ToM scores were 17 times more likely to generate at least one CR response. Additional Spearman correlations showed that the number of CR responses children provided was significantly, positively related to their ToM (ρ =0.339, $p < .001$), age (ρ = 0.359, $p < 0.001$) and WM, (ρ = 0.316, $p < 0.001$). Results suggest that both executive function and social skills influence whether children generate a CR response and how many they provide.

PRESENTER: JUSTINE DU, PSYCHOLOGY AND LAW AND SOCIETY
FACULTY MENTOR: DR. YONG CHO, ART HISTORY
PROJECT TITLE: THE POWER OF CHINESE EMBROIDERY

Within the Chinese American community, the art of embroidery is often valued as a way of forging one's connections with Chinese history and culture. As a form of traditional textile craftsmanship, the knowledge of embroidery is often passed down through generations within a family. How does the act of creating a work of embroidery—which is, after all, simply a piece of cloth—instigate the process of constructing one's lineage and cultural identity? This project investigates the various aspects of embroidery—its technique, materiality, and design—in order to understand how the embroiderer's choices in the process of embroidering dictates and shapes the meaning of the resulting work. The Chinese American embroiderer often chooses the type of stitch, material of the fabric, and the pattern to create an artwork with the specific intentions of portraying and constructing one's own cultural identity. In this project, I demonstrated the power of embroidery and captured its cultural significance by creating my own work of embroidery. In doing so, this project demonstrated how it can be worthwhile to analyze the technical and material details of an embroidered cloth congruently as a way to understand this art medium's power to preserve the embroiderer's intergenerational memories and cultural identity.

PRESENTER: KARLA ESTRADA, PHILOSOPHY
FACULTY MENTOR: DR. ERIC SCHWITZGEBEL, PHILOSOPHY
PROJECT TITLE: ON THE SOUL: MESOAMERICAN AND PLATO'S CONCEPTION OF THE SOUL

Prominent Mesoamerican scholarship surrounding the conception of the Aztec soul attributes 3 essences—or vital forces—to a human being: Tonalli, Teyolia, and Ihiyotl. Scholars, such as Austin, Maffie and McLeod, offer a tripartite conception of the soul. The three essences inhabit different parts of the body—Tonalli residing mainly in the head and face, Teyolia in the heart and Ihiyotl in the liver—all which are crucial for an individual to live. This conception and arrangement of the essences initially seems similar to Plato's conception of the tripartite soul. I argue that while all three essences share some similarities in the way that they work together, Teyolia is most similar to the reasoning part of the soul, while Tonalli is similar to the spiritive part, and Ihiyotl is similar to the appetitive part. In this presentation I will highlight the similarities between Aztec and Western ideas of the soul. My goal is to see if we can make more generalizations of the soul based on the found similarities. Are there certain qualities or traits of the soul that transcend cultures? What can we take from these two different philosophical lenses? I believe that my findings will allow for more conversations about souls to be studied. If we are to find similarities, in what direction should we take these findings?

PRESENTER: EIRSA YUMNA FAISAL, NEUROSCIENCE
FACULTY MENTOR: DR. MUHAMAD ALI, MIDDLE EAST AND ISLAMIC STUDIES
PROJECT TITLE: THE CONFLICT BETWEEN ISRAEL AND PALESTINE

Over the course of 76 years, the relationship between Israel and Palestine has been marked by a complex history of conflict, displacement, and territorial disputes. Drawing on extensive research into the history between Israel and Palestine, this paper aims to answer the following primary question: how does the conflict between Israel and Palestine reflect historical events that have occurred in the past and how does this affect other countries and more specifically Muslims globally? This question is addressed throughout the paper, by examining the historical causes and long-term effects of this conflict. Drawing comparisons to similar territorial disputes such as the Kashmir conflict between India and Pakistan, this paper explores how these historical parallels provide insight into the complexities of the Israeli-Palestinian conflict. Furthermore, this paper delves into the broader implications for Muslim communities, specifically Muslim American students, who face hate crimes and psychological distress as a result of this. This paper also addresses the role of the United States in shaping the dynamics of the conflict. By combining historical, political, psychological, and social aspects, this research paper tends to shed light on the root causes and lasting impact of the Israeli-Palestinian conflict on individuals and countries worldwide, with particular attention to the experiences of Arabs, Jews, and Muslims globally.

PRESENTER: RILEY FONG, POLITICAL SCIENCE
FACULTY MENTOR: DR. KIM DIONNE, POLITICAL SCIENCE
PROJECT TITLE: POLICING, PROTESTS, AND POLICY: THE IMPACTS OF INSTITUTIONAL BACKLASH ON STUDENT ACTIVISTS

This study examines the relationship between arrests made during on-campus protests and the motivations of student protestors to continue participating in those protests following those arrests, taking into account the scrutiny of police alongside rising political activity in the student body that have culminated in highly publicized criticism of policing as an institutional tool against student protesting. To further understand this relationship, I examined the attendance trends of seven California college campus protests from 2023-2024 with information from CalMatters and the Crowd Counting Consortium. Using this data, I created a timeline analysis of the affected attendance sizes of Pro-Palestinian protests over time as high counts of arrests occurred, as well as a supplemental correlational test to provide a basis for the findings of my timeline. Ultimately, I found that student protestors' motivations to continually protest are negatively affected after large-scale arrests occur, and I hypothesize that students fear retaliation through arrest or violence if they continue attending protests. In future research, I plan to incorporate survey data to gain a more nuanced perspective of students' attitudes towards protesting following police activity, and my findings contribute to a broader understanding of student protestors, youth political participation, and the impact of policing upon protesting motivation.

PRESENTER: ANDREW FRIEDMAN, EDUCATION
ADDITIONAL PRESENTERS: STELA NOELLE, PSYCHOLOGY AND KELLSIE PHAM-NGUYEN, EDUCATION
FACULTY MENTOR: DR. SERENA ZADOORIAN, PSYCHOLOGY
PROJECT TITLE: ASSESSING THE IMPACT OF VISUAL SPEECH CUES ON SPEECH PERCEPTION IN DIVERSE HEARING POPULATIONS

Visual speech cues have become increasingly relevant in recent years, especially as the COVID-19 pandemic necessitated the use of masks. Previous research, including work by Sumby and Pollack (1954), have shown that visual speech cues improve speech perception, especially in noisy environments. While all listeners benefit from visual speech cues, the extent of their usage varies. For instance, studies such as Herbert et al. (2022) and Bernstein et al. (2014) show the usage of visual speech before cochlear implantation benefits some patients but hinders others. Understanding this variability could help clinicians tailor rehabilitation programs for individuals with varying levels of hearing loss. The goal of this research is to create a self-rating questionnaire to assess patients' reliance on visual speech cues and their impact on speech comprehension in environments with varying noise levels. This study aims to measure visual speech use, offering insights into its role in speech perception across diverse hearing populations. Our findings can significantly enhance clinical practices and patient care protocols, leading to more effective and personalized treatments.

PRESENTER: ARIANA GONZALEZ-ALCAZAR, HISPANIC STUDIES
FACULTY MENTOR: DR. LINDA LEMUS, HISPANIC STUDIES
PROJECT TITLE: RETHINKING BILINGUAL EDUCATION: WHAT ABOUT THE PARENTS?

The impact of state policies in California has had an impact on bilingual education. For nearly three decades, Proposition 227 (1998) restricted bilingual education, until Proposition 58 (2016) passed and repealed Proposition 227 and expanded bilingual education, including dual language immersion (DLI). This study examines parents' perceptions and attitudes toward Spanish-English DLI programs, emphasizing the need for improved teacher training and stronger collaboration among families, educators, and policymakers. In Southern California, many parents lack familiarity with the educational system or the structure of DLI classrooms, making it difficult to support students with homework and academic tasks. Despite these challenges, research shows that DLI programs enhance students' proficiency in both English and Spanish, contributing to higher academic achievement, including higher GPAs (Serafini & Winsler, 2020). However, researchers and educators may be over-reporting parent satisfaction when, in reality, parents may simply be appreciative of the dual language opportunity (Olivos & Lucero, 2020). Using a qualitative research approach, parent participants with children in DLI completed a survey and a semi-structured interview about their perceptions and attitudes toward the DLI program. Data were collected across three school districts in Southern California and analyzed to examine the intersection of dual-language education, academic achievement, parental engagement, and systemic barriers to bilingualism in U.S. schools. By analyzing these perspectives, this study highlights

the need for stronger institutional support and policies that empower bilingual students and their families.

PRESENTER: CHAVAH GRACIE, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: BRIDGING THE GAP: THE DISCONNECT BETWEEN HISTORICAL RESEARCH ON THE TRANSATLANTIC SLAVE TRADE AND CALIFORNIA K-12 CURRICULUM

The Transatlantic Slave Trade led to the violent removal of over 12 million people, bound together three continents, and reshaped the early modern world. But how are these impactful and complicated topics taught in California K-12 education? This project focuses on examining both the evolution of California's statewide curriculum adoptions and research produced by historians on the topic of the Transatlantic Slave Trade. It argues that there is a glaring disconnect between what California's statewide curriculum expects teachers to teach and what professional historians argue is central to understanding the Transatlantic Slave Trade and the emergence of slavery in the United States. First, the research chronicles the creation and implementation of California's changing statewide curriculum. Then, it highlights prominent research and findings of professional historians. And finally, looking closely at the content requirements in California's curriculum, it showcases the disconnect between K-12 educational practices and the research of professional historians in regards to the Transatlantic Slave Trade. The project concludes by offering suggestions and solutions for better connecting historical research, educational research, and the experiences of educators, arguing that by more closely aligning these approaches the Transatlantic Slave Trade can be taught in a more nuanced and holistic manner while improving student learning and providing students more skills for historical exploration.

PRESENTER: NATALIE HALPERN, NEUROSCIENCE
FACULTY MENTOR: DR. EDWARD KORZUS, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: JORDAN STEINHAUSER AND KYLENE SHULER
PROJECT TITLE: THE BEHAVIOR PARADIGM ENABLES MICE TO EFFECTIVELY DISCRIMINATE BETWEEN ENVIRONMENTAL CONTEXTS FOLLOWING GENERALIZED FEAR ACQUISITION

Fear is a normal response to environments perceived as dangerous or threatening, aimed at making decisions that maximize survival. Studying fear responses reveals patterns and trends that help understand and manipulate the mechanisms activated during fearful behaviors. Contingency Judgment Learning (CJL) allows for accurate predictions and ultimately behavioral responses to fearful contexts based on associated cues. We hypothesized that mice would be able to discriminate between distinct contexts after generalizing their fear across these contexts. The paradigm of this study utilizes the concept of Pavlovian Conditioning, where the mice associate the unconditioned stimulus of a foot shock

with the conditioned stimulus of a specific context. We then measure their ability to discriminate between safe and threatening contexts based on the amount they freeze in place. We found that the mice developed fear during conditioning, displayed generalized fear in two contexts, and successfully distinguished between the contexts by the end. The average percentage of time they spent freezing was recorded throughout the behavioral experiment, and this data was used for statistical analyses. A repeated measures ANOVA indicated a statistically significant reduction in freezing of mice in the safe Conditioned Stimulus (CS-) context compared to the threatening context, Conditioned Stimulus + (CS+). This indicates that, in the early stages of CJL, mice primarily perceive both the CS+ (unsafe) and CS– (safe) as threatening, but after several days of repeated exposure, they learn the contingencies and can discriminate accordingly.

PRESENTER: COLE HAMMES, ECONOMICS
FACULTY MENTORS: DR. BREE LANG, ECONOMICS AND DR. VICTOR ORTEGO-MARTI, ECONOMICS
PROJECT TITLE: REMITTANCES: A SMALL POSITIVE IN THE COVID ERA

For many low- and middle-income countries, remittance payments are a vital contributor to their economy. However, the emergence of the Covid-19 pandemic in 2020 led to swift action by countries to limit travel and migration, hoping to protect their population from the virus. Low- and middle- income countries that rely on remittance payments as fixtures to their GDP experienced a major decline in incoming remittance funds. Unexpectedly, during the second half of 2020, remittances made a major rebound. The rebound was due to a multitude of factors highlighted by increased access to regulated, affordable electronic payment tools, and economic support from remittance host countries. To analyze the effect of Covid-19 policy on remittances, this paper utilizes data provided by Oxford University that evaluates policies related to vaccine and testing access, financial support, and containment measures from 6 host countries. The data about policy responses are linked to bilateral remittance and immigration data from the World Bank for 147 additional countries. The findings of the study can be used to develop successful policy in the face of natural disaster to sustain the remittance market.

PRESENTER: ZACHARY HANSON, HISTORY
FACULTY MENTOR: DR. CATHERINE GUDIS, HISTORY
PROJECT TITLE: CHALLENGES, HURDLES, AND INSTITUTIONAL ROADBLOCKS IN UNDERGRADUATE DOCUMENTARY FILMMAKING

Increasingly prevalent in the modern digital age, documentary film offers an accessible and convenient form of educational media consumption. As traditional readership declines, this may become more exaggerated. Despite their growing significance, student documentaries often face challenges that hinder their completion. Academic and institutional hurdles, particularly limited funding and access to essential resources, often lead these films to incompletion. Not unique to UCR, these obstacles are

significant within this institution due to departmental library restrictions, limited class sizes and faculty populations within the Arts and TFDP departments, and a shortage of significant funding for student research. As a transfer student, these issues affected me particularly harshly given the short time which I have and will study at this institution. While here, I attempted production of two documentary films, both of which succumbed to time and funding issues. Film as a medium is extremely dominating, and without support production on these pieces borders on impossible, especially as a student outside of the dedicated arts departments. Through analysis of the factors that led to the failure of these projects and the exploration of potential solutions, both personal and institutional, the challenges and opportunities for student documentary filmmaking at UCR may be brought to light.

PRESENTER: EQUINOX HARTMAN, ANTHROPOLOGY
FACULTY MENTOR: DR. JENNIFER SYVERTSEN, ANTHROPOLOGY
PROJECT TITLE: PSYCHIC WORLDS THEORY: INTERSECTIONS OF PLAY, ART, AND ACTIVISM

How does play intersect with conceptual worldmaking? How does art intersect with forming identity and community? These are the questions central to my research in understanding secondary, or as I call them, Psychic worlds. As the name implies, a psychic world exists first within the mind, but through things like art, play, and community this world may be shared and exist between consciousness. The real, or material, world along with a person's conditions therein informs personal perceptions and forms their psychic world. To understand this psychic world is to see how those in power are able to control common sense through popular culture. To harness the power of the psychic world is to subvert previously held beliefs of nihilism, supremacy, and racism. Eugen Fink (1960), Mark J.P. Wolfe (2012), Adrienne Maree Brown (2017), and Mark C. Jerng (2017) all trace and theorize the formation and power of the psychic world in relation to play, worldbuilding, activism, and race respectively. Through active play anyone can harness this world, community can foster a new psychic world, and in art one may change conceptions of that world. This is why the critical study of things like pop media matter so much to combating systems of oppression. This alternative world helps to explain why art can so deeply affect one's sense of identity. By harnessing the psychic world laterally in opposition to forces of hierarchy, we can start to form a new material world through art and play based on mutual aid and joy.

PRESENTER: MURPHY HERNANDEZ, EDUCATION
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: REFRAMING THE LAVENDER SCARE: CENTERING QUEER VOICES

During the Cold War Era, the dominant narrative of LGBTQ+ people was that they had weak "moral fiber" and were susceptible to Communist ideology and blackmail, leading to anti-LGBTQ+ policies, widespread investigations, and mass firings in the military and federal government. This time was known

as the "Lavender Scare." In the decades since, our understanding of this era has shifted to recognize these policies as manifestations of moral panic, homophobia, wasteful security theater, and a tactic for political attention. Yet one area of the Lavender Scare that remains underexplored are the rich experiences of LGBTQ+ military personnel. This poster centers the voices and stories of LGBTQ+ military personnel and transforms a narrative of Queer victimhood into one of Queer humanity. Analyzing a photograph collection of LGBTQ+ Life housed at UC Riverside's Special Collections, Queer writing, and interviews with military veterans, this work showcases human stories of joy, sorrow, community, and remarkable resilience during this time of government repression. This reframing is vital not only for creating new understandings of the impact of the Lavender Scare on LGBTQ+ people, but also in taking LGBTQ+ military personnel out of the historical shadows and honoring their contributions to the U.S. Military.

PRESENTER: LEYNA HOANG, PHILOSOPHY
FACULTY MENTOR: DR. ALEXANDRA NEWTON, PHILOSOPHY
PROJECT TITLE: MEANINGFULNESS & AUTHENTICITY—ARE THEY THE SAME?

When describing our lives, two common words used to describe its quality are "meaningful" and "authentic," typically used interchangeably. We seek out actions and relationships that we deem meaningful or authentic in order to live life to the fullest. However, it begs the question, why do we assume that these words are interchangeable? Is a meaningful life the same as an authentic life? In this project, I discuss the difference between authenticity and meaningfulness in an individual's life, distinguishing the difference between these labels. By referencing Martin Heidegger's *Being and Time*, I establish an understanding of authenticity as a state of being that individuals must strive and work towards. Meaningfulness, on the other hand, is established to describe the quality of actions—it can be thought of as a scale. With authenticity understood as a state of being and meaningfulness as the quality of actions, are these two related at all? Authenticity and meaningfulness are two steps required to live a full life. The individual must understand what it means to be authentic according to her being, not what anyone else says, before performing meaningful actions. If not, then there is a chance that she performs actions that may not be meaningful to her life. By understanding meaningfulness and authenticity this way, we're able to better understand how to live our individual lives to the fullest.

PRESENTER: DANIELLE HOLTZ, HISTORY
FACULTY MENTORS: DR. GEORG MICHELS, HISTORY AND DR. MICHELE SALZMAN, HISTORY
PROJECT TITLE: THE GRACCHI: REVOLUTIONARIES AGAINST THE SENATE

Tiberius and Gaius Gracchus were revolutionary tribunes in the late Roman Republic. Their progressive social reforms, such as Tiberius' agrarian law and Gaius' judiciary and tax changes, encroached on the traditional role of the Senate and led to a dramatic increase in political tensions. The focus of my research is on the escalation of violence that continued to rise with each of the brother's successive tribunates. Neither party was willing to compromise. Finally, the Senate felt so threatened by the Gracchi's growing power that it turned to violence and in the aftermath, Tiberius was assassinated in 133 BC. His brother, Gaius, suffered the same violence in 121 BC. The tribunates of the Gracchi brothers mark the start of growing political strife that eventually led to the demise of the Senate and the fall of the Roman Republic. My analysis is based on a careful reading of Appian's *Bellum Civile* and Plutarch's *Lives*, along with numerous other secondary sources. I will argue that the failure of the Gracchi to compromise was the source of on-going political tensions that eventually undermined the state.

PRESENTER: NATALIE HWANG, PSYCHOLOGY
FACULTY MENTOR: DR. REBEKAH RICHERT, PSYCHOLOGY
PROJECT TITLE: COMPARING ATTACHMENT STYLES BETWEEN ADOPTEES AND NON-ADOPTEES AT UCR

This study aims to explore attachment styles in adoptees and non-adoptees. By focusing on their interpersonal relationships with parental figures and close friends, the study will use an Adoption Questionnaire and the Inventory of Parental and Peer Attachment (IPPA) to identify if there is a difference in the following subscales: trust, communication, and alienation. The developed Adoption Questionnaire will collect basic demographic information and adoption status if applicable while the IPPA will evaluate personal perceptions of connections with one's mother figure, father figure, and close friends. Currently, data is being collected from undergraduates at UCR. By comparing the responses between the adoptees and non-adoptees, this research aims to dissect how adoption experiences might affect or shape attachment bonds in the future. Currently, research on adoptees is minimal, as existing literature largely focuses on adoptees' academic growth or lack of, parental relationships with adopted children, maternal challenges, and more. While these studies have produced influential findings for this population, research still overlooks relational challenges that adoptees might face such as building emotional bonds with peers. This study hypothesizes that adoptees will exhibit weaker attachment qualities in comparison to non-adoptees. Findings from this study may inform other research on the impact of adoption, including but not limited to abandonment challenges and social regulation. With more empirical research on this population, core individuals in an adoptee's life could be better informed in supporting their developmental needs.

PRESENTER: AINARA IBARRONDO, PHILOSOPHY
FACULTY MENTOR: DR. ERIC SCHWITZGEBEL, PHILOSOPHY
PROJECT TITLE: ADDICTION, JUDGMENT, AND NARRATIVE SELF-CONSTITUTION; ALCOHOLICS ANONYMOUS AND THE SELF-CONTROL OF ABSTINENT ADDICTS

This research is concerned with developing a model of addiction that may provide explanatory power for the effectiveness of Alcoholics Anonymous and adjacent 12-step programs. The model I set forth is one in which the cycle of intention-setting, consumption, and regret is driven by what Levy identifies as "cue dependent belief oscillations" wherein the addict's failure to exercise diachronic agency is affected by a failure to have control over their judgments. First, I motivate an account of the addict's agency by exploring the theoretical problems with the Disease and Willpower models of addiction as well as their phenomenological salience, particularly with regard to AA. From there I argue that addiction is characterized by unpredictability and that the addict is neither subject to irresistible temptation nor able to consistently align their intentions and their actions. With this in mind, I engage critically with Levy's account of weakness of will and judgment in order to claim that the addict who is unable to consistently carry out their intentions to refrain is unable to have predictable judgments in response to predictable stimuli. Thus, in the period between resetting the intention to refrain and drug availability, the addict cannot have any reliable indicator as to whether or not they will judge that they have good reason to refrain.

PRESENTER: FUNANYA IKECHUKWU, BIOLOGICAL SCIENCES
FACULTY MENTOR: DR. KIM YI DIONNE, POLITICAL SCIENCE
PROJECT TITLE: INVESTIGATING OBESITY AMONG AFRICAN-AMERICAN AND NIGERIAN IMMIGRANT POPULATIONS

Current obesity research often lumps all Black individuals into a single category, disregarding the cultural and genetic differences between African-Americans and recent African immigrants. This issue highlights the need for ethnic distinctions within Black populations to understand obesity patterns more accurately. The study conducts a systematic review of existing obesity studies, focusing on research involving Black/African-Americans and Nigerian-Americans, with a particular emphasis on obesity rates and their genetic correlations. Preliminary findings reveal significant disparities between these groups. Nigerians have lower obesity rates than African-Americans. U.S. Despite this, both Nigerian immigrants and African-Americans share common genetic markers, such as polymorphisms in the angiotensin-converting enzyme and AGRP genes, which are linked to obesity. It is also noted that Nigerian immigrant groups had a lower plasma leptin which is correlated with lower obesity rates. However, Nigerian immigrants tend to have lower obesity rates compared to other African diasporic groups. The analysis also shows that factors like resting energy expenditure (REE) and physical activity levels do not seem to significantly differ between the groups, suggesting that the cause of obesity may lie in other factors, such as diet or genetic predispositions. This review emphasizes the need for more targeted health

interventions that consider cultural and ethnic distinctions and lays the groundwork for future research to explore how diet, culture, and genetics contribute to obesity within these communities.

PRESENTER: BRYNN IZAY, CLASSICAL STUDIES
FACULTY MENTOR: DR. BENJAMIN KING, CLASSICAL STUDIES AND DR. KYLE KHELLAF, CLASSICAL STUDIES
PROJECT TITLE: MEDEA AS A WARNING: EURIPIDES IN ACKNOWLEDGEMENT OF AND IN PROTEST AGAINST THE NON-IDEAL ATHENIAN WOMAN

Euripides, a classical Athenian playwright working during the 5th century BCE, was, considering his position as a relatively wealthy man, uniquely aware of the social situation of Athenian women. He recognized the distinction between the ideal for women that had been perpetuated by men—that she would remain isolated from society, only interacting with her household—and the lived reality of most Athenian women, which included social activities performed amongst other women. Most Athenian women were not wealthy enough to run their households in isolation, so many of their duties required that they go out of doors. Many scholars even suggest that these women would not choose an antisocial life for themselves regardless of wealth. The reality of this disparity meant a tension between the "ideal" and the "non-ideal" Athenian woman, knowledge of which Euripides used to inform the characterization of his female characters. In reading his play *Medea* while considering his characterization of the titular Medea as independent and volatile in the context of both where it was performed as well as the audience themselves—which most likely contained both genders—an argument can be made that his specific characterization of Medea is both an acknowledgment of and a warning against specific traits of the non-ideal Athenian woman, traits which Medea shared, as Medea's nature led her to choices which would render her morally irredeemable, a fate which Euripides wished for the Athenian women in the audience to fear for themselves, in this way encouraging them to behave more like the "ideal" woman.

PRESENTER: SPANDANA JANAPATI, PUBLIC POLICY
FACULTY MENTOR: DR. CASSIA ROTH, SOCIETY, ENVIRONMENT & HEALTH EQUITY
PROJECT TITLE: THE IMMIGRANT EXPERIENCE: BARRIERS TO PRENATAL HEALTHCARE IN THE UNITED STATES

Immigrants in the United States experience significant barriers when accessing prenatal healthcare, regardless of documentation status. These barriers include cost, language difficulties, lack of trust in providers, and fears related to immigration enforcement. This review investigates the availability, accessibility, and effectiveness of prenatal healthcare services for immigrant women in the United States from 2015 to 2025, focusing on identifying systemic gaps in state and federal-level policies that further healthcare inequities. I conducted a critical analysis of existing peer-reviewed studies and scholarly articles in three databases: PubMed, Web of Sciences, and ProQuest. The analysis revealed consistent concerns with health insurance policies and highlighted ongoing challenges in prenatal

healthcare access and outcomes among immigrant women. These findings align with broader discussions on immigrant health disparities, such as the "healthy immigrant paradox," which suggests that some immigrant groups experience better health outcomes compared to U.S.-born individuals, despite facing substantial barriers to care. This research hopes to explore disparities in prenatal care further and provide policy recommendations to healthcare providers. The study will emphasize the need for more inclusive and equitable healthcare policies that ensure all women, regardless of immigration status, access essential prenatal services.

PRESENTER: ROSEANNE JERIES, NEUROSCIENCE
FACULTY MENTOR: DR. ELIZABETH WATKINS, HISTORY
PROJECT TITLE: PERPETUATING STIGMA: THE TEACHER'S ROLE IN DIAGNOSING ADHD

The medicalization of ADHD (Attention Deficit Hyperactivity Disorder) in the United States has been a significant phenomenon that has greatly impacted the country's education system for both ADHD youth and educators. Due in part to the advocacy group CHADD (Children and Adults with Attention Deficit/Hyperactivity Disorder) in the late 1980s, the use of stimulant medication in the US is significantly greater than in any other country in the world, and is prevalent among children who display symptoms of ADHD—primarily hyperactivity. With its widespread popularization from the 1990s to the early 2000s, the medicalization process came under harsh scrutiny, having been interpreted by some scholars as medicating to achieve conformity. This research paper will first present the history of the ADHD diagnosis and its evolution in the United States up until the 1990s. Then, using primary and secondary sources such as documentaries and related research, this paper will explore the role and consequences of the teacher as a cornerstone of the diagnostic process, in tandem with the spread of information—and misinformation—by CHADD during that time period. At its core, this paper will provide an examination of the medicalization of ADHD, the interplay between "experts" and the public, and students and teachers.

PRESENTER: ELANI KHOE, PSYCHOLOGY
FACULTY MENTOR: DR. AERIKA LOYD, PSYCHOLOGY
PROJECT TITLE: PLAY MORE, STRESS LESS: THE MINDFULNESS BENEFITS OF *PUMP IT UP!* FOR COLLEGE STUDENTS

Exergames—video games that involve physical activity—have been shown to cultivate a mindful state of awareness. Research shows that heightened levels of mindfulness, a non-judgmental present awareness, is associated with lower stress levels. However, few studies have directly examined the connection between engaging in exergames on mindfulness and stress. The current study aims to examine how engaging in the exergame *Pump It Up!* impacts the relationship between mindfulness and stress levels among college students. We aim to recruit 150 college students to complete self-report

measures on basic demographics, the five facets of mindfulness, and stress overload, while engaging in a six-week intervention using *Pump It Up!* To date, participants are (*n*=98, 70.4% female, 29.6% male) from diverse backgrounds (41.0% Hispanic, 36.6% Asian, 11.6% White, 5.4% Black, 4.4% Middle Eastern, and 1% Native American); on average 19 years old (*SD* = 2.2) and 47% psychology majors. Preliminary results reveal that on average college students report moderate levels of mindfulness (*M*=3.22, *SD*=0.48) and elevated levels of stress (*M*=31.18, *SD*=7.68). This presentation will cover the study's intervention and planned analysis to explore the effectiveness of engaging in exergames on mindfulness and stress among the sample of college students. Results can inform the potential use of exergames as an accessible and intrinsically reinforcing stress and mindfulness intervention, especially for low-income minority college students. This topic necessitates future research because of the high stress levels college students face.

PRESENTER: EMMA KRANE, ENGLISH
FACULTY MENTOR: DR. EMMA STAPELY, ENGLISH
PROJECT TITLE: THE PRECARIOUS GIRL: FRACTURES AND FAILINGS IN FEMINIST TELEVISION

Lena Dunham's TV series *Girls* and Phoebe-Waller Bridge's TV series *Fleabag* have become media sensations that draw on their appeal to their target demographic, primarily young adult women. Feminist critics and media researchers have debated the feminist themes of these works and labeled them as "postfeminist." However, contemporary feminist discourse debates the applicability of this term, which indicates that the aims of previous feminist generations have been met, and that feminism has therefore been superseded or rendered obsolete. This essay will study women's sexuality and identity in these series to examine how the "precarious-girl comedy," a sub-genre coined by Rebecca Wanzo, navigates previous feminist discourse's impact on the assumed conditions of "postfeminism." My study argues that *Fleabag* and *Girls* are haunted by the failings and fractures of second-wave feminism, which are cornerstones for the dysfunctional "precarious-girl comedy." These shows cannot, therefore, be considered as *postfeminist* in the usual sense, as they work through the ongoing fallout of the second-wave, rather than marking it as a thing of the past.

PRESENTER: CHRISTOPHER LAUTFY, PSYCHOLOGY
FACULTY MENTOR: DR. IAN BALLARD, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: XINXU SHEN
PROJECT TITLE: GOAL-ORIENTED BEHAVIOR AND SOCIAL MEDIA USE: A NATURALISTIC INVESTIGATION

Goal-oriented behavior is essential for achieving long-term objectives, while habits can sometimes interfere with the development of such aims. Understanding the interaction between goal-directed and habitual behaviors is crucial for improving adaptive decision-making and memory accuracy. Using a

naturalistic design, participants were presented with an iPad navigation task where they could freely switch between watching two stimuli, a lecture video (goal-directed), and Instagram reels (habit). To enhance ecological validity, participants logged into their personal Instagram accounts, where content would align more with their personal interests. The task allowed us to observe the real-time dynamic between goal-directed and habitual behaviors. Following the iPad navigation task, participants completed a free recall and temporal memory test to examine how their memory reflected what they just completed. Data from 36 individuals found that participants on average switched between the lecture video and Instagram reels 4 times. Our findings suggest the habitual use of social media could interfere with goal-oriented behaviors in a naturalistic setting and the potential impact of habitual social media use on cognitive control and attentional shifts. Moreover, neuroimaging data will be collected to identify patterns of brain activity associated with task-switching between habitual trends and goal-directed behavior, as well as to explore how these patterns relate to memory accuracy.

PRESENTER: JESSICA LO PRESTI, PSYCHOLOGY
FACULTY MENTOR: DR. REBEKAH RICHERT, PSYCHOLOGY
PROJECT TITLE: SOUL SEARCH: UNDERSTANDING CAREGIVER-CHILD CONVERSATIONS ABOUT THE SOUL

Past research has explored how children view “the soul” (Richert & Harris, 2006), as they become acquainted with their family’s religious and spiritual beliefs. Research often examines what human functions children associate with the soul, such as biological, cognitive, emotional, and ethical/spiritual capacities. The current, qualitative study examined caregiver-child conversations about “What happens when we die?” Transcripts were coded based on: whether (and who first) they used the word “soul,”, as well as the different processes brought up in the conversation (physical, biological, psychological). Participants were 85 caregiver-child dyads with 4- to 12-year-old children. 37.65% of child participants were female; and dyads represented a diversity of religious backgrounds: 22.35% Catholic, 15.29% Church of Jesus Christ of Latter-Day Saints, 2.35% Jewish, 4.71% Muslim, 37.65% Protestant Christian, 17.65% non-affiliated. Within the conversations, 18.82% of conversations specifically mentioned the soul, with caregivers and children equally being the one to assign the label during their conversation (n = 8, 9.41%); however, children (n = 56, 65.88%) engaged in slightly higher frequencies of conversation where they did not label the soul than their caregivers (n = 49, 57.65%). Additionally, children initiated (n = 57, 67.06%) the conversation more often than their caregivers (n = 14, 16.47%). During the conversations, 82.35% of children brought up physical processes, 16.47% brought up biological processes, and 23.53% brought up psychological processes. Caregivers mentioned physical processes in 67.06% of conversations, biological processes in 16.47%, and psychological processes in 22.35%. Future analysis intends to explore potential correlations between code frequencies.

PRESENTER: JAYLYNN LOPEZ, POLITICAL SCIENCE
FACULTY MENTOR: DR. LOUIE F. RODRIGUEZ, DIVISION OF UNDERGRADUATE EDUCATION
PROJECT TITLE: A DOCUMENT ANALYSIS OF MENTAL HEALTH PROGRAMMING IN A PUBLIC COUNTY OFFICE OF EDUCATION AND SCHOOL DISTRICT SETTINGS

Mental health is a significant issue across public schools in the United States, especially after the recent COVID-19 pandemic. While federal legislation mandating school preparedness for mental health does not exist, federal stimulus funding provided schools with more opportunity to improve support. The funding utilized by the California Department of Education (CDE) was supplied by three laws signed in 2020: the Coronavirus Aid, Relief, and Economic Security (CARES) Act, the Coronavirus Response and Relief Supplemental Appropriations (CRRSA) Act, and the American Rescue Plan (ARP). The focus of this study is the 2020 Mental Health Initiative established by the Highland County Office of Education (HCOE). By analyzing documents from three education systems (HCOE, Scotts Unified School District (USD), and Tartan USD) in a pre- and post-pandemic comparison, clearer perceptions of the mental health legislation and mental health programming patterns in schools within HCOE are drawn. This research engages in a document analysis of information collected from two four-year periods, one before the initial impacts of the pandemic, and one after: the 2016 academic year through March 2020, and April 2020 through the 2024 academic year. Meeting minutes and agendas, annual community reports, and media were reviewed for this project. The results, partially due to ongoing grants, demonstrate upticks in mental health conversations and efforts (e.g., counseling, wellness weeks, and student/parent/educator workshops). Limitations and future impacts will be discussed. This project aims to better understand the effects of legislation and funding concerning mental health supports in public K-12 education.

PRESENTER: DANIELLE MA, POLITICAL SCIENCE
FACULTY MENTOR: DR. KIM DIONNE, POLITICAL SCIENCE
PROJECT TITLE: CANDIDATE SUPPORT, CLIMATE CHANGE, AND THE 2016 YOUTH VOTE

This study examines the relationship between climate change opinions and candidate support among young voters during the 2016 election, using the Time Series Study data from the American National Election Study (ANES). More specifically, I explore ANES data to understand how opinions on climate change—whether related to policy or societal concerns—shaped support for either Donald Trump or Hillary Clinton among voters. The study also investigates how age moderates the relationship between climate change opinion and vote choice. With extreme weather becoming the norm, climate change has become more salient among younger generations than ever. Understanding these dynamics will offer key insights into how younger voters engage in politics, distinct from older voters. The findings will contribute to broader conversations on public opinion, issue salience, and youth political engagement in the United States.

PRESENTER: AMY MAATOUK, PSYCHOLOGY
ADDITIONAL PRESENTERS: MONAYA MAAZ, PSYCHOLOGY; SYED NAQVI, BIOLOGY; AND SORAYA SAFAIPOUR, PSYCHOLOGY
FACULTY MENTORS: DR. GINA WANEIS, MIDDLE EAST AND ISLAMIC STUDIES AND DR. CHRISTINE VICTORINO, EDUCATION
PROJECT TITLE: SPARK: SOUTHWEST ASIAN NORTH AFRICAN (SWANA) PURPOSE ACADEMIC RESEARCH AND KNOWLEDGE

Establishing and maintaining healthy habits is key to success in both personal and work life. Traditional habit-tracking methods lack personalized and adaptive guidance. Advancements in artificial intelligence (AI) and machine learning (ML) provide an opportunity to revolutionize this process with intelligent, data-driven solutions tailored to each individual. This study focuses on the development of an AI-powered habit tracking and formation system, designed to analyze behavioral patterns, predict adherence trends, and provide real-time, adaptive habit-building strategies.
Leveraging ML algorithms, the system will dynamically adjust recommendations based on user input and engagement history, optimizing goal-setting for long-term achievement. It'll incorporate supervised and reinforcement learning to maximize habit formation and offer timely, personalized interventions. Key performance metrics will assess effectiveness, including model accuracy, user retention, and habit completion rates. The system will prioritize accessibility and ease of use for broad applicability.
This research contributes to behavioral science and AI in that it demonstrates the potential for machine learning to produce meaningful, lasting changes in behavior. In addition to value to the individual, the system is more important to society through promoting well-being, productivity, and goal realization at scale. By integrating AI into habit formation, this project offers a transformative solution that redefines how technology can support human development, paving the way for more intelligent and effective self-improvement tools in the future.

PRESENTER: KAYLA MANCILLA, PHILOSOPHY
FACULTY MENTOR: DR. JALONDRA DAVIS, ENGLISH
PROJECT TITLE: ACCLAIM IS NOT ADEQUACY: A CRITICAL ANALYSIS OF THE RELEVANCE OF SECONDARY EDUCATION TEXTS

Despite the implementation of programs like the No Child Left Behind Act, it is evident that students are still struggling to keep up with school through literacy rates and carry a noticeable disinterestedness towards their school work. I propose that the curriculum is unrelatable for students and is therefore a deterrent to completing schoolwork. This project investigates student reception of the texts assigned to them. By focusing on what books are assigned to a specific grade level in their English course, I came to my ultimate research question. Do the texts assigned to 11th graders in southern California accurately reflect their audiences? To find the answer to this question I performed a close reading of each text myself and conducted a literature review that focused on student reactions to books and why. I found that students actually did find the books relatable to an extent but credited this to lesson plans and what are meant to be universal themes. Ultimately, I concluded that the books assigned to the student audiences in question fall short in terms of relevancy. Additionally, the aspects of so-called universal

themes and engaging lesson plans are not unique to the texts assigned to students and can be found in more representative stories as well.

PRESENTER: ANASTASIA MANVELYAN, HISTORY
FACULTY MENTOR: DR. GEORG MICHELS, HISTORY
PROJECT TITLE: BEYOND VICTIMHOOD: THE RESISTANCE OF WOMEN AND CHILDREN DURING THE ARMENIAN GENOCIDE

The Armenian Genocide (1915-1923) stands as one of the most devastating acts of mass violence in the 20th century, resulting in the deaths of an estimated 1.5 million Armenians. Scholars have often overlooked the various forms of Armenian resistance, emphasizing the alleged passivity of survivors as reflected in the victimization of women and children. This research aims to uncover largely forgotten modes of resistance by Armenian women and children while they were being deported across the desert, forced into death marches, and confined in concentration camps. In fact, women demonstrated significant agency. They resisted Turkification after being forced into marriages with Turkish men; escaped deportations, helped run and establish orphanages, and contributed to wide-flung networks of humanitarian aid. Children in Turkish state-run orphanages likewise fought to keep their Armenian identity; they escaped orphanages, deportations, and concentration camps. For my analysis I draw on memoirs of genocide survivors; eyewitness accounts of Western diplomats and missionaries; oral interviews with survivors; and documentation from the archives of German and American foreign offices. Informed by the works of Armenian Genocide scholars, I argue that resistance, no matter how small, played a pivotal role in Armenian survival in the face of extermination.

PRESENTER: ULISES MATA, PSYCHOLOGY
FACULTY MENTOR: DR. DIAMOND BRAVO, PSYCHOLOGY
PROJECT TITLE: DISCRIMINATION AND MICROAGGRESSIONS: IN THE LATINX COMMUNITY: EXAMINING UNDERGRADUATE COPING MECHANISMS WITHIN A HISPANIC-SERVING INSTITUTION

Prior research on ethnic-racial discrimination suggests that Hispanic/Latinx college students face an increased risk of experiencing race-based discrimination. Ethnic-racial discrimination and microaggressions are pervasive worldwide and have been shown to negatively impact health through frequent exposure. This continuous exposure is associated with higher levels of stress and increased risk for mental health issues. Previous studies have primarily focused on Hispanic/Latinx students in predominantly white institutions (PWIs); however, the experiences of these students within Hispanic-serving institutions (HSIs) remain underexplored.

Despite HSIs' resources aimed at attracting and retaining students, Hispanic/Latinx undergraduates still experience ethnic-racial discrimination and microaggressions, suggesting that attending an HSI is not a

protective factor against race-based discrimination. While HSIs are uniquely positioned to support Hispanic/Latinx students, limited research has examined how coping mechanisms to address race-based discrimination vary across different cultural contexts within the U.S.

Further research is essential to inform health and social policies aimed at reducing the harmful effects of ethnic-racial discrimination and microaggressions. By understanding coping strategies, HSIs can better support the academic and emotional well-being of Latinx students.

The current study investigates how Latinx/Hispanic undergraduates cope with ethnic-racial discrimination and microaggressions through employing eight focus groups (N=28) at an HSI located in Southern California. Inductive thematic analysis revealed seven strategies: Ignoring Conflict, Seeking Support, Acceptance, Discrimination as a Motivator, Increased Awareness, Humor, and Avoiding Confrontation. Preliminary findings offer insights into resilience among Hispanic/Latinx students and may inform solutions for fostering inclusivity and racial justice in higher education.

PRESENTER: SHIREEN MEHTA, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. THOMAS SY, PSYCHOLOGY
PROJECT TITLE: GENERATIONAL DIFFERENCES IN IDEAL LEADER TRAITS

Findings on generational differences in leadership preferences have been mixed; however, some research suggests that younger generations may value qualities like Creativity and Dedication in a leader, while older generations may prioritize Intelligence and Masculinity (Sessa et. al, 2007). The purpose of the present study was to assess Implicit Leadership Theories (ILTs) between four generations. This study measured 7 Implicit Leadership Theories: Dedication, Dynamic, Intelligence, Creativity, Masculinity, Sensitivity, and Tyranny (Epitropaki & Martin, 2004; Offermann & Coats, 2018). I hypothesized that participants categorized as Baby Boomers (born 1946-1964) and Generation X (1965-1980) would generally score their ideal leader higher on Intelligence, Dynamism, and Masculinity, than Millennials (1981-1996) and Generation Z (1997-2012), while Millennials and Generation Z were hypothesized to score their ideal leader higher on Sensitivity, Dedication, and Creativity than Baby Boomers and Generation X. This study analyzed self-report surveys of participants across the U.S. (n = 596), and compared ILTs by generation using an ANOVA test. Contrary to my hypotheses, findings suggested that Gen Z rated ideal leader ILTs of Masculinity and Tyranny significantly higher than any other generation. The remaining ILTs did not differ significantly by generation. These findings challenge assumptions about generational shifts in leadership ideals and poses the question of the development of ideal ILTs. Further exploratory analyses will examine potential moderators or demographic differences in ideal ILTs.

PRESENTER: MANVITHA MYSORE, ECONOMICS
FACULTY MENTOR: DR. JAMES TOBIAS, ENGLISH
PROJECT TITLE: CONSTRUCTING CYBORGS: ANALYZING CYBORG IDENTITY AND LABOR IN CONTEMPORARY SCIENCE TRANSMEDIA

The cyborg is an integral figure in science fiction; being both man and machine, they can be one of the best expressions of the advancement of science and technology in the genre. The inherent connection between technology and labor often comes with racial and gendered overtones, which raises questions on how we perceive labor in relation to these identities. This project explores those racial and gendered dimensions of cyborg imagery while being anchored by Kara Walker's *Fortuna and the Immortality Garden* at SFMOMA, her first exploration of automata. Walker's work, already known for its commentary on race, sex, and labor through a historical lens, serves as a new critical entry point for examining how cyborg identities are entangled with labor under contemporary global capitalisms. While Donna Haraway's "A Cyborg Manifesto" (1985) positioned the cyborg as a figure of feminist liberation by being beyond human ideas of gender and sex, Walker's art complicates this narrative by foregrounding the ways in which cyborg bodies—especially Black and female ones—are often portrayed as disposable laborers. Drawing on Walker's installation as a primary case study, this project engages with local archives and contemporary art + technology exhibitions in Southern California to contextualize her work within a broader lineage of cyborg representation. The final article will use Walker's automata as a foundation to critique the tendency to map marginalized identities onto cyborg bodies, exploring whether these portrayals can transcend their historical ties to exploitation and envision new forms of agency.

PRESENTER: AMARI NAVARRO, HISTORY
FACULTY MENTOR: DR. JORGE LEAL, HISTORY
PROJECT TITLE: SEGREGATED BY DESIGN: THE CITRUS INDUSTRY'S ROLE IN MAINTAINING A RACIALIZED LABOR PIPELINE 1900-1960

My research examines how the labor industry particularly in Southern California systematically reinforced agricultural labor roles for Mexican children via inferior educational practices. Highlighting the once-booming citrus industry in what was known as the citrus belt of the Inland Empire. Highlighting how the first segregated Mexican schools in California were deliberately located in citrus-growing areas. Building on the foundational work of scholars such as Gilbert G. Gonzalez and Genevieve Carpio, who explore the historical barriers imposed by California's agricultural industry, this research investigates how segregation and vocational training were employed to restrict educational opportunities for ethnic Mexican communities in the Inland Empire. This research reveals the calculated role the United States and the labor industry played in racializing and repressing an entire group to menial labor positions. By analyzing archival documents and oral histories, this research reveals how agricultural systems were

deliberately structured to channel ethnic Mexican children into labor roles, thereby perpetuating cycles of economic and social inequality across generations.

PRESENTER: DORA NGUYEN, PSYCHOLOGY
FACULTY MENTOR: DR. KALINA MICHALSKA, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: JOHANNAH MOYNIHAN, PSYCHOLOGY
PROJECT TITLE: ETHNIC-RACIAL DISCRIMINATION AND DEPRESSION IN LATINA YOUTH: THE PROTECTIVE ROLE OF CULTURAL VALUES

Objectives: Repeated exposure to ethnic-racial discrimination (ERD) may lead to internalization of negative self-beliefs, contributing to depression symptoms. Embracing one's heritage cultural values, such as drawing on familial support, may protect against depression symptoms by promoting a sense of belonging and reducing psychological distress. However, less is known if the protective effects of cultural values against depression symptoms extend to pre-adolescence. The current study examined whether Mexican cultural values can help buffer any adverse effects of ERD on depression symptoms in preadolescent Latina youth.

Methods: 129 Latina girls (M_{Age} = 11.50, *SD* = 2.55) reported their depression symptoms via the *CDI-II*. Youth endorsed their experiences of ERD using the *PRaCY* scale and reported on values commonly associated with Mexican heritage via the *MACVS*.

Results: More experiences of discrimination were associated with increases in depression symptoms (p =.0092, 95% CI [.2825, 1.9569]). A marginally significant interaction between ERD experiences and MACVS cultural values emerged (ΔR^2= .0226, p = .0587). The association between ERD and depression symptoms was significant at low (-1 SD) (p < .001, 95% CI [.2610, .6422]), average (p < .001, 95% CI [.1846, .4574]), and high (+1 SD) (p =.0137, 95% [.0458, .3932]) levels of cultural values.

Conclusion: The association between ERD and depression is strongest when MACVS cultural values are low and reduced as cultural values increase. This study emphasizes the potentially protective role of cultural values in attenuating the adverse psychological effects of ERD on Latina youth, informing interventions aiming to strengthen Latina cultural values.

PRESENTER: DORA NGUYEN, PSYCHOLOGY
FACULTY MENTOR: DR. KALINA MICHALSKA, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: JOHANNAH MOYNIHA, PSYCHOLOGY AND HANA QURESHI, PSYCHOLOGY
PROJECT TITLE: LATINX PARENTS' ACCULTURATIVE PRESSURE AND SPANISH PROFICIENCY: EFFECTS ON PARENTAL OVERCONTROL AND CHILD EMOTIONAL WELL-BEING

Objective: Irritability, or excessive reactivity to negative emotional stimuli, predicts mental health disorders, including generalized anxiety.[1] Parental factors such as overcontrol, the excessive monitoring of child behavior, may interact with cultural stressors and competencies to influence child irritability.[2] We tested whether parental overcontrol is associated with child irritability and anxiety for Latinx parents who feel pressure to acculturate to US culture. We also tested whether Spanish language proficiency moderates any associations between parental overcontrol and child irritability and anxiety.

Methods: The study recruited Latinx children ages 8-13 and their primary caregivers. Children completed a frustration-inducing computer task while their primary caregiver observed. Parental overcontrol was assessed via the *BIPS*[3] validated behavior coding scale. Children completed the *ARI*[4] and *STAI*[5] to measure irritability and anxiety, respectively, while parents completed the *MASI*[6] to assess acculturative pressure and Spanish proficiency.

Analytic Strategy: Linear regression analyses will test the interactive effect of parental overcontrol and pressure to acculturate and Spanish proficiency on (i) child irritability and (ii) anxiety. We hypothesize that parental overcontrol predicts irritability and anxiety symptoms. Pressure to acculturate will act as a risk factor, exacerbating the effects of parental overcontrol on irritability and anxiety. In contrast, Spanish proficiency will act as a protective factor, mitigating the effects of parental overcontrol on irritability and anxiety.

Conclusions: Understanding how parental overcontrol both *influences* child irritability and anxiety and is *influenced* by cultural factors is vital to culturally-informed prevention efforts targeting children's mental health.

PRESENTER: LESLIE NUNEZ, ENGLISH
FACULTY MENTOR: DR. TIMOTHY PETETE, ENGLISH
PROJECT TITLE: THE RHETORIC OF COLLEGE CAMPUS GRAFFITI

The creation of art and writing on public walls are often judged as wrongful acts; however, these actions can be poetic, activist, and resourceful. Students are displaying their voices in public and private spaces throughout the campus of UC Riverside. They are advocating calls to action and cries for help as they use public restroom stalls as a resource to spread awareness and to express their mental/emotional states. This is all happening through the act of graffiti. Although it is defined as an act of vandalism, in this case,

it is deemed to be a positive and necessary act of expression to reclaim the female agency. My research consists of debriefing the notion of what drives the participating individuals to use a wall of what is supposed to be a private and enclosed space for their bodies, as their journal or outlet. In the search for that answer, I intend to examine the emotional impact of both ends- the creator and the observer. My research methods include visiting and examining the female restroom stalls that are located on the grounds of the university campus. By doing so, I will compare and contrast the rural and the modern buildings to further digest the writing in the walls and discover the rhetoric behind the graffiti.

PRESENTER: ULISES NUNEZ, HISTORY
FACULTY MENTOR: DR. WILLIAM BAUER, HISTORY
PROJECT TITLE: MEXICO'S LACK OF RESOLUTION IN THE FACE OF AN AMERICAN UPRISING IN CALIFORNIA (1830S-1840S)

With the increased arrival of Anglo settlers in the 1830s and 1840s, Californios—that is, Spaniards and their descendants—began to worry that their grip on California was fading. Soon, rumors of Anglo uprisings against the Mexican government reached Californio politicians. These politicians reacted promptly, but they would find themselves let down by corrupt government officials who failed to see the threat that Anglo-Americans posed to Mexican control over California. In this presentation, I explore the Graham Affair in 1840-41, a particularly telling example of Mexico's failure to address the problem. Governor Alvarado sent José Castro to take Isaac Graham and other Anglos, who were plotting an uprising, to court in Mexico. Not only were they acquitted but the Mexican government, influenced by the British Consul, had Castro tried by the council of war. Though Castro was eventually freed, he was treated worse than the Anglos. This, and the acquittal of the accused men, were injustices in the opinions of Californios; Castro had indeed witnessed the making of an Anglo uprising. Anglos by contrast celebrated what they saw as a just victory over the 'villainous' Californios. The Graham Affair reveals that the suspicions of Californios towards Anglo-American settlers were justified. It also shows the influence of European diplomats over the Mexican government; their interventions helped to undermine Mexico's resolution to respond to American uprisings in the making. Thus, the Mexican failure intensified Americans' ambitions to take over California, fueled by the bravery of so-called heroes like Isaac Graham.

PRESENTER: DAMIAN NUNEZ, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: CULTURAL RESILIENCE IN COLONIAL AMERICAN CAPTIVITY

Captivity narratives have been integral to defining European-Native interaction in late seventeenth and early eighteenth century New England. Richard White's "middle ground" historiography has led previous scholars to use such narratives as examples of cultural and religious exchange between European

captives and their indigenous captors. However, the historiography on the Native-European symbiosis leaves out another important aspect of colonial American life: cultural resilience. Colonial American borderlands were places of contention between Native people and European settlers as they competed for land and people. Each side acted based on their own interests rooted in their cultural values. Captives' and captors' expression of their distinct cultures and religions served to maintain the core principles of their original communities. While scholars now assume Native and European values had become interconnected and inseparable, I found that this was not always true. My approach is influenced by Robbie Richardson's critical analysis of a captive's diction and actions for understanding how self-identification and morality change as captives experience life with their Native captors. Many European captives sought to desperately maintain their culture and identity despite their Native captors' efforts to force them to assimilate. Native American captors exercised their own beliefs and social practices, many contradicting the wishes of their European allies. These conflicts between Native captors and European captives can be observed in Reverend John Williams' 1707 memoir *The Redeemed Captive Returning to Zion* which contains a New England pastor's experiences as a captive among French-allied Native Americans after a raid of his home village.

PRESENTER: SOFIA OCHOA, PHILOSOPHY
FACULTY MENTOR: DR. AGNIESZKA JAWORSKA, PHILOSOPHY
PROJECT TITLE: UNDERSTANDING THE RELATIONSHIP BETWEEN EMPATHY AND CARE

When we reflect on our own lives, it is clear to see the importance of care. We care for friends, family, our hobbies, and even our favorite sports teams. One of the ways a person might show that they care for another is through attempting to empathize with them. But, is empathy necessary in order to properly care for a person? In this paper, I will focus on separate philosophical accounts of empathy and care and examine the ways in which the two attitudes interact with one another. Through critical analysis of both Amy Coplan's article "Understanding Empathy: Its Features and Effects" and Agnieszka Jaworska's article "Caring and Internality," I will argue that empathy and caring are complementary yet distinct emotional phenomena that don't require one another but can improve one another. Through my examination I will be able to deepen our philosophical understanding of both empathy and caring and shed some light on the ways in which they intersect.

PRESENTER: ANGEL PALACIOS-PADILLA, PSYCHOLOGY
FACULTY MENTORS: DR. DINA ALY, SOCIOLOGY AND DR. STEPHANIE MOORE, EDUCATION
PROJECT TITLE: THE RISING EPIDEMIC OF SCHOOL SHOOTINGS IN THE U.S. - A CALL FOR IMPROVEMENT AND PREVENTION

School shootings in the U.S. have become an increasingly concerning epidemic with the number of deaths and occurrences significantly rising over the years. In 2024, there were a total of 331 incidents along with a total of 267 victims, making it the second highest year of school shootings behind 2023, which had 349 incidents and 249 victims. Records of previous cases traced the motivation for the majority of perpetrators committing these crimes to be a combination of bullying, problems with socialization, difficulty navigating their environments, and showcasing homicidal thoughts with unmonitored access to firearms. The attitudes and behaviors developed by perpetrators due to their situations lead them to be more susceptible to experiencing isolation and detachment from those around them, often finding ways to occupy themselves through violent ideation as a potential solution to their conflicts. Although schools nationwide have amplified their security precautions in hopes of lowering the numbers of deaths and incidents, it is important to understand and address the root cause and common patterns that are prevalent in these individuals in order to prevent school shootings from frequently happening. Upon further discussion and interpretation of data, it is suggested that schools should provide students with a tolerant and safe environment that promotes healthy communication and socializing between students and faculty. It is also essential that parents or caregivers are open and willing to take action and responsibility for their child, providing the proper care of the child's emotional and mental well-being.

PRESENTER: SNEHA PANDA, PSYCHOLOGY
ADDITIONAL PRESENTERS: SOUMYA AGARWAL, BUSINESS ADMINISTRATION; ADAMANDIA PEGADIOTES, PSYCHOLOGY; LEAH FELEMA; PSYCHOLOGY; JASNOOR PADDA, PSYCHOLOGY; SOLA (ASENA) PARK, NEUROSCIENCE
FACULTY MENTORS: DR. AARON SEITZ, PSYCHOLOGY AND DR. MARCELLO MANIGLIA, PSYCHOLOGY
PROJECT TITLE: PLFEST: AN APPLICATION FOR ENHANCING PERCEPTUAL LEARNING

Open science refers to the process of making scientific research available to everyone as a free and usable resource. However, transparency and accessibility within open science has not often been prioritized in previous research. To address these issues, the mobile application PLFest was developed, which aimed to support this cause specifically for the field of perceptual learning (PL). PLFest is a platform designed to promote open science by making perceptual and cognitive tests readily accessible. We conducted a study on 100 younger adult participants to test the effectiveness of PLFest. PLFest offers a wide range of PL assessments, and we are primarily focusing on three assessments: visual acuity, contrast sensitivity, and speech in competition. We hypothesize that training with PLFest will significantly increase visual acuity and contrast sensitivity in young adults with healthy vision, however that this training will not lead to a change in the speech in competition tasks. This study will help us

understand whether the PLFest mobile application replicates findings from previous laboratory studies and can serve as an open science platform for perceptual learning research.

PRESENTER: DANIEL PENDERGRASS, PSYCHOLOGY
FACULTY MENTOR: DR. RACHEL WU, PSYCHOLOGY
PROJECT TITLE: EXPLORING THE IMPACT OF RETIREMENT TIMING AND POST-RETIREMENT ACTIVITIES ON COGNITIVE DECLINE

Retirement has been associated with an increased risk of cognitive decline, but researchers are still unclear on the key factors associated with retirement that might contribute to possible decline. Identifying retirement-related factors that contribute to cognitive decline, or alternatively protect against it, could provide valuable information to aid the transition out of employment and increase cognitive longevity after retirement. As such, the proposed study examines cognitive performance for working memory and cognitive control over 18 months related to three possible variables that have been identified as prominent factors that could influence the risk and rate of cognitive decline after retirement: the length of retirement, age of retirement, and post-retirement activities. As part of an ongoing project, 36 participants will complete cognitive assessments and provide information about their retirement timing and post-retirement activities. We predict that both earlier retirement age and longer retirement duration will relate to lower or decreasing performance on cognitive tasks over time, and that individuals who maintain an active and cognitively engaged lifestyle after retirement will perform with less decline over time. Once results are obtained, we will analyze them with separate linear mixed effects regression for each cognitive domain (working memory and cognitive control). Findings from this study could provide policymakers, community members, and retirement services with valuable recommendations to maintain or improve cognitive health and quality of life with retirement.

PRESENTER: KATHRYN PEREZ, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: WINTER INTERACTIONS AT VALLEY FORGE

In December of 1777, George Washington, Commander of the newly created Continental Congress, kept a watchful eye of the movements of the British troops and thus chose to stay near them in Philadelphia. While camped at Valley Forge, extremely freezing temperatures threatened the camp's survival. The troops grew restless and sickly as packages for food were not making it to the camp. This poster examines the letters and accounts of the soldiers during the horrible winter in Valley Forge, detailing the incredible strife for survival and the ingenious solutions they developed to stay alive. By analyzing the words and actions of both ordinary soldiers and officials, like Washington, a different story of Valley Forge emerges, one in which civilian life, resources, and individuals mattered tremendously to the success of the Continental Army. These sources show that though Valley Forge is often portrayed as a

nadir and isolating moment for the Continental Army, in reality there were many civilians living their day to day routines nearby. As a result of the nearby soldiers, many farmers, workers, and passing civilians would account for the situations they faced. Through these interactions, it provides a unique narrative that many military historical writers briefly mention in their works.

PRESENTER: ANTHONY QUATERNIK, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: MANUMISSION: LIMITING OR FREEING?

In August of 1791 Robert Carter III formulated, wrote, and executed a deed named The Deed of Gift. The deed gradually set free more than 500 enslaved individuals. It was such a well-planned deed that it continued liberating people for over twenty years after his death in 1804. In 1799, Robert Pleasants in accordance with his own beliefs and on behalf of his late father's wishes attempted to manumit enslaved people held in both his and his relative's estates. But the claim was contested by his family using the precedent set by the Virginian Act of 1723. This poster explores these relatively understudied cases of how enslavers both used and challenged manumission laws. I argue that the familial as well as legal contestations to manumission help uncover the restrictive power of slave society.

PRESENTER: ZUBAIR RAHMAN, BIOLOGY
FACULTY MENTOR: DR. HAYDEN HENDLEY, PSYCHOLOGY
PROJECT TITLE: MEMORY RECALL CAPABILITIES IN MEDICAL PHYSICIST WHEN ANALYZING RADIOGRAPHS

Many studies have shown that people have greater memory capacity for images that are meaningful to us. For instance, radiologists have greater memory for medical images compared to non-experts. Investigating memory in experts who examine medical images has been particularly useful for two reasons: first, to better understand the structure and capacity of memory from a theoretical standpoint and second, to identify the cognitive mechanisms that guide a successful search for an abnormality. Many errors in medical imaging are perceptual, and investigating memory and other cognitive processes in experts may help shed light on why these errors occur. Research in understanding memory in medical experts has been largely limited to radiologists when they analyze or identify anomalies in a variety of images. Medical physicists support radiological oncologists by detecting treatment plan errors in medical images, and the cognitive mechanisms that support their unique task are largely unknown. The focus of this study is to compare and contrast the memory of medical physicists and novice individuals by presenting subjects with a series of x-rays and assessing memory using a two-alternative forced choice task. We anticipate that the medical physicist will have a greater memory performance compared to novices when presented with various radiographic images.

PRESENTER: KASHISH RAI, POLITICAL SCIENCE
FACULTY MENTOR: DR. KIM YI DIONNE, POLITICAL SCIENCE
PROJECT TITLE: POLITICAL EFFICACY AND ASIAN AMERICAN VOTING - INSIGHTS FROM A REPLICATION STUDY

This paper will examine the extent to which political efficacy affects the political participation of Asian Americans. The research question driving this study is: Are Asian Americans less likely to participate in their political systems because of their level of educational attainment? To answer this question, I will examine Collaborative Multi-Racial Post-Election Survey (CMPS) data from 2016 to measure how political efficacy (the belief that citizens can change their government) affects the way that they interact with their political system. This paper replicates and builds on "New Asian American Voters: Political Incorporation and Participation in 2016," by Natalie Masuoka, Kumar Ramanthan, and Jane Junn, and published in *Political Research Quarterly*.

PRESENTER: PABLO RAMIREZ, PSYCHOLOGY
FACULTY MENTOR: DR. AERIKA LOYD, PSYCHOLOGY
PROJECT TITLE: DOES COMMUNITY CULTURAL WEALTH BUFFER THE IMPACT OF RACIAL DISCRIMINATION ON MENTAL HEALTH OUTCOMES IN LATINO COLLEGE STUDENTS?

Racial discrimination persists as a major challenge threatening many Latino college students across the United States, which can manifest into negative outcomes such as worse mental health. The proposed study, derived from the College Student Identity Project database, will aim to understand the relationship between community cultural wealth, which can be defined as a person's existing social and familial support systems, dispositions, and cultural connections, and whether or not it behaves as a buffer between racial discrimination and poor mental health outcomes specifically in a Latino college student sample. The primary mental health outcomes that will be analyzed are symptoms of depression and anxiety, as well as satisfaction with life and hope. Furthermore, covariates such as gender, year in college, and social class will be looked into to uncover any potential significant disparities. I hypothesize that community cultural wealth will result in positive outcomes for both Latino men and women college students regardless of experiences with racial discrimination. The overall purpose of this study is to try to understand ways in which the negative impact of racial discrimination can be negated and how this can be applied to existing college support systems to further strengthen them and better serve the Latino student population.

PRESENTER: IAN REID, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: MUSICAL PARODIES OF REVOLUTIONARY AMERICA

While colonial music in the late 17th century served as a source of entertainment and a means of worship, it also served as a powerful political tool. During the years leading up to the American Revolution, music became a medium through which both Patriots and Loyalists could engage in political discourse, rally support, and express dissent. This study explores the ways musical parodies were employed in 1768 to advance political agendas, forge communal bonds, dismantle opposing viewpoints, and shape public opinion across diverse social classes. Focusing on one popular song and its corresponding parodies, as well as foundational political documents featuring signatures from prominent figures like John Dickinson and Richard Bland, this study demonstrates how musical parodies conveyed political arguments with clarity and persuasion and harnessed the music's familiarity and emotive power to communicate complex ideas and justifications regarding the American Revolution in ways that resonated deeply with the public. This study thus emphasizes how Patriots constructed their emerging American identity by drawing upon British cultural foundations, evident in both the lyrics and the original melodies of these parodied songs.

PRESENTER: DEBANHI ROJAS, POLITICAL SCIENCE
FACULTY MENTOR: DR. KIM DIONNE, POLITICAL SCIENCE
PROJECT TITLE: GENDER: A GROWING THREAT TO INDIVIDUAL SECURITY? A STUDY IN YUCATAN AND ZACATECAS[1]

Gender representation in politics reflects democratic principles and also serves as a catalyst to combat gender stereotypes. Existing research has explored the impact of female legislators entering the traditionally male-dominated realm of politics in parliamentary and presidential democracies, finding their presence influences party dynamics and societal perceptions (Harris 1988; McKay 2004; Wiliarty 2008; Funk and Philips 2018). Building on these insights, I apply theory from existing research to Mexico, a country known for persistent discriminatory gender stereotypes, while simultaneously experiencing advances in women's political representation. This study proposes that the gender of Mexican governors impacts individual security perceptions among both men and women, due to gender stereotypes and representation. I examine public opinion of male and female governors in Yucatan and Zacatecas states. Analyzing survey data from the AmericasBarometer spanning from 2006 to 2012, I produce descriptive statistics engaging the question: How does the gender of Mexican governors affect public perceptions of safety?

Key Words: Gender Representation, Gender Stereotypes, Security, Public Opinion.

PRESENTER: BIANIS SALAZAR, PSYCHOLOGY
ADDITIONAL PRESENTER: SHANNON BRADY, PSYCHOLOGY
FACULTY MENTOR: DR. ELIZABETH DAVIS, PSYCHOLOGY
PROJECT TITLE: INCOME, GENDER, AND MENTAL HEALTH: EXAMINING ANXIETY AND DEPRESSION SYMPTOMS IN LATINX CHILDREN

Previous research suggests that income and gender relate to children's anxiety and depressive symptoms, with girls and children from lower-income families showing higher levels of these symptoms. However, fewer studies have examined gender differences in these symptoms among younger children, and much of the literature has focused on White/European samples. To further explore these relations, this study examined the links between household income, gender, and the amount of self-reported depressive and anxiety symptoms in predominantly Latinx children. Fifty-five children (ages 7–12; 30 girls, 25 boys) were administered the Screen for Child Anxiety-Related Disorders and Children's Depression Inventory while parents reported family income. Subscales of separation anxiety, social anxiety, generalized anxiety, and school avoidance were analyzed separately. A series of 2 (gender) × 2 (Income Level: Low, High) ANOVAs found no significant effects of gender or income on depressive symptoms, social anxiety, generalized anxiety, or school avoidance. However, girls reported significantly more separation anxiety symptoms (M = 7.73, SD = 3.47) than boys (M = 6.00, SD = 3.46), $F(1, 48)$ = 5.184, p = .027. These findings contrast with prior research linking lower income to higher depression and anxiety. Possible explanations include a relatively small sample size, limited income range choices, and young children's difficulties self-reporting such symptoms. Future research should examine older children, who may better articulate their emotions, incorporate parental reports for a more comprehensive understanding, and explore patterns in diverse communities to identify potential protective factors linked to social resources.

PRESENTER: EDYN SALGUERO, POLITICAL SCIENCE
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: THE INVISIBLE MAYA

Abstract: In 1895, Allison V. Amour from the Columbian Museum of Chicago funded an expedition to Yucatan, Mexico to research various topics including biology, flora, fauna, and ancient Mayan ruins. This project explores and analyzes a photograph album housed at UC Riverside Special Collections, which depicts a variety of places visited by the expedition, including ancient ruins of the Mayan civilization (like The Building of the Monjas and The Ruined Temple in the South End of Mujeres Island), Dr. G.F. Gaumer's residence, and the Church at Izamal. This poster presents a critical analysis of this collection, reading against the empty and pristine photographs to show how they depicted a form of colonization against the Mayan people of these lands, and argues instead that these lands are Mayan holy places used to revere divine power and make sense of the Mayan mythology.

PRESENTER: ANGIE SALINAS, LAW AND SOCIETY
FACULTY MENTOR: DR. JOHN LAURSEN, POLITICAL SCIENCE
PROJECT TITLE: LADDERS: BRIDGING PHILOSOPHY, ART, AND THE HUMAN EXPERIENCE

This project explores the intersection of philosophy, political theory, and art to examine the moral dilemmas that have shaped human society. *Ladders* is an illustrated collection of poetry that reinterprets foundational ideas from ancient and modern political philosophers, spanning from pre-Christian thinkers to contemporary theorists. By analyzing key works—including *The Republic* by Plato, *Leviathan* by Thomas Hobbes, and *Utilitarianism* by John Stuart Mill—the project uncovers philosophical perspectives on fear, beauty, rights, wealth, and knowledge. Over twelve months, extensive research and artistic expression were combined to transform these abstract theories into accessible visual narratives, fostering deeper engagement with complex philosophical concepts. This project challenges prevailing norms by merging art with philosophy, offering an innovative approach to ethical reflection. Through poetic reinterpretation and evocative illustrations, *Ladders* encourages readers to critically examine societal structures, personal identity, and the pursuit of wisdom. By bridging historical philosophy with contemporary concerns, this work aims to spark dialogue and inspire a new generation to explore philosophical thought in a more creative and introspective way. Ultimately, this project serves as both a personal exploration and a stepping stone toward a career in law and public policy, reinforcing the necessity of ethical discourse in shaping just societies.

PRESENTER: AMELIA SCHOCH, COMPUTER ENGINEERING
FACULTY MENTOR: DR. NAWA SUGIYAMA, ANTHROPOLOGY
PROJECT TITLE: AUTOMATING THE SEARCH FOR AN ANCIENT MEASUREMENT UNIT IN TEOTIHUACAN, MEXICO

There is great potential in the social sciences for computational analysis. Automation can amplify researchers' abilities and cover their weaknesses, opening the door for new discoveries. This research uses a computational approach to search for a unit of measurement in the ancient Mesoamerican city of Teotihuacan, Mexico. Teotihuacan is a UNESCO World Heritage Site and the archetype of planned city-building in ancient Mesoamerica. The units of measurement used by the people of Teotihuacan have been challenging to identify, and the amount of data available is too vast to check by hand. Saburo Sugiyama proposed a unit of 83 centimeters, and he suggested that it reveals important Mesoamerican calendrical numbers in the layout of the temples, pyramids, and city plan. Data was extracted from a 3D lidar map of the site and input into a computer program that checked each measurement against important numbers. The program found intriguing numbers in multiple areas of the site. For example, the distances between some large monuments are multiples of 200. This is significant because the people of Teotihuacan used a base 20 number system. Calendrical numbers were also found, which could support the theory that the city was built to symbolically represent the Teotihuacan view of time or the universe. This could help explain why Teotihuacan was such an important religious location, even

thousands of years after its fall. This work demonstrates how automation can uncover patterns in large datasets that may otherwise be difficult to spot.

PRESENTER: ABTIN SHAFIE, BIOENGINEERING
ADDITIONAL PRESENTER: UDITI DESAI, NEUROSCIENCE
FACULTY MENTOR: DR. NICHOLAS NAPOLIO, POLITICAL SCIENCE
PROJECT TITLE: NOURISHING CONNECTIONS: WELLBEING, FOOD SECURITY, AND COMMUNITY ENGAGEMENT AMONG LGBTQ+ STUDENTS AT UC RIVERSIDE

LGBTQ+ college students face disproportionate mental health challenges and food insecurity due to systemic barriers such as discrimination, inadequate policies, and limited resources. These issues can negatively impact academic performance, well-being, and access to essential services.

This study examines how food-related incentives at LGBTQ+-focused events influence food security and community engagement among LGBTQ+ students at the University of California, Riverside (UCR). These events center on LGBTQ+ themes and identities, fostering representation, visibility, and peer connection.

Through pre- and post-event surveys, we assess both qualitative and quantitative changes and will analyze trends in attendees' mental health, motivation, awareness of resources, and sense of community. Our study surveyed students who participated in nine LGBTQ+ events during the 2023-2024 academic year (n = 97) and four events during the 2024-2025 Fall and Winter quarters (n = 41) for a total sample size of n = 138.

Qualitative data from open-ended responses revealed that these events provide a safe and affirming community, with one attendee noting that they felt "seen and heard." Statistical analysis, conducted in STATA, indicated a significant improvement in mental health scores, with an average increase of 0.45 ($p < 0.05$) on a 5-point scale. Our examination of outreach methods shows that the most frequent way students learn about these events is "through a friend," suggesting that peer recommendations play a crucial role within the LGBTQ+ community. These results highlight the importance of addressing basic needs as a strategy to support marginalized student populations and promote inclusivity on college campuses.

PRESENTER: ABIGAIL SMITH, PSYCHOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
PROJECT TITLE: OBSERVING THE LINK BETWEEN OBJECT HOLDING AND LANGUAGE DEVELOPMENT IN INFANT'S EVERYDAY EXPERIENCES

Infants' object experiences provide opportunities for language acquisition: infants with larger variation in object exploration in a lab setting had larger vocabularies (Slone et al. 2019). In addition, when infants held objects in brief 18-minute home video recordings, the parent more frequently labeled what the object was (West & Iverson, 2017), showing that infants' manual actions are related to language learning. Object holding is also vast and variable such that in two-hour home video recordings, infants frequently shifted among dozens of objects in distributed bursts (Herzberg et al. 2022). Although previous work has observed infant object interactions in brief lab or home video recording sessions, we do not know whether individual differences in daily frequency of object holding is related to infants' vocabulary development. Our study aimed to see if there was correlation between an infant's object holding frequency and their ability to understand (receptive) and say (productive) words. We sent caregivers of infants in two cohorts—younger (4-7 months) and older (10-13 months)—text message surveys to calculate infants' total object frequency. We correlated this frequency with their MacArthur-Bates Communicative Developmental Inventory receptive and productive language score. Infants' daily object holding experiences were not a significant predictor of infants' receptive and productive language ability. This shows that the frequency of object experiences alone may not be sufficient to understand infants' language development. Future research should aim to look at more refined hypotheses that examine caregivers' role in infants' daily language and object interaction experiences.

PRESENTER: HARINI SRINIVASAN, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. JULIANN EMMONS ALLISON, SOCIETY, ENVIRONMENT & HEALTH EQUITY
PROJECT TITLE: THE SUSTAINABLE PRACTICES OF SMALL SUSTAINABLE CLOTHING COMPANIE

In the midst of a climate crisis when people are calling for more transparency and sustainability from the clothing industry, some smaller clothing companies are taking the lead by innovating sustainable practices. However, there is no established database or reports that provide information on these practices. My research fills in this gap. It documents the process and results of an original survey of small sustainable clothing businesses concerning their production practices and the factors that they believe make them uniquely sustainable. I present my data analysis and results in a report that highlights the sustainable practices that these small businesses focus on most, the extent to which differences among them are based on geographical location, and the potential for generalizing successful sustainable practices to larger, multinational clothing manufacturers. These findings provide researchers and others with information regarding the sustainable practices of smaller companies that may also assist larger companies to further explore long-term ways to incorporate sustainability into their companies. I expect

this research and consequent changes in manufacturing to increase sustainability will make the future of the clothing industry a little less grim.

PRESENTER: MANYA SRIVASTAV, NEUROSCIENCE
ADDITIONAL PRESENTERS: VASUDHA ATTANTI, NEUROSCIENCE AND ANJALI VADDEPATY, PSYCHOLOGY
FACULTY MENTOR: DR. AARON SEITZ, PSYCHOLOGY
PROJECT TITLE: EFFECTS AND IMPLICATIONS OF PRL STIMULATION ON EXOGENOUS ATTENTION

Macular degeneration (MD) is a condition in which the loss of central vision affects patients' daily quality of life. Patients affected with MD adopt a preferred retinal focus (PRL) in order to develop compensatory strategies that can take over oculomotor duties normally of the fovea. The formation of a PRL may play a consequential role in a patient's ability to focus on an object without moving their eyes, otherwise known as covert or exogenous attention. However, research in MD is limited due to challenges in studying naturally occurring visual impairments. To address this, the Fixation and Learning and Plasticity (FLAP) study was designed to simulate central vision loss in healthy participants using a calibrated gaze-contingent scotoma. This raises an important question: does PRL stimulation affect exogenous attention? To investigate this, we use the Exogenous Attention task, a standard test which investigates how repeated practice with a fixed-size simulated scotoma influences exogenous attention and reaction time in response to congruent and incongruent visual stimuli. By analyzing the results of 42 participants over three sites, we will aim to assess whether participants are faster in utilizing their covert attention in incongruent or congruent tasks. We will be presenting the task training, rationale, and real-life applications in MD research.

PRESENTER: AMRISHA SRIVASTAVA; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. AMANDA LUCIA, RELIGIOUS STUDIES
PROJECT TITLE: THE IMPACT OF HINDU RELIGIOUS GURUS ON THE EFFICACY OF THE MEDICAL SYSTEM DURING THE COVID-19 PANDEMIC IN INDIA

This research explores the influence of Indian Hindu Gurus on the efficacy of the medical system during the COVID-19 pandemic in India. Given that approximately 80% of India's population identifies as Hindu, religious leaders wield significant social and media influence (Pew Research Center 2021). This study examines the information disseminated by select Hindu Gurus across various platforms and compares it to the professional medical advice provided by doctors and government officials during the same period. By analyzing public perception and adherence to these messages, this research aims to assess the extent to which the Gurus' influence shaped health behaviors and compliance with medical guidelines.
The study discusses the intersection between religion and medicine, particularly in highly religious and densely populated societies. It highlights the power religious figures hold in shaping public attitudes and

underscores the necessity of understanding religious influence when addressing public health crises. The findings of this research will contribute to the development of strategies for improving communication between medical professionals, government authorities, and religious leaders. By recognizing the role of faith in health decision-making, this study can inform the creation of medical curricula that equip doctors to better serve religious communities. Additionally, the insights gained could help policymakers and healthcare providers collaborate with religious leaders in future pandemics to enhance public trust in medical advice and improve health outcomes. Ultimately, this research argues that despite the reliability of medical information, the influence of Gurus often superseded governmental and medical guidance, impacting public health responses during the pandemic.

PRESENTER: KENDALL SULLIVAN, PSYCHOLOGY
FACULTY MENTOR: DR. ANNIE DITTA, PSYCHOLOGY
PROJECT TITLE: EXPLORING THE RELATIONSHIP BETWEEN COMPREHENSION AND CREATIVITY IN STATISTICS LEARNING

The goal of education is not only to teach students how to understand new information (i.e., comprehension), but to additionally teach them how to apply their knowledge beyond the classroom (i.e., creativity). It has been established in prior research that there is a significant positive relationship between generalized comprehension and creativity, such that students who are better able to understand a topic are also able to think more creatively on an unrelated creativity task. However, the relationship between comprehension of a topic and the ability to generate a creative idea that successfully employs learned material for that specific topic has not been studied. We hypothesized that a positive relationship exists between comprehension and creativity since understanding a topic may facilitate appropriate creative idea generation. We examined this question using a between-groups, quasi-experimental design. Participants watched a brief statistics lecture and then: a) took a test on the material, and b) applied that knowledge in a creative thinking task. Creative thinking was scored in terms of functional fluency, or the number of correct ideas generated using knowledge from the lecture. A median-split of the comprehension scores created two groups (low vs. high comprehension), which were compared on their functional fluency. Contrary to our prediction, there was no statistically significant difference in functional fluency between groups, indicating that comprehension may not be necessary for creative idea generation in statistics learning. However, this design may not have been sensitive enough to detect a difference.

PRESENTER: AMBER SUMMERS, PSYCHOLOGY
FACULTY MENTOR: DR. MEGAN ROBBINS, PSYCHOLOGY
PROJECT TITLE: GENDER DIFFERENCES IN OUT-LOUD SELF-TALK: EXPLORING HOW GENDER INFLUENCES NARRATION OUT-LOUD SELF-TALK AND POSITIVE OUT-LOUD SELF-TALK

Gender differences in out-loud self-talk (OLST) may be influenced by traditional social norms and moral perspectives. Women tend to emphasize care and empathy, whereas men focus on assertiveness and independence (Gibbs, 2021). This study used survey methods to examine how gender variations in OLST were associated with differences in self-reported positive, uplifting, hopeful, or engaging out-loud self-talk (POLST) and narration of current planned behaviors/actions out-loud self-talk (NOLST). Participants included 123 men and 229 women. The perceived frequency of one's own POLST and NOLST were assessed using a Likert scale with response options ranging from 0 (never) to 4 (always). An independent samples t-test revealed no significant gender difference in POLST, $t(350) = -1.48$, $p = .141$. This contrasts with prior research suggesting that women engage in more emotion-related self-talk (Currin et al., 2011). However, on average, men reported engaging in significantly more NOLST ($M = 1.42$, $SD = 1.15$) relative to women ($M = 1.61$, $SD = 1.10$), $t(350) = -2.64$, $p = .009$. The findings indicated that, in this sample, men perceive themselves as engaging in more NOLST than women. While the non-significant results suggest POLST may not be as strongly gendered, the significant NOLST findings highlight a difference between men and women, suggesting that gender-related factors may play a role in self-reported experiences. These findings can contribute to a deeper understanding of gender differences in OLST, which can have implications for mental health and cognitive processes.

PRESENTER: SARAH SUTJIPTO, BIOLOGY
ADDITIONAL PRESENTER: MATTHEW LU, BIOLOGY
FACULTY MENTORS: DR. RACHEL WU, PSYCHOLOGY AND DR. CAMRYN AMUNDSEN, PSYCHOLOGY
PROJECT TITLE: EXPLORING DIGITAL LEARNING: THE ROLE OF MOTIVATION AND SKILL TYPE IN YOUNG ADULTS' ACQUISITION OF ONLINE TECHNICAL SKILLS

Employees are frequently required to learn new technical skills with minimal training resources, such as short online tutorials. Understanding how to optimize knowledge acquisition in young adults is essential in developing effective training strategies that will meet industry demands. This study examines the impact of motivation and skill-type on the learning outcomes of young adults when learning two distinct technical skills through online instruction: an operational procedure (EEG cap application) and a programming task (modifying R code for graphing). Undergraduate participants will be recruited through UC Riverside's Human Subject Research Pool and will be compensated with Psychology course credit for their participation. Participants will complete the training and survey remotely via Qualtrics, simulating real-world, self-directed learning. Previous research suggests that younger adults may excel at learning online technical skills due to their familiarity with technological advances, but may require additional guidance for procedural or unfamiliar tasks. These results will provide insights for better understanding

how quickly young adults can acquire and apply new technical skills, a crucial factor for their success in adapting to the demands of the workforce.

PRESENTER: SIERRA SUTTON, PSYCHOLOGY
FACULTY MENTOR: DR. AERIKA LOYD, PSYCHOLOGY
PROJECT TITLE: THE POWER OF COMMUNITY: HOW SOCIAL NETWORKS INFLUENCE BLACK MENTAL HEALTH HELP-SEEKING

Despite growing recognition of mental health needs within the Black community, systemic barriers and cultural factors continue to hinder service utilization. Key challenges include financial inaccessibility, lack of Black representation in the field, and deeply rooted medical mistrust and stigma stemming from historical injustices, all contributing to the avoidance of professional help (Burkett, 2017; Nestor, et al., 2016). Social networks play a complex role in mental health help-seeking by providing positive emotional support and pathways to treatment. However, research shows social networks can simultaneously reinforce cultural stigma and discourage professional service utilization, particularly within communities of color (Choi, et al., 2019; Green & Pescosolido, 2023). This study examines the interplay between structural barriers, cultural narratives, and the role of social networks in shaping attitudes about mental health and service utilization in the Black community. Findings from in-depth qualitative interviews with Black women in the Inland Empire reveal that while the greater Black community may view therapy as inaccessible or unnecessary, those who witness its benefits - personally or within their networks - are more likely to advocate for help-seeking. Personal stories of healing can counteract skepticism and inspire others to seek support through social networks. Based on these findings, we posit that a gradual cultural shift in attitudes, driven by increased awareness and the positive influence of those who have benefited from therapy highlights the need for proactive policy changes, increased representation among mental health service providers, and educational initiatives to make mental health services more accessible and relevant for Black Americans.

PRESENTER: SIN SZE MAN; THEATRE, FILM, AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. ANNIKA SPEER; THEATRE, FILM, AND DIGITAL PRODUCTION
PROJECT TITLE: WHAT DOES SUCCESS MEAN WHEN YOU'RE AN ACTOR?

This intends to be an oral presentation from my experience of gathering interviews from a diverse range of working actors in the industry (and mock interviews I did with students that I find valuable and insightful), with questions relating to their personal experience, esteem, fulfillment and satisfaction. With interviewees of varied ages and at different places in life, and a very similar and vital performer's mindset to survive in this industry and continue doing the work that they do. This pilot study project is titled 'What it means to be an actor', not just what it means in being-an-actor and the acting work itself, but it was aimed to explore the complexities between an actor's psychological process and personal

sense of self in a demanding field that can lack clarity and consistency in upward mobility or stability. It intends to highlight how performers navigate their sense of self-worth in a career rife with volatility. The project idea started from my own interest in better understanding how actors can navigate through those inner critiques and exterior stressors, because I was experiencing my own setbacks as an undergrad and performing artist. It is ultimately also the oral presentation about what it's like for me to expand my experiences and skills as an acting concentration student, while also working on this project, and continuously learning to navigate my own esteem and challenges that come with pursuing a seat in this field and owning up space.

PRESENTER: STEVEN TORRES, HISTORY
FACULTY MENTOR: DR. JORGE LEAL, HISTORY
PROJECT TITLE: TROUBLE IN EAST LOS ANGELES: LOS ANGELES'S MODEL CITY PROGRAM, 1969-1973

The Model Cities Program was launched as a part of President Lyndon B. Johnson's War on Poverty in 1968; its purpose was to provide increased financial resources and improved living conditions to urban communities. The Model Cities Program intended to bring city officials and local communities together to discuss unresolved issues that had been affecting city neighborhoods. Los Angeles became a participant of the program, particularly its eastern neighborhoods that contained a significant Latinx/Hispanic population. However, the efforts to improve East Los Angeles's Latinx neighborhoods failed due to the poor organization and lack of centralization in leadership. Public projects were not completed and never received the entirety of proposed funding grants. My research intends to explore the progression of the Model Cities Program in East Los Angeles in the years 1969 to 1973. In particular, I will analyze the consequences of its flawed organization and local community members' perception of the program's failure. I draw on media publications and city records ranging from the period. These sources reveal how the program gradually shifted away from productive planning and became ineffective; this prompted community criticism. I argue that the issues of Los Angeles's Model City Program encouraged local Chicanx communities throughout the city's eastern neighborhoods to reconsider their relationships with institutional organizations. These communities instead chose to focus their efforts on community-established services and projects.

PRESENTER: NAKANLAYA TUPSAMPHAN; THEATRE, FILM, AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. CHRISTOPHE KATRIB; THEATRE, FILM, AND DIGITAL PRODUCTION
PROJECT TITLE: *ACINTEY-A9 108B*: SIAMESE FUTURISM, A SCIENCE FICTION JOURNEY THROUGH THAI BELIEFS

This creative project is a short script and partial production of a narrative film. The story follows Tawan, a human pilot, and Robot05, a humanoid robot, as they return to Earth from a mission to find habitable planets and living forms. However, they drift into an uncharted region of space, where Tawan is drawn

to a mysterious planet, and she gives it the name Acintey-a9 108b. As she explores, time begins to blur—memories and alternate realities surface, revealing aspects of her past that she and her relationship with the family had never fully understood. Meanwhile, Robot05's mission is to ensure Tawan returns home safely and insists she must leave, as their mission is already complete. This project blends science fiction with cultural identity, incorporating Buddhist philosophy and reflecting on the historical portrayal of Asians in futuristic narratives. The film's world draws inspiration from the Tripitaka, a collection of Buddhist scriptures, while maintaining a scientific framework. The story challenges conventional depictions of cyborgs by giving Robot05 a deeper narrative role, moving beyond the stereotypical ornamental presence of Asians as robots in media. Additionally, elements of Thai household traditions are embedded into the spacecraft's design, merging cultural heritage with speculative storytelling. Initially envisioned as an experimental film, the project evolved into a narrative-driven exploration of memory, identity, and belonging. Through this script, the project aims to contribute to discussions on representation and reimagining Asian identities within science fiction.

PRESENTER: VALERIE VALENCIA, PSYCHOLOGY
FACULTY MENTOR: DR. ANNIE S. DITTA, PSYCHOLOGY
PROJECT TITLE: INVESTIGATING THE IMPACT OF REPEATED GENERATIVE AI USE ON CREATIVE THINKING IN COLLEGE STUDENTS

Given generative AI (GenAI's) rapid growth in popularity, it seems inevitable that it will become a part of everyday life. As such, this study sought to understand the impact of repeated GenAI use on human cognition—specifically, creative thinking ability. We hypothesized that through repeated use of GenAI, participants would develop a dependence on the tool that would lead to a reduction in their creative thinking when access to the tool was unexpectedly removed. To test this idea, participants were asked to complete multiple iterations of the Alternative Uses Task (AUT), in which they were asked to generate as many uses for objects (e.g., tennis ball, brick) as possible. Half of the participants completed this task with the support of ChatGPT, and half completed it unassisted. We then compared their creative thinking ability through scoring the AUT for fluency (number of ideas generated), originality (how novel the ideas were), and elaboration (how developed the ideas were). We used a pretest-posttest design, where we compared scores for the AUT trials in which they did not have access to ChatGPT for both conditions. Contrary to our hypothesis, we found no significant difference in fluency and elaboration between the AI-assisted and unassisted groups. However, we did find a significant interaction such that participants in both groups started with similar levels of originality, but the AI-assisted group *increased* their originality after using ChatGPT compared to those that did not. Given the unexpected finding, we are currently running a second experiment to replicate this effect.

PRESENTER: OMAR VARGAS, ANTHROPOLOGY
FACULTY MENTOR: DR. JENNIFER SYVERTSEN, ANTHROPOLOGY
PROJECT TITLE: AN INTERSECTIONAL ANALYSIS OF EXPOSURE OF VIOLENCE AND SUBSTANCE USE: IMPACTS ON THE BEHAVIOR OF MALE YOUTHS OF COLOR IN CALIFORNIA

The intersectionalities of socio-economic and political issues in low-income communities have affected people of color resulting in making youth susceptible to violence and gang culture. The purpose of this study is to evaluate patterns of the relationship in gang culture and its dynamics from the early 1990s to the 21st century that affects the youth's behavior with the use of social media platforms and the use of drugs in California. I will be exploring the intersectional look in gang culture through the exposure of violence and substance use in social media trends impacting male youth of color living in marginalized communities. This study focuses on the youth (ages 11-17) and the influence of Instagram trends in shaping their identity, delinquency and the exposure to gang culture. Through a quantitative study, literature review findings can help identify the evolution of substance use trends and behavioral patterns in support of personal narratives. Central to this research are Luis J. Rodriguez's novel Hearts and Hands because of his personal narratives on gang culture as well as studies that explore the relationship between gang violence, rap and social media. Past research has also identified youth who are at risk due to the socio-economic issues that can lead to participation in intergroup violence or substance use because of the influence of trends on social media. Gang recruitment methods, existing terminology such as internet-banging, intergroup identity theory and the limitations from male youths' experiences in substance use and social media will be emphasized.

PRESENTER: HOLDEN VIGNA, CLASSICAL STUDIES
FACULTY MENTORS: DR. MICHELE SALZMAN, HISTORY AND DR. KYLE KHELLAF, COMPARATIVE LITERATURE AND LANGUAGES
PROJECT TITLE: SALLUST THE TRAGEDIAN: THE MEMORY OF SULLA IN TRIUMVIRAL-PERIOD HISTORICAL NARRATIVE

Sallust was a Roman historian of the late Republic, writing in the wake of the civil war, dictatorship, and assassination of Julius Caesar, and during the tyranny of Caesar's partisans. To Sallust, writing in the late 40s BCE, the political chaos could not have seemed more similar to the late 80s, when another general, Sulla, similarly won a civil war and instituted himself as dictator. Asking how Sallust confronts these similarities is to ask about his "metahistory," or implicit narrative structure. Hayden White's *Metahistory: The Historical Imagination in Nineteenth-Century Europe* provides a framework for analyzing not just these narrative structures, but how these structures shape our understanding of history. Although White's research focuses on modern historians, the same framework should be applied to discuss the metahistory of ancient historians. When Sallust's historical works are analyzed using White's framework, Sallust becomes the model of a tragic historian, viewing history as a decline, and using metonymy as his narrative convention. Sallust makes "mechanistic" arguments, emphasizing long-term historical phenomena; and his politics are "radical." This method illustrates that the memory of Sulla plays a vital role in all areas—the history, politics, and morals—of Sallust's corpus. Sallust's

rooting his narratives in the memory of Sulla establishes a complex historical consciousness that reveals his personal politics and anxieties. Most importantly, Sallust's narrative structure reaffirms the authority Sulla retained in public memory long after his death.

PRESENTER: KATIE VO, PSYCHOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
PROJECT TITLE: THE EFFECTS OF COGNITIVE LOAD ON 3D VISUAL SEARCH TASK PERFORMANCE

Cognitive load refers to the amount of mental effort allocated to different tasks, such as searching and counting. Previous eye-tracking research has demonstrated that increasing cognitive load can alter visual search strategies and impair task performance. For instance, Fockert et al. (2001) demonstrated that high cognitive load (i.e., memorizing number sequences) increases susceptibility to visual distractions. However, past studies were conducted in constrained, screen-based search tasks, unlike in real-world environments where head and body movements are required to shift gaze in three dimensions. Therefore, the maintenance of visual representations across changes in the visual field when moving the head and body may disrupt encoding and add to cognitive load. Participants were asked to find certain targets among distractor items in a collection of 27 images spread across 3 walls in a rectangular room, while simultaneously completing a secondary cognitive loading task of counting backwards out loud by different intervals (0, 1, 3, 5, 7). After each trial, participants were tested about the number of target stimuli, and we will analyze task performance by calculating the number of correct targets. We predict that increased levels of cognitive load (e.g., counting backwards by 7 vs by 1) will decrease task performance. Thus, this study contributes to a better understanding of how cognitive load affects real-world search tasks to affect task performance.

PRESENTER: NATHAN VUONG; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL PRESENTER: DANIEL PUNZALAN, PSYCHOLOGY
FACULTY MENTOR: DR. AARON SEITZ, PSYCHOLOGY
PROJECT TITLE: SIMULATED CENTRAL VISION LOSS TRAINING ON PERIPHERAL ATTENTION AND ITS IMPLICATIONS

Macular degeneration (MD) is a common condition resulting in central vision loss. Patients with MD develop a peripheral retinal locus (PRL) to replace their fovea. Attention mechanisms are also compromised in central vision, and so the process of PRL induction may have additional consequences on locational attention. Despite how common MD is, issues with patient accessibility and the need to control external factors make it a difficult condition to research. Using eye-tracking software, MD can be simulated in healthy participants to control variables for a laboratory setting. Previous research indicates that visual training tasks can induce the formation of a PRL in healthy participants and that performance improvements can be observed with training. The question then arises: does developing a PRL using a simulated scotoma impact sustained and dynamic attention? This outcome will be examined

using Rapid Serial Visual Presentation (RSVP), a standard test of sustained and endogenous attention. Results for 42 participants were collected over 3 sites. We will determine whether participants are faster in allocating attention toward the PRL and slower when moving away following training. We will be presenting the training, the reasoning, and possible applications towards MD research.

PRESENTER: MICHELLE WANG, PHILOSOPHY
FACULTY MENTOR: DR. PIERRE KELLER, PHILOSOPHY
PROJECT TITLE: JÜRGEN HABERMAS'S DELIBERATIVE POLITICS AND DEMOCRACY: TWENTIETH CENTURY AND BEYOND

Our society is shaped by diverse political forces, where government actions, court decisions, and media influence are deeply interconnected. Media, especially social media, increasingly orchestrates public policy. Using Jürgen Habermas's 2023 book, *A New Structural Transformation of the Public Sphere and Deliberative Politics*, as the basis of my analysis, this essay critically examines how civic thought and participation has changed over the past two centuries. In the 1962 book, *The Structural Transformation of the Public Sphere*, Habermas revisits the events of the eighteenth century to document fundamental changes that had led to the evolution of a new, fundamentally transformed public sphere which could support deliberative democracy. In his new book, he continues to discuss not only the way that the public sphere has in turn been transformed by events in the first half of the twentieth century, but also in the last 75 years. Habermas argues that these transformations need to be appreciated if democratic institutions are to be restored and preserved in countries like Germany, and he is now considering new threats to democracy by social media. Social media challenges the role of free deliberation of ideas within the public sphere, within political parties, and even affects the formation and dissemination of ideologies, and more. I will develop my own arguments for these concepts and compare relevant philosophical texts. This includes referring back to Habermas's earlier works, especially *his Theory of Communicative Action*, as it is relevant to the development of his distinctive account of social and individual action.

PRESENTER: ALLISON WANG, POLITICAL SCIENCE
FACULTY MENTOR: DR. JOHN MEDEARIS, POLITICAL SCIENCE
PROJECT TITLE: LOCAL PUBLIC RADIO STORYTELLING WITH 91.9 KVCR NEWS

In Spring 2023, I took POSC198G - Field Work with Professor Medearis, an internship program that connected political science students to internship host sites; I was assigned to KVCR News, a nonprofit public radio station part of a larger agency, National Public Radio (NPR) and broadcasts to the Riverside-San Bernardino-Inland Empire area.

Since then, I have stepped into this position and crafted stories about local people and places of interest, for example: Professor Boris Baer of UCR's Entomology Department, the Lavender Festival, The Gardens of Hope, a therapeutic horticulture nonprofit, and more.

Audio storytelling is an art of its own and I have learned how to eloquently and concisely tell a story that resonates with listeners. I have taken this experience further, teaching this craft to others with my R'Course "Local Public Radio Storytelling with 91.9 KVCR News," taught in Winter 2025 and Spring 2025. In my class, utilizing the skills I teach them, students create radio features that will be aired on KVCR's FM channel 91.9 and published on KVCR.org.

My time with KVCR and public radio, as a broadcaster and as a teacher, will culminate in an audio documentary that chronicles my journey and illustrates the local impact of this work. Estimated to be about 25-20 minutes long, it will include interviews with relevant key figures such as Dr. Medearis (my faculty mentor), Rick Dulock (KVCR's Program Director), Dr. Kavetsky (head of the R'Course Program), my students, and more.

This project is my UCR University Honors Capstone.

PRESENTER: ELISE WYMAN, SOCIOLOGY
FACULTY MENTOR: DR. CAMELIA HOSTINAR, PSYCHOLOGY
PROJECT TITLE: POSITIVE PARENTAL REGARD RELATES TO LOWER CORTISOL STRESS REACTIVITY IN ADOLESCENTS

Research shows that the parent-child relationship, as perceived by the child, predicts children's stress biology (Lucas-Thompson et al., 2011) and functioning (Forehand et al., 1991). Parental support has been positively associated with a lower cortisol stress response in children (Hostinar et al., 2014). However, less is known about how adolescents' stress reactivity relates to parent-adolescent relationships from the adult perspective. This study examines whether adolescents' stress response is associated with their parents' positive regard for them. Adolescents (age 11-15 years, n = 201, 55% female) completed surveys, provided saliva samples, and participated in a social stressor task called the modified Trier Social Stress Test (TSST-M, Buske-Kirschbaum et al., 1997). Outcomes included adolescent self-reported emotional stress appraisal captured by the Self-Assessment Manikin (SAM), state anxiety measured by the Short State Anxiety (SSA) scale, and positive parental regard measured by responses on the Child Behavior Checklist (CBCL). Linear regression analyses were used to examine the association between positive parental regard, child's anxiety, biological stress reactivity, and emotional stress post-TSST. Greater parental positive appraisal was associated with lower salivary cortisol reactivity (B = -.44, p = .029) when controlling for age and sex. Parent appraisal did not significantly predict change in anxiety (B = -0.005, p = 0.76) or self-reported stress post-TSST (B = .012, p = .713) when accounting for age and sex. Females reported more stress post-TSST (B = .397, p = .003) and greater cortisol increases compared to males (B = .168, p = .044). Findings suggest that positive parental regard is connected to lower stress reactivity in adolescents.

PRESENTER: INAAM ZAFAR, BIOLOGY
ADDITIONAL PRESENTER: AMAAN ZAFAR, BIOLOGY
FACULTY MENTOR: DR. ILANA BENNETT, PSYCHOLOGY
PROJECT TITLE: THE CARCERAL STATE: PUBLIC HEALTH, VIOLENCE, AND THE LINK BETWEEN INCARCERATION AND AGE-RELATED NEURODEGENERATION

The U.S. prison system, rooted in punitive and isolationist approaches, exacerbates cycles of violence and deepens societal inequities. While incarceration is widely perceived as a deterrent to crime, research shows that declining crime rates are largely attributable to factors outside of imprisonment. This poster explores the carceral system's structural flaws, its role as a public health crisis, and its contribution to age-related neurodegeneration. Prisons, shielded by geographic and institutional isolation, perpetuate state-sanctioned violence, creating a psychologically toxic environment. Chronic stress, overcrowding, and deprivation of autonomy accelerate cognitive decline, particularly for aging populations. Prolonged incarceration increases susceptibility to neurodegenerative diseases such as Alzheimer's and dementia, a crisis worsened by inadequate healthcare and undiagnosed cases. Following release, individuals face heightened mortality risks, including overdoses, compounded by years of trauma and neglect. Additionally, the school-to-prison pipeline funnels marginalized youth into the justice system, exacerbating cognitive and mental health challenges. Racial disparities in disciplinary practices and inadequate access to mental health services in schools compound long-term effects on brain health. Addressing these systemic issues demands reforms prioritizing equity, public health, and restorative justice. Programs emphasizing education, rehabilitation, and early intervention can mitigate the public health crisis linked to the carceral system and promote better outcomes for vulnerable populations.

PRESENTER: ALEXA ZELAYA, PSYCHOLOGY
FACULTY MENTOR: DR. KALINA MICHALSKA, PSYCHOLOGY
PROJECT TITLE: DOES PROXIMITY TO WAREHOUSES INFLUENCE LATINE CHILDREN'S EMOTIONS AND PERCEPTIONS OF CLIMATE CHANGE?

BACKGROUND: Latine populations are vulnerable to climate-related psychological distress (Uppalapati et al., 2023). Research examines adults' climate-related distress (Mento et al., 2023), little work focuses on children in high-risk areas. This study focuses on children living in the Inland Empire of California, a community with high warehouse concentrations and significant air pollution (Center for Community and Environmental Justice, 2023). We investigate whether children living in warehouse-dense areas are more worried about climate change and pro-environmentally engaged than children in areas with lower warehouse concentrations.

METHODS: Our sample includes 122 Latine youth (M_{Age}=10.81, *SD*= 1.712) residing in the Inland Empire of California. Participants completed questionnaires about knowledge of warehouses in their community, pro-environmental engagement (*Climate Change Anxiety Scale*; Clayton & Karazsia, 2020), and climate worry (Ojala, 2012).

RESULTS: An independent samples t-test revealed children who noticed warehouses reported significantly higher levels of behavioral engagement (*M*=20.82, *SD*=3.065) compared to those who did not (*M*=19.28, *SD*=4.330), *t*(120) =2.272, *p*=.025. Children who noticed warehouses also exhibited higher levels of climate worry (*M*=21.79; *SD*=4.324) compared to those who did not (*M*=20.13, *SD*=4.386), *t*(120)=2.101, *p*=.038.

CONCLUSION: This study highlights the impact of warehouse proximity on children's climate perceptions and emotional well-being. The results contribute to equitable developmental research and will inform conversations among educators and public health leaders to reduce stigma around climate-related emotions.

PRESENTER: ALEXA ZELAYA, PSYCHOLOGY
FACULTY MENTOR: DR. KALINA MICHALSKA, PSYCHOLOGY
PROJECT TITLE: DO FUTURE-ORIENTED COGNITION AND DISPOSITIONAL EMPATHY PREDICT ADAPTIVE COPING MECHANISMS AND CLIMATE ENGAGEMENT IN LATINE CHILDREN?

BACKGROUND: Climate change heightens climate distress in adults.[1,2,3] Less is known about how preadolescent Latine children cope with climate distress.[4] Future-oriented cognition and trait empathy are two psychological processes that may promote adaptive coping and climate engagement in children. We hypothesized that future-oriented cognition would promote adaptive coping and climate engagement among highly empathic children.

METHODS: Participants included 41 Latine children (M_{Age}=11.85 ± 1.49) who reported future-oriented cognition via the *FTP*[6], and coping strategies and climate engagement via the *CCS*[7]. Participants previously completed the *EmQue-CA*[8] assessing affective empathy, cognitive empathy, and intent to support.

RESULTS: Future-oriented cognition (*p*=.009) and overall empathy (*p*=.037) predicted meaning-focused coping, whereas intent to support was inversely associated with de-emphasizing coping (*p*=.033). The association between future-oriented cognition and climate engagement was moderated by overall empathy (*p*=.0034), cognitive empathy (*p*= .0120), and intent to support (*p* = .0104). First, future-oriented cognition was associated with climate engagement at high (*p* = .0007, 95% CI [1.9187, 6.6069]) and mean (*p* = .0189, CI [0.3438, 3.5964]), but not low overall empathy levels. Second, future-oriented cognition was associated with engagement at high (*p* = .0018, CI [1.5893, 6.3766]), but not mean or low

cognitive empathy levels. Third, future-oriented cognition was associated with engagement at high (p = .0018, CI [1.6099, 6.4679]) and mean (p = .0061, CI [0.7635, 4.2620]), but not low intent to support levels.

CONCLUSION: Children with higher future-oriented cognition and empathy are more likely to engage in climate action, suggesting strategies to help youth cope with climate change.

PRESENTER: SARAH ZIMMERMAN, ANTHROPOLOGY
FACULTY MENTOR: DR. JENNIFER SYVERTSEN, ANTHROPOLOGY
PROJECT TITLE: CANNABIS USE AS HARM REDUCTION AMIDST AN OVERDOSE CRISIS

The current legal status of cannabis in the United States has created barriers to both academic research and open discussion about its potential benefits for those struggling with substance use disorders. Through analysis of data from a broader community study on opioid overdose, this research found that 95% of 195 participants surveyed who use drugs (e.g., opioids or stimulants) also used cannabis. Importantly, almost half of these participants reported using cannabis specifically to help manage their use of other substances. These findings suggest that cannabis may serve as a harm reduction tool - a strategy that aims to minimize negative health and social consequences associated with substance use. This research explores how cannabis could potentially play a role in promoting safety for at-risk populations during the ongoing overdose crisis.

STUDENT PRESENTERS

In alphabetical order of lead presenter by college:

College of Natural and Agricultural Sciences

PRESENTER: MARIAN ABAWI, NEUROSCIENCE
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: BRANDON OLIVER
PROJECT TITLE: EFFECTS OF AEROBIC EXERCISE ON NICOTINE RELAPSE IN MICE

Nicotine addiction has been a major public health concern over many years, and we still lack highly effective treatments, as relapse rates remain high. Understanding the neurobiological mechanisms of addiction and relapse is crucial to come up with successful interventions. Nicotine recruits dopamine release in the brain's reward circuitry, leading to the development of addiction as well as promoting susceptibility to relapse. Aerobic exercise potently modulates dopamine within this circuitry and may prove to be an effective intervention. Therefore, this study investigates the dopaminergic mechanisms and therapeutic effects of aerobic exercise on nicotine relapse in mice.

To carry out this study, male and female adult C57BL/6J mice are implanted with a chronic brain probe to measure dopamine release and are then trained to nosepoke for intravenous infusions of nicotine via a jugular vein catheter. After a 14-day period of intravenous nicotine intake, mice undergo a 21-day withdrawal or incubation period without access to self-administer nicotine, during which they are provided with a homecage running wheel that is either locked (control) or unlocked. Subsequently, nicotine craving or "seeking" is assessed to determine if prior exercise decreases vulnerability to relapse. Throughout nicotine self-administration and craving tests, phasic dopamine release is measured within the brain's reward pathway.

Preliminary findings demonstrate that mice with an unlocked running wheel exhibited lower signs of nicotine-seeking behavior compared to those given a locked wheel. This overall suggests that aerobic exercise lowers the craving for nicotine during late withdrawal. These findings could pave the way for future research exploring dopamine activity in greater depth and investigating non-pharmacological interventions aimed at reducing relapse.

PRESENTER: MIRIAM AGAIBI, BIOLOGY
FACULTY MENTOR: DR. ERICA HEINRICH, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: KARAPET MKRTCHYAN
PROJECT TITLE: SOCIODEMOGRAPHIC CONTRIBUTORS TO HYPOXIA AND HYPERCAPNIA-INDUCED DYSPNEA

Dyspnea is the subjective sensation of breathing discomfort. This symptom may drive dyspnea-induced anxiety caused, partially, by a higher work of breathing and carbon dioxide-induced air-hunger. While prior work has provided a detailed understanding of the neurophysiological mechanisms underlying dyspnea, we know little about the drivers of individual variation in how this symptom manifests. Sociodemographic factors may play a role in the psychological mechanisms underlying the sensation of dyspnea. This study aimed to investigate if sociodemographic factors contributed to self-reported dyspnea severity under controlled conditions of modified arterial oxygen and carbon dioxide partial pressures. We hypothesized that higher levels of stress related to medical access (including financial concerns) would lead to either blunting or exacerbation of dyspnea severity. To test this, we recruited healthy men and women between ages 18 and 49. Participants completed a questionnaire examining sources of financial, social, and medical stress. They then completed a dyspnea simulation experiment where they reported dyspnea severity while breathing controlled oxygen and carbon dioxide tensions to target 6 combinations of end-tidal PCO2 (45 or 55 mmHg) and inspired oxygen tensions (150, 80, or 68 mmHg). Preliminary data suggests that individuals who have higher difficulty accessing healthcare are more likely to report higher dyspnea severity, particularly under less challenging treatment trials such as room air ($p<0.001$, $R=0.57$) and 45 mmHg end-tidal PCO2 ($p=0.001$, $R=0.82$). This suggests that anxiety related to accessing medical care may impact subjective sensations of key symptoms linked to disease.

PRESENTER: SAMIHA ALAM; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. MARGARITA CURRAS-COLLAZO; MOLECULAR, CELL AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: ELENA KOZLOVA, ARTHA LAM, AND JACQUELINE SHUM
PROJECT TITLE: CCKA RECEPTOR CONTAINING VAGAL SENSORY AFFERENTS OF THE GUT-BRAIN AXIS CONTRIBUTE TO THE PRO-INFLAMMATORY INTERLEUKIN-6 RESPONSE TO LIPOPOLYSACCHARIDE TREATMENT

Gulf War Illness (GWI) is a chronic condition encompassing unexplained neurological and gastrointestinal symptoms affecting Gulf War Veterans, experiencing cognitive deficits, chronic fatigue, neuroinflammation, and gut dysbiosis. Thus, it's suspected that altered gut-brain signaling plays a prominent role. Vagal afferent neurons (VANs) are important mediators of the gut-brain axis. To examine how cholecystokinin (CCK)-A-receptor-containing VANs affect gut-brain immune signaling, adult male mice were subjected to bilateral vagal deafferentation via intraganglionic injection with CCK conjugated to the neurotoxin saporin (CCK-SAP, 250nL, 250ng/uL), into the nodose ganglia which contains VANs that project to solitary tract nucleus (NTS). Controls received Blank-SAP injections. Following 6d post-deafferentation, mice were injected with 0.1mg/kg LPS or saline. Plasma, brains, and nodose ganglia were collected 2h later. Compared to saline, LPS increased plasma levels of pro-

inflammatory cytokine IL-6 in both groups but to a lesser extent in CCK-SAP (64%) than BLANK-SAP (129%) (p<0.01, n=3-9/group). LPS-stimulated cFOS-positive cell counts in the intermediate NTS were 24% lower in CCK-SAP than BLANK-SAP (p<0.01,n=8-11/group), indicating deafferentation by CCK-SAP. Another cohort of CCK-SAP mice showed no effect of CCK, a satiety peptide, on food consumption as seen at baseline prior to surgery (p<0.01-0.0001, n=7). Collectively, the findings indicate that CCKAR-containing VANS participate in pro-inflammatory responses and can be leveraged to interrogate gut-brain immune functioning in disorders with gastrointestinal and neurological abnormalities such as GWI. Supported by DoD grant (MCC), UCR Student Minigrants (SA, JS).

PRESENTER: ALLYSSA ALANO, BIOCHEMISTRY
FACULTY MENTOR: DR. ANDREY BEKKER, EARTH AND PLANETARY SCIENCES
PROJECT TITLE: TESTING CORRELATION OF PALEOPROTEROZOIC BASINS IN INDIA USING CARBON ISOTOPE CHEMOSTRATIGRAPHY

Sedimentary basins record the history of surface conditions and host mineral deposits. Carbonates in these sedimentary basins precipitated from seawater record chemical composition and geochemical signatures that can be used for correlation between basins and indirect dating. The $\delta^{13}C$ isotope values give us information on the amount of organic carbon buried and also the amount of oxygen released via photosynthesis to surface environments. Highly positive carbon isotope values in carbonates are rare throughout Earth's history, but are preserved in Paleoproterozoic carbonates with ages between ca. 2.22 and 2.06 Ga, a signature called the Lomagundi carbon isotope excursion (LCIE), which occurred at the peak of the Great Oxidation Event (GOE). We studied the chemical composition of 14 Paleoproterozoic shales and carbonates from the Gwalior Basin in India to compare them with the data from the previously studied Bijawar Basin; these basins developed on the northern and southern margins of the Bundelkhand Craton, respectively. The Bijawar Basin carbonates have highly positive C isotope values and were inferred to be deposited during the LCIE. Our studied carbonates showed $\delta^{13}C$ isotope values close to 0 ‰ V-PBD, suggesting that the previous correlations of the basins are not likely to be correct. These basins were deposited at different times and the Gwalior sedimentary succession is younger than both the GOE and LCIE. As basins and mineralization evolve in response to tectonic drivers, this information is important in understanding the evolution of continents over time and the origin of sediment-hosted mineral deposits.

PRESENTER: SAMUEL ALSTON, BIOCHEMISTRY
FACULTY MENTOR: DR. PINGYUN FENG, CHEMISTRY
PROJECT TITLE: PORE SPACE PARTITIONED METAL ORGANIC FRAMEWORKS FOR GAS AND VAPOR SEPARATION

Metal-Organic Frameworks (MOFs) are a special class of crystalline porous materials consisting of metal cation or metal clusters integrated with organic linkers. These MOF materials can be used as hosts to selectively interact with diverse guest molecules for gas sorption and separation. In this study, seven MOFs were synthesized using the pore-space partition (PSP) strategy to divide their porous cavities with pyridine-based trimodal molecules. Particularity, three carboxylic acids, three pore partition ligands, and four trimeric metal clusters were employed to synthesize partitioned-acs (pacs) MOFs to demonstrate pore-size tailorability of the pacs-MOF cavity. Tri(pyridin-4-yl)amine (TPA) and tris(pyridin-4-ylmethyl)amine (TPMA) were used as partition ligands to increase the selectivity of small molecules over pacs-MOFs prepared with tris(pyridine-4-yl)triazine (TPT). More specifically, it was determined with this new class of MOFs that vapor phase selectivity for benzene over cyclohexane increased from 4.5 to 482.5 for CoV-BDC-TPT to CoV-FA-TPA, respectively. A series of new pacs materials have been developed demonstrating complete control of cavity size with the CoV-FA-TPA MOF having the smallest cavity to date. These advancements have demonstrated the effectiveness of the PSP strategy in precise control of pore spaces to enhance molecular selectivity. The MOFs have also exhibited high stability that have allowed for single-crystal diffraction studies to be carried out on various crystalline forms to help reveal the mechanistic aspects of adsorption processes in the pacs materials.

PRESENTER: AHMAD ARAIN, BIOLOGY
FACULTY MENTOR: DR. WEIFENG GU; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: EFFECTIVE RECOMBINANT DNA GENERATION FOR LARGE KILOBASE PAIR FRAGMENTS

In molecular biology, recombinant DNA is routinely used for studying gene functions. Several techniques have been developed to generate recombinant DNA, most of which typically combine an insert and a plasmid. Traditional molecular cloning utilizes highly specific sequences such as restriction sites and recombination signals, which limit its practical application to very few situations. Ligation Independent Cloning was developed as a next generation method for generating recombinant DNA and has proven to be much more practical compared to traditional methods. However, even this method has its limitations when it comes to large kilobase pair fragments and where on a plasmid an insert can be placed. In this project, I aim to develop a highly efficient, all-sequences-compatible, inexpensive and convenient method for recombinant DNA generation. This method will use a Polymerase Chain Reaction amplified flanking sequence on the insert, which compliments the flanking sequence found on the plasmid. These are then processed using T4 DNA Polymerase which possesses both DNA polymerase and 3’ -> 5’ exonuclease activity. These conflicting activities counteract each other and form 5’ overhangs, allowing the insert and plasmid to anneal. The conditions at which these occur will be investigated and optimized to increase efficiency.

PRESENTER: ABDULLAH AWAD, BIOLOGY
FACULTY MENTOR: DR. AHMED EL-MOGHAZY, MICROBIOLOGY AND PLANT PATHOLOGY
PROJECT TITLE: ADVANCES IN FOOD SAFETY OF FRESH PRODUCE FROM FRUIT BYPRODUCTS

This ongoing research aims to address the contamination of fresh produce with foodborne pathogens, which has led to numerous outbreaks of illness and trade disruptions. There is an increasing need for new and sustainable methods to reduce microbial contamination effectively. Our current investigation explores the potential of fruit byproducts as a sustainable source of bioactive compounds with natural antimicrobial properties, to enhance food safety in fresh produce. Specifically, we are focusing on the extraction of these bioactive compounds from fruit byproducts through a green aqueous (water) extraction procedure, evaluating their effectiveness in reducing the risk of foodborne pathogens. Additionally, we are studying the synergistic effects of light induction on enhancing the antimicrobial activity of these extracts. By valorizing fruit byproducts, our research highlights the significance of sustainable practices in the food industry while providing valuable insights into the use of natural resources to safeguard the safety of fresh produce. This study not only deepens our understanding of the untapped potential of fruit byproducts but also contributes to the development of eco-friendly, sustainable strategies to improve food safety, advancing a future where food safety and sustainability work hand in hand for the benefit of consumers and the environment.

PRESENTER: KENNETH BAILEY, BIOLOGY
FACULTY MENTORS: DR. DANIEL PETRAS, BIOCHEMISTRY AND DR. TILMAN SCHRAMN, BIOCHEMISTRY
ADDITIONAL CONTRIBUTOR: TILMAN SCHRAMM, BIOCHEMISTRY
PROJECT TITLE: WHAT'S IN YOUR WATER: A COMMUNITY-BASED SAMPLING KIT FOR NON-TARGETED CHEMICAL ANALYSIS

Understanding the quality of tap water and ensuring its safety is of paramount importance for public health. Dissolved organic matter (DOM) in tap water can affect water taste, odor, and potentially form harmful byproducts during disinfection processes. Our research seeks to advance research on DOM in a variety of water sources available to the public by developing and marketing novel hydrophobic extraction methods designed to selectively separate and concentrate organic compounds. The following research will expand upon prototypical solid phase extraction (SPE) technology in conjunction with liquid chromatography tandem mass spectrometry (LC-MS/MS) for qualitative analysis of DOM. The primary objective is to identify and quantify various organic compounds present in urban water samples using a non-targeted approach. By providing a streamlined approach to water sampling techniques, we aim to bridge the gap between DOM research and public health concerns of drinking water purity. This strategy will enhance our understanding of DOM characteristics in local water systems while contributing to the development of improved water treatment. Through a sizable sample collection and bioanalytical techniques, our research promises to provide valuable insights into water composition and quality management associated with dissolved organic contaminants.

PRESENTER: LILLIANNE BAKSHI, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. SHAWN WESTERDALE, PHYSICS AND ASTRONOMY
PROJECT TITLE: THERMAL CONTRACTION OF REFLECTIVE MATERIALS AT CRYOGENIC TEMPERATURES

Dark matter is believed to account for about 85% of the universe's mass, yet it remains undetected through direct observation. This estimate is supported by various astrophysical and cosmological observations, such as gravitational lensing and cosmic microwave background measurements, which suggest the existence of unseen mass. One primary candidate for dark matter is Weakly Interacting Massive Particles (WIMPs), which could be detected by their rare interactions with ordinary matter. Detectors like scintillation counters and dual-phase time-projection chambers, such as the DarkSide-20k (DS-20k), aim to capture these interactions through light produced by scintillation and ionization from WIMP-nucleus scattering events. Silicon Photomultipliers (SiPMs) detect this light, but their high cost makes it impractical to use them throughout large detectors. Instead, reflective materials are employed to direct scattered light toward the SiPMs.
In the DS-20k experiment, materials like Lumirror enhance light collection efficiency. However, at cryogenic temperatures (~87 K), these materials undergo thermal contraction, which may affect their mechanical stability. To address this, I have designed an experimental setup that allows direct measurement of the behavior of reflective materials, such as Lumirror, in a cryostat filled with liquid nitrogen. The study focuses on understanding how materials like Lumirror, 3M ESR foil, aluminized Mylar, aluminized polyimide, and Tyvek contract at low temperatures. Through controlled cooling experiments, we can determine the contraction rates of these materials and assess their suitability for use in large-scale dark matter detectors like DS-20k, providing valuable insights into their performance in cryogenic environments.

PRESENTER: VARSHINI BALAJI, MICROBIOLOGY
FACULTY MENTOR: DR. JASON STAJICH, MICROBIOLOGY AND PLANT PATHOLOGY
ADDITIONAL CONTRIBUTORS: JESSICA WU-WOODS AND MIA MIYATAKE
PROJECT TITLE: COMMUNITY COMPOSITION OF ENDOLITHIC FUNGAL COMMUNITIES IN DESERT ROCK

Extremophilic microbial communities are vital in understanding the various biological mechanisms that allow microorganisms to survive in harsh environments. One type of extremophiles are thermophiles, or microorganisms that thrive in extremely hot environments - usually at a temperature range of 45-60°C (Powell et al., 2011). Our project aims to identify the endolithic fungal community composition present in desert rocks sampled from Southwestern US deserts. The sampled rocks are sandstone rocks from the Valley of Fire State Park and the Burns Piñon Ridge Reservoir, both of which are desert environments. Sandstone rocks were chosen from both locations as we hypothesized that its porosity would allow various extremophilic microbes to enter and live inside of the rocks. Fungal isolates have been grown from rock dust collected from the rock interior, and we have extracted DNA and sequenced the internal transcribed spacer (ITS) gene of isolates. ITS is the best gene sequence for identifying fungal isolates as it is the easiest to use to calculate barcode gaps (the differences in interspecific versus intraspecific

sequences) for fungal species (Schoch et al., 2012). The ITS gene sequence will be used to build phylogenetic trees for each sample location, as well as a tree comparing the lineage of the two communities. Fungal isolates will also be imaged via microscopy in order to further analyze their cellular structures. Based on preliminary results and phenotypical observations, we hypothesize that the two communities will have similar compositions, with many being extremophilic fungi that can survive the harsh conditions.

PRESENTER: ANISHA BHARADWAJ, BIOLOGY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
PROJECT TITLE: METFORMIN EFFECT ON MISFOLDED PROTEINS IN HEK293T CELLS

Patients with type two diabetes commonly use the medication known as metformin to regulate blood sugar. Despite its wide use because of its ability to control blood sugar, the biochemistry of how it works in the body is still unknown, contributing to approximately 25 percent of patients experiencing untreatable symptoms, and 5 percent to discontinue the medication. Using Dr. Genereux's DNAJB8 assay and immortalized human embryonic cells (HEK293T) to produce and isolate misfolded proteins affected by metformin, we can develop a deeper understanding of how it works at the cellular level. We use gel electrophoresis in two ways, silver staining and western blot, as a quality control check for an adequate amount of protein present. This is followed with mass spectrometry techniques to understand and analyze the types of proteins affected by the medication. Currently, the literature indicates the potential of metformin to inhibit the mechanism of gluconeogenesis, thus we expect to see misfolded proteins found within the mitochondria in the mass spectrometry analysis. This has the potential to improve drug efficacy for patients diagnosed with type 2 diabetes as understanding the proteins affected by metformin is to understand its mechanism of action. Understanding what proteins are affected by metformin in diabetes patients has the potential to pave the way for further research to elucidate its effects and potential benefits.

PRESENTER: ESHAN BHATT, BIOLOGY
FACULTY MENTOR: DR. RONG HAI, MICROBIOLOGY AND PLANT PATHOLOGY
ADDITIONAL CONTRIBUTORS: DANIEL CHOI, BIOLOGY AND SARA PATEL, BIOMEDICAL SCIENCES
PROJECT TITLE: UNDERSTANDING THE ROLE OF HNRNP-M IN INFLUENZA VIRUS REPLICATION

Mounting evidence has shown that the heterogeneous nuclear ribonucleoprotein (hnRNP) family plays a crucial role in the packaging and stabilization of pre-mRNA. One of those then is the hnRNP-M gene. Moreover, studies have shown that hnRNPs interact with the influenza viral polymerase proteins, suggesting a potential link between these host cell factors and the viral replication machinery. However, the precise function of hnRNPs in the context of influenza virus replication remains unknown. To elucidate the role of hnRNPs in this process, we have applied a

targeted approach, using CRISPR technology to generate A549 cell lines devoid of hnRNP-M expression. By comparing the replication kinetics of influenza virus in these mutant cells with those in wild-type A549 cells, we aim to discern the specific contribution of hnRNP-M to the viral life cycle. The results will provide novel insights into the interplay between hnRNP-M and influenza virus replication.

PRESENTER: AXEL BUSCH; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL PRESENTER: VARUN KUMARVELU; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTORS: DR. JULIA BAILEY-SERRES, BOTANY AND PLANT SCIENCES AND SYED ADEEL ZAFAR, BOTANY AND PLANT SCIENCES
PROJECT TITLE: ENGINEERING DROUGHT-RESILIENT ROOT ARCHITECTURE USING GENOME-EDITING

Rice is a major staple crop, feeding over half the global population. Typically grown in paddy fields, it significantly contributes to greenhouse gas emissions (GHG), particularly methane. One way to address this problem is by adopting alternate wetting and drying cycles, but this increases the risk of drought which negatively affects grain production. The architecture of the xylem (vasculature), plays an important role in drought tolerance by regulating the transport of water and nutrients from roots to above ground plant parts, referred to as root hydraulics. We seek to engineer the root vasculature (xylem) to optimize root hydraulics under drought conditions. It is therefore critical to identify and examine the function of genes that regulate xylem plasticity in response to drought. Previously, our group predicted gene regulatory networks controlling root xylem plasticity using cell-type specific gene expression profiling. These networks are enriched in transcription factors (TF), a class of proteins that act like switches, turning genes on or off. To understand the roles of these TFs, we have used CRISPR-Cas9 gene-editing technology to develop mutations in these TFs. We have learned to visualize xylem architecture such as the number and diameter of xylem vessels. We will assess the roles of the TFs in xylem plasticity by exposing the wild type and mutant plants to drought stress, followed by visualization of structural changes in the proto- and metaxylem through cross-sectional microscopy. We hypothesize that these drought-induced and xylem-expressed TFs affect vascular plasticity, thus improving water uptake efficiency and reducing GHG.

PRESENTER: FALON BUTCHER, ENTOMOLOGY
FACULTY MENTOR: DR. CHRISTIANE WEIRAUCH, ENTOMOLOGY
PROJECT TITLE: POP GOES *PAROPSIS*! - USING INATURALIST TO ANALYZE THE DISTRIBUTION OF *PAROPSIS ATOMARIA* IN CALIFORNIA FROM 2021-2024

Paropsis atomaria, also known as the Dotted Paropsine Leaf Beetle, is a well-established chrysomelid beetle in Southern California. This is yet another invasive, Australian beetle that specializes on

eucalyptus and other related trees that was recently introduced to California. Although the United States Department of Agriculture (USDA) first documented its presence in Los Angeles August of 2022, iNaturalist has records of sightings as early as July 13, 2021. The USDA ranked *P. atomaria* as a Medium (2) level when it comes to how they predicted its distribution, meaning that they predict that *P. atomaria* would become well established, particularly in the coastal area of California, but not be so widespread that it would be ranked higher in the case of a more concerning invasive species. The goal of this research is to compare if this predicted distribution of *P. atomaria* from the USDA in 2022 and its first documented location matches the distribution of recorded observations of *P. atomaria* on iNaturalist prior to its official documentation up until December of 2024. Data analyzed includes a total of 3,650 observations (including Verified and Research Grade level observations) uploaded from iNaturalist and then input into the mapping program ARCGIS Pro to illustrate the distribution of *P. atomaria* over time by county in California per year as time progresses. As for future applications, this project could serve as an example of how iNaturalist can be used to document and track invasive species in California.

PRESENTER: CAITLYN CAMPBELL, MEDIA AND CULTURAL STUDIES
FACULTY MENTOR: DR. CHRISTIANE WEIRAUCH, ENTOMOLOGY
PROJECT TITLE: LICE TO MEET YOU: AN INTRODUCTION TO PHTHIRAPTERA IN THE UNITED STATES, USING INATURALIST

Lice—an infamous pest for humans and pets all around the world. In 2024 alone, there were millions of lice infestations reported on children from the United States. To better understand the distribution, phenology, and host associations of lice – parvorder Phthiraptera (Insecta: Psocodea), a study was conducted using the online database iNaturalist. Understanding the data provided by iNaturalist leads researchers to question the value and biases of citizen science databases, expand the knowledge researchers already have on certain taxa, and aid pesticide researchers and companies.

PRESENTER: RAYMOND CAO, BIOLOGY
FACULTY MENTOR: DR. JACK EICHLER, CHEMISTRY
PROJECT TITLE: EVALUATING LARGE LANGUAGE MODELS FOR FEEDBACK GENERATION IN HIGHER-ORDER LEARNING ASSESSMENTS

There is an ongoing interest in our research group to incorporate higher-order learning in the introductory general chemistry sequence. One challenge to this is assessing student learning gains with this type of learning, due to the need to evaluate and provide feedback on open-ended prompts in which students provide reasoning and explanations.

The experiment uses a set of final exam free response questions as a sample (119 students, 2 total problems), aiming to explore the possibility of AI feedback in 3D-LAP (3-Dimensional Learning Assessment Pattern) assessments.

The experiment began with the creation of a rubric that is easier for AI to comprehend and the transcription of handwritten responses to a digital format. Two large language models were used to evaluate free-response assessment answers submitted by students, followed by a statistical analysis through SPSS that compares the scores from these AI systems to human scoring.

In the end, the Pearson bivariate correlation came to an average above 0.8, which shows that the scores from the AI systems generally aligned with the human scoring.

Although correlation showed a positive relationship, AI is somewhat constrained when it comes to explanation questions, when a student not only has to identify the right answer to the question but also provide an explanation. Therefore, large language models may not be considered trustworthy for providing a precise score or grading due to the type I errors with explanation questions, but can be a guide in terms of providing feedback for student assessments.

PRESENTER: LILY CAPLON-GUIN, BIOENGINEERING
FACULTY MENTOR: DR. HOORI AJAMI, ENVIRONMENTAL SCIENCES
PROJECT TITLE: ASSESSING SURFACE WATER-GROUNDWATER DYNAMICS IN A CALIFORNIA MOUNTAIN VALLEY AQUIFER SYSTEM

The California Central Valley aquifer system relies heavily on water supply from the Sierra Nevada mountain range, including surface water and groundwater recharge. This study seeks to understand the dynamics of surface water and groundwater resources in the Kaweah River watershed, located in the southern Sierra Nevada and Central Valley, and how they respond to climate variations and human water use. We propose that large hydraulic connectivity exists between the Kaweah River watershed's mountain and valley aquifer systems. We performed exploratory data analysis in MATLAB to understand trends and variability in streamflow, groundwater level, precipitation, and temperature observations in the mountainous and valley regions. We fitted a series of linear regression models to the time series data from publicly available monitoring stations in the two regions to assess trends and variability in surface water and groundwater resources. The Mann-Kendall Test was used to determine if there was a significant increasing or decreasing trend in water levels over time. Preliminary results suggest human water use significantly contributes to groundwater depletion in the Central Valley. Future work will focus on analyzing stream and groundwater samples from the mountainous region to assess major ions and stable water isotopes and evaluate changes in hydrochemistry over time. From these combined hydrometric and hydrochemistry analyses, we aim to quantify the valley aquifer's dependence on groundwater recharge from the mountain watershed. This research has important implications for groundwater management in the region.

PRESENTER: ZACHARY CHAN, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. FRANCESCA HOPKINS, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTOR: JULIANA GUERRA, ENVIRONMENTAL SCIENCES
PROJECT TITLE: METHANE CONCENTRATIONS FROM WASTEWATER NETWORKS IN RIVERSIDE, CA

Urban infrastructures, including sewer systems and storm drains, can be an underappreciated source of methane (CH4), a potent greenhouse gas with significant implications for climate change. They are significant emitters of methane and are projected to increase as in proportion to the population. This study interprets the significance of urban manhole infrastructure at the University of California, Riverside, which emits measurable concentrations of methane based on location. High concentrations of methane will occur in areas where lots of people congregate, like the HUB or the dorms. To determine methane concentrations from manholes on the University of California, Riverside campus, I used a LI COR LI-7810 CH4/CO2/H2O Trace Gas Analyzer. During the fall semester of 2024, a series of measurements were performed at different locations and different times, across campus, utilizing the atmospheric gas analyzer to capture real-time methane concentrations. The experimental setup involved positioning the analyzer's inlet, near the manhole opening to detect methane concentrations. Initial results indicate detectable methane release from several manholes near the Hub, during lunch time, with concentrations reaching 95 ppm. These findings suggest that urban manhole systems contribute to localized methane emissions and warrant further investigation and possible mitigation strategies.

PRESENTER: SUMUKH CHANDA, NEUROSCIENCE
ADDITIONAL PRESENTER: NICO PRECIADO, NEUROSCIENCE
FACULTY MENTOR: DR. MARTIN RICCOMAGNO, NEUROSCIENCE
ADDITIONAL CONTRIBUTORS: TERESA UBINA, CAMILLE GRONECK, LENA LUC, NORAH PHAM, MAYA KARGINOVA, AND PATRICK WILLIAMSON
PROJECT TITLE: USING SHORT PROMOTER DRIVEN AAVS' TO DELIVER GENETIC CARGO TO THE BRAIN

Adeno-associated viruses (AAVs) have become indispensable in gene therapy and neuroscience research due to their relatively low immunogenicity and efficiency. AAV viral vectors enter target cells via endocytosis, migrate to the nucleus, and leverage host-cell machinery to express inserted genes. However, the limited cargo capacity of AAVs underscore the need for compact, cell-type-specific promoters to maximize the space for therapeutic genes. In this study, we evaluated the cell type specificity of multiple promoters, identified through bioinformatic analysis, for their ability to drive the expression of green fluorescent protein (GFP) in various neural cells. Neonatal mice were injected intraventricularly with the AAV constructs. After development, the brains were extracted, sectioned, and immunostained for GFP and various cell-type markers including neurons, astrocytes, oligodendrocytes, and vascular structures. Quantitative confocal imaging revealed that our positive-control AAV drove GFP expression across all tested cell types confirming the broad range activity of the

control virus. Of the three novel promoters, two predominantly drove astrocyte expression, exhibiting high colocalization with ADLH1-positive cells and showing minimal variable target expression. Conversely, the non-specific control promoter showed indiscriminate expression reinforcing the lack of cell-type specificity. These findings highlight the potential of promoter design for precision gene delivery in the brain. Future work will focus on testing additional promoters for specificity in other neural cell types and further validating promoter performance. This research advances the development of more efficient promoter sequences and refined AAV delivery systems, contributing to advancements in gene therapy and neuroscience research.

PRESENTER: KARINA CHANG, NEUROSCIENCE
FACULTY MENTOR: DR. JOSHUA HARTMAN, CHEMISTRY
PROJECT TITLE: STRUCTURING A GROWTH MINDSET IN UNDERGRADUATE CHEMISTRY CURRICULUM

General chemistry presents numerous conceptual challenges that act as barriers for undergraduate science students. These barriers are known to disproportionately impact first-generation college students and students from underrepresented minority backgrounds, highlighting the need for targeted support and resources. Our research, which aims to significantly improve student learning outcomes in general chemistry using mastery grading and interactive courseware, could be a game-changer for underrepresented minorities (URM) and first-generation students at the University of California, Riverside. Traditional chemistry course structures rely on one or two midterms, a final exam, and practice from textbook's end-of-chapter questions. Course structures relying on high-stakes exams can deleteriously impact student performance and morale.

In comparison, a mastery grading system provides a low-stakes environment that encourages a growth mindset. Within the mastery grading framework, students have frequent unit exams with multiple opportunities for retakes. Interactive courseware that provides immediate feedback and provides resources for students to improve their understanding of challenging concepts between successive attempts. Preliminary results using mastery grading and interactive courseware show a 7.1% improvement in the mean performance on a common final assessment relative to the control group relying on traditional high-stakes testing. The focus of our current work involves building out the resources to deploy mastery grading department-wide.

PRESENTER: RUMAAN CHEEMA, BIOLOGY
FACULTY MENTOR: DR. NICOLE ZUR NIEDEN; MOLECULAR, CELL AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: DR. THOMAS SPAETER, MADELINE K. VERA-COLON, CHRIS GATDULA AND CHRISTIAN LLAMAS
PROJECT TITLE: IN VITRO STEM CELL MODELS TO PREDICT ADVERSE EFFECTS OF CHEMICALS ON BONE DEVELOPMENT

About 3% of all birth defects have been linked to the prenatal exposure of pregnant women to environmental toxicants, which is roughly 3,600 babies per year. Many of these babies are born with musculoskeletal defects, including facial malformations and other bones, representing a majority of these birth defects. Since many chemicals in our environment are untested for their safety, the embryonic stem cell test (EST) was introduced in the early 90s to predict toxicity in vitro without using animals. The EST uses embryonic stem cells from the mouse (mESCs) and humans (hESCs) to mimic bone development in the embryo. During 20 days of in vitro differentiation, mESCs/hESCs are exposed to a toxicant at different concentrations. Cytotoxicity and matrix calcium production are then tested with an MTT and calcium assay, respectively. For example, differentiating mESCs were exposed to ethylparaben, a paraben naturally found in fruits and insects that acts as an antimicrobial agent in skincare products. It was found that the dose where cell viability remained unchanged but produced a decrease in calcification was at an ID50 calcium value of 208.5 µg/mL, which potentially indicates inhibition of osteogenic differentiation at subtoxic concentrations. From a safety perspective, this suggests that pregnant women can unknowingly be exposed to environmental toxicants, including in their skincare, which can adversely affect their babies. This research will allow efficient screening of toxic chemicals and observe their effects on osteogenic differentiation, as the expected impact is to understand how toxicants affect embryonic bone development.

PRESENTER: JIMMY CHOI, BIOLOGY
FACULTY MENTORS: DR. POLLY CAMPBELL; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY AND DR. JONATHAN HUGHES; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: NEO-SEX CHROMOSOMES ARE NOT CORRELATED WITH ECOLOGY OR ENVIRONMENT IN EUTHERIAN MAMMALS

The XX/XY sex chromosome system is highly conserved in eutherian mammals, dating back ~180 million years. However, in spite of potential fitness costs, species with variant sex chromosome systems are found in several mammalian families. The majority of these variants involve fusions between an autosome and a sex chromosome, termed neo-sex chromosomes. The roles of sexual antagonism and genomic conflict in the development of neo-sex chromosome systems have been studied extensively. However, the influence of climate and ecology on the probability that newly arisen neo-sex chromosomes persist is less well understood. Previous work suggests that variables such as latitude, range size, and temperature seasonality are associated with sexual antagonism, genome evolution, and changes in chromosome morphology. To test whether climate and ecology are associated with the presence of neo-sex chromosomes, we conducted a phylogenetic logistic regression using a recently compiled dataset of variant mammalian sex chromosomes and a comprehensive database of tetrapod traits and environmental preferences based on species observation data. We compared three

representative families of mammals: Herpestidae (mongooses, Y-autosome fusions), Soricidae (shrews, X-autosome fusions), and Phyllostomidae (New World leaf-nosed bats, both X- and Y-autosome fusions). After statistical correction, none of the seven variables tested were significantly correlated with neo-sex chromosomes when using a single phylogeny. However, testing for the influence of tree topology on our regression analysis revealed correlations between neo-sex chromosomes and both range size and mean annual temperature that depend on the phylogeny used, demonstrating the importance of accounting for alternative evolutionary hypotheses.

PRESENTER: DANIEL DAR, MICROBIOLOGY
FACULTY MENTOR: DR. SYDNEY GLASSMAN, MICROBIOLOGY AND PLANT PATHOLOGY
ADDITIONAL CONTRIBUTOR: MARIA ORDONEZ, MICROBIOLOGY
PROJECT TITLE: THERMOTOLERANCE IN PYROPHILOUS BACTERIA: ADAPTATIONS FOR SURVIVAL IN FIRE-IMPACTED SOILS

Wildfires significantly alter microbial communities, often reducing microbial richness but leading to the emergence of “fire-loving” pyrophilous microbes. While it is clear that similar genera of pyrophilous taxa bloom after wildfires across biomes, the traits enabling their post-fire survival is largely unknown. Fires often select for thermotolerant taxa, influencing post-fire microbial succession (Enright et al., 2022). Leveraging our collection of pyrophilous bacteria isolated from burned soils after California wildfires, we selected 20 isolates from across three phyla to test for thermotolerance as a potential adaptation to fire-impacted environments. To test maximum survivable temperature as a mechanism of thermotolerance, we incubated isolates overnight in LB broth, then exposed them to 23°C, 30°C, 40°C, 50°C, and 75°C, with select trials including 45°C and 47.5°C. Growth recovery was assessed via plating and colony formation after 48-72 hours. Several isolates demonstrated growth persistence at elevated temperatures, particularly at 40°C, with some tolerating 50°C and beyond. An isolate identified as *Brevibacterium frigoritolerans* displayed the highest survival rates at elevated temperatures (75°C), indicating potential resilience mechanisms. These results align with previous findings on fire-adapted microbial communities, where pyrophilous taxa rapidly colonize post-fire soils (Pulido-Chavez et al., 2023). The observed thermotolerance suggests some bacterial populations may play a crucial role in ecosystem recovery and nutrient cycling (Enright et al., 2022). Future work should explore genetic and physiological mechanisms underlying bacterial heat resistance. By characterizing bacterial thermotolerance, this study contributes to understanding microbial succession in fire-affected landscapes and highlights candidate taxa for further ecological investigations.

PRESENTER: DEVANG DESHPANDE, BIOLOGY
FACULTY MENTOR: DR. SEEMA TIWARI-WOODRUFF, BIOMEDICAL SCIENCES
PROJECT TITLE: NOVEL ESTROGEN RECEPTOR BETA LIGAND

Multiple sclerosis is a neurodegenerative disease in which cells responsible for inflammation attack myelin, a protective cover that encases neurons responsible for normal information processing. Without myelin protecting the axons, signals that are sent between neurons are significantly weakened, and in some cases fully inhibited. Due to research over the years, there are now various therapies in the market that are used to treat MS. However, these drugs do not initiate functional recovery or neuroprotection. At most, these drugs ease the symptoms of MS and decrease the progression of the disease.

More recently, published literature has shown that estrogen has a positive impact on the development and progression of the disease, however the mechanisms by which remain to be inconclusive. This project will test the efficacy of a novel estrogen receptor β (ERβ) ligand to induce functional remyelination using a demyelinating mouse model. In this study, we gave the mice a cuprizone diet to induce toxic demyelination for 12 weeks. We then removed the diet and treated the mice with ERβ for three weeks, allowing us to evaluate the degree of remyelination, and thus, the efficacy of the drug over a period of time. To analyze the degree of remyelination, we performed immunohistochemistry (IHC) on the brain tissue containing the corpus callosum. The results showed an overall increased amount of myelin in the treatment groups as well as decreased inflammation as compared to the diseased groups. Overall, the treatments seem to be promising, suggesting future applications as potential therapeutic agents.

PRESENTER: ALY DOEVE, BIOLOGY
FACULTY MENTOR: DR. RICHARD CARDULLO; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: TEMPORAL DYNAMICS OF T-TYPE VOLTAGE GATED CHANNELS IN *CULEX PIPIENS* SPERM

The northern house mosquito, *Culex pipiens*, is the most widespread mosquito species in the United States and is a dangerous disease vector. Understanding *C. pipiens* reproduction allows for the development of novel mosquito population control strategies. Previous studies have demonstrated that calcium is necessary for *C. pipiens* sperm motility following entry through a T-type voltage channel and activation by an endogenous protease. T-type channels are low-voltage-activated channels that open in response to small membrane depolarizations, acting as key transducers of calcium to initiate motility. I investigated the cellular and temporal effects of T-type voltage channels on motility after activation under five experimental conditions, including treatment with a hyperpolarized solution and ionomycin. Hyperpolarization refers to changes in the cell that result in a more negative membrane potential. Ionomycin, a calcium ionophore, binds to calcium and facilitates its transfer across the membrane. A sperm motility analysis program, SpermQ, was used to determine key parameters such as velocity and flagellar beat frequency. To our knowledge, this is the first time that these motility parameters have

been used in relation to calcium channel activation, potentially clarifying a role for T-type channels in sperm motility ultimately serving as a biological target for mosquito population control.

PRESENTER: SHARLYN DONOZA, BIOLOGY
ADDITIONAL PRESENTER: KIRSTEN DINGSON, BIOLOGY
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
PROJECT TITLE: IMPACT OF AEROBIC EXERCISE ON THE DOPAMINERGIC MECHANISMS OF COCAINE RELAPSE

Cocaine induces the release of dopamine in brain reward pathways, facilitating addiction development and enhancing vulnerability to relapse after prolonged periods of abstinence. Aerobic exercise has been shown to significantly influence dopamine regulation within these pathways, suggesting its potential as an efficacious therapeutic strategy. This study examines the dopaminergic mechanisms and the therapeutic potential of aerobic exercise in mitigating cocaine relapse in mice. To do this, mice are outfitted with chronic brain probes to monitor dopamine levels and trained to self-administer intravenous cocaine infusions. The mice are given either a locked or unlocked homecage running wheel during the 21-day withdrawal period that follows a 10-day cocaine administration regimen. Afterward, the mice's behavior is tested for their cocaine "seeking," which presents how likely they are to relapse. Dopamine release dynamics in the reward pathway are continuously monitored during both the cocaine self-administration and the seeking tests to elucidate the impact of aerobic exercise on dopamine release patterns that underlie cocaine craving. Preliminary results indicate that mice with access to an unlocked running wheel showed less interest in seeking cocaine compared to their counterparts with a locked wheel. These findings suggest that aerobic exercise may attenuate cocaine cravings during late withdrawal stages, thereby supporting further investigations into the role of dopamine activity and the exploration of non-pharmacological interventions to decrease relapse rates.

PRESENTER: MATTHEW DUONG, BIOLOGY
ADDITIONAL PRESENTER: CASSETTY HABIB, PLANT BIOLOGY
FACULTY MENTOR: DR. CAROLYN RASMUSSEN, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTORS: ALONDRA CONTRERAS, HONG LIANG, ALEJANDRO QUINONES, AND HENRIK BUSCHMANN
PROJECT TITLE: UNDERSTANDING AIR9 FUNCTION IN DIVISION PLANE ORIENTATION THROUGH NATIVE AND MITOTIC EXPRESSION IN *ARABIDOPSIS*

Plant cell division is unique because it begins in the center of the cell, growing radially outward toward the cell cortex. Due to this complexity, plants have developed many structures so that the immature cell wall expands to the right location, such as the preprophase band (PPB). The PPB is an array of microtubules and microfilaments that predicts the site of division and cell wall construction during G2, like a runway for a landing plane. Additionally, the PPB recruits proteins like TANGLED (TAN1) and

AUXIN-INDUCED-IN-ROOTS9 (AIR9) that mark the division site (the 'lights' of the runway). TAN1 and AIR9 seem to be functionally redundant proteins required in proper cell division. In the *tan1* and *air9* *Arabidopsis* single mutants, plants grow normally and divisions are correctly oriented; however, in the *tan1 air9* double mutant plants have improper cell division (unguided cell plate expansion) and are short-statured. Previous studies showed that constitutively-expressed AIR9 rescues the *tan1 air9* phenotype. To further test AIR9's functional necessity in cell division, we are introducing multiple domains of YFP-AIR9 (Δ1, Δ15, full-length) with native and mitotic (KNOLLE) promoters to *tan1/air9* double mutants. We have observed that mitotic expression of full-length YFP-AIR9 (pKN::AIR9 full-length) rescues the double mutant phenotype, suggesting that AIR9's necessary function occurs during mitosis. We hope that a better understanding of proteins critical to cell division, like TAN1 and AIR9, will provide insight into cell division mechanisms in all organisms, like humans, and possible health applications.

PRESENTER: FAYEZ EYABI, BIOLOGY
FACULTY MENTOR: DR. ADLER DILLMAN, GENETICS, GENOMICS, AND BIOINFORMATICS
PROJECT TITLE: THE ROLE OF PARASITIC ESPS IN MACROPHAGE POLARIZATION AND IMMUNE MODULATION

Macrophage polarization plays an important role in the immune system shifting between the M1 pro-inflammatory and M2 anti-inflammatory phenotype which are influenced by environmental immune cues. Previous studies have shown that pro-inflammatory cytokine interferon-gamma (IFN -γ) establishes M1 polarization while interleukin-4 (IL-4) establishes M2 polarization. Excretory/secretory products (ESPs) include molecules released by parasitic nematodes, which can modulate host immune responses. *Steinernema carpocapsae* is a parasitic nematode which releases these ESPs that suppress host immune defense to establish parasitism. We examined if ESPs from *S. carpocapsae* can alter macrophage polarization and phagocytic ability of mouse macrophages *in vitro*. We utilized mouse macrophages (RAW 246.7) and observed changes in cytokine expression of M1 and M2 markers like tumor necrosis factor-alpha (TNF-α) and inducible nitric acid oxide synthase (iNOS), as well as Arginase-1 and Fizz1 for M2 markers using qPCR. Furthermore, we utilized fluorescently conjugated bacteria to analyze whether ESPs affect the ability of macrophages to phagocytize pathogens. Our findings hope to contribute to the understanding of the immunomodulatory effects of parasitic nematode ESPs on mammalian macrophages.

PRESENTER: JOSEPH FELDMAN-PETERSON, EARTH AND PLANETARY SCIENCES
FACULTY MENTOR: DR. ANDREY BEKKER, EARTH AND PLANETARY SCIENCES
PROJECT TITLE: DETRITAL ZIRCON GEOCHRONOLOGY SUGGESTS DEPOSITION ON THE CONVERGENT PLATE BOUNDARY FOR THE LATE EDIACARAN KOTLIN REGIONAL HORIZON IN BALTICA

paleocontinent corresponding to the Eastern Europe. It was paleontologically characterized as the late Ediacaran and until recently has been poorly geochronologically constrained, with the underlying bentonites dated at 557-555 Ma. Recent detrital zircon geochronology study suggested the early Cambrian depositional age, challenging the paleontologically established paradigm (Soldatenko 2019). Four detrital zircon samples were dated in this study using LA-ICP-MS, and multiple statistical methods have been applied to constrain their maximum depositional age. The youngest detrital zircon peaks for these samples are between 539.4 ± 2.7 Ma and 531.0 ± 5.1 Ma. Due to geochronologiccomplexities (e.g., potential Pb loss and no correction for common Pb applied), I used the statistical treatment methods to constrain the maximum depositional age. I conclude that if there is a zircon population close to the formation age of the rock, then TIMS, a more precise, but more time-consuming and expensive dating method is the best way to determine the age of zircons and the rocks they are found in. Detrital zircon populations analyzed with LA-ICP-MS can be more readily utilized to determine the provenance of the zircons and shed light on the tectonic setting of the basin in which they were deposited using a 10^{th}-50^{th} percentile over Chi², with potentially important implications for the Kotlin Regional Horizon. Our data suggest deposition on the convergent plate boundary, which contrasts to previously inferred depositional setting.

PRESENTER: JONAH FRAZIER, BIOCHEMISTRY
FACULTY MENTOR: DR. SIHEM CHELOUFI, BIOCHEMISTRY
PROJECT TITLE: SPT6 HISTONE CHAPERONE CONTROLS AP-1 TRANSCRIPTION FACTOR ACTIVITY TO MAINTAIN CELL FATE

Histone chaperones are a group of proteins with diverse functions that are primarily involved in the maintenance of the chromatin landscape during DNA templated processes. Accumulating evidence supports their role in cell fate maintenance; however, the underlying molecular mechanisms remain elusive. Among all histone chaperones, our lab discovered that the loss of the transcription-coupled histone chaperone SPT6 is sufficient to induce the differentiation of hematopoietic stem and progenitor cells. My project focuses on identifying the transcription factors (TFs) that respond to the loss of SPT6 and understanding how they mediate cellular differentiation. Through a series of chromatin accessibility and transcriptional profiling assays, we found that the loss of SPT6 alters chromatin accessibility at promoter elements. This effect is in part dependent on the activity of AP-1 transcription factors. The AP-1 TF family members are known to be implicated in numerous cellular processes, including inflammation, stress-response, and apoptosis. To assess whether AP-1 TFs influence the differentiation phenotype, I performed a genetic screen using CRISPR CAS9 silencing and RNAi technologies. I identified Fosl2 and FosB as candidate TFs involved in promoting myeloid cell differentiation in the context of SPT6 perturbations. These findings provide a paradigm for how histone chaperone pathways can be

manipulated to control cell fate. We thank the NIGMS R35 GM151004, UCR Ronald E. McNair Scholars Program, and the UC Cancer Research Coordinating Committee for funding this research.

PRESENTER: BROOKE FREEMAN, BIOCHEMISTRY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
PROJECT TITLE: CHARACTERIZING DNAJB8 ISOFORMS AS MISFOLDED PROTEIN SENSORS

Our laboratory has been using the molecular chaperone DNJAB8 to identify destabilized and misfolded proteins on the basis of their binding affinity to the chaperone. The mechanism of how DNAJB8 recognizes and binds proteins is unclear. Characterizing DNAJB8 structure, kinetics and molecular behavior could allow us to improve our assay. While optimizing purification of DNAJB8 bound to misfolded proteins, we observed on the basis of gel migration that in HEK-293T cells DNAJB8 has at least two distinct isoforms. Using mass spectrometry and traditional biochemical methods, we will characterize the chemical structure of these isoforms. The influence of isoform on client protein selection and association will also be assessed. This investigation into DNAJB8 isoforms will allow us to better optimize our misfolded protein assay.

PRESENTER: MALIA FREESE, BIOENGINEERING
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
PROJECT TITLE: HSP40 AFFINITY PROFILING TO ASSESS PROTEIN DESTABILIZATION IN HEK293T CELLS UPON 2,4-D EXPOSURE

The use of herbicides has become pervasive in the agricultural industry as a method of controlling weeds and maximizing crop yield. Dichlorophenoxyacetic acid (2,4-D) is a selective herbicide which operates as a synthetic auxin, mimicking naturally occurring growth hormones in plants and inducing uncontrollable growth. This excessive growth is unsustainable and results in plant death, though the exact mode of action is not fully understood. 2,4-D residues present in the soil, air, and water can easily be adsorbed by humans and animals; this has shown to pose a serious health hazard by inducing free radical generation, chromosomal aberration, or apoptosis. We hypothesize that 2,4-D may undergo bioconjugation to key biomolecules through nucleophilic aromatic substitution (S_NAr), which interferes with protein activity and disrupts key cellular processes. To assess the cytotoxic effects of 2,4-D, HEK293T cells were exposed to 1mM 2,4-D for thirty minutes, then proteins were extracted using a quantitative proteomics methodology utilizing the molecular chaperone DNAJB8. This molecule is part of the heat shock protein (Hsp40) family that binds to misfolded or non-native proteins. Following retrieval of DNAJB8 from cells, these bound protein samples were analyzed using a combination of SDS gel electrophoresis, western blotting, silver staining, and mass spectrometry. We expected to see increased protein misfolding upon 2,4-D exposure; preliminary results suggest there is no significant

correlation between 2,4-D exposure and protein misfolding. Further replicates and statistical analysis are necessary.

PRESENTER: JASMIN GILL; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL PRESENTER: SHIHARA PERERA, NEUROSCIENCE
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: SAIGAYATHRI BHASKAR, AND BRANDON OLIVER
PROJECT TITLE: THE ROLE OF DOPAMINE IN BEHAVIORAL FLEXIBILITY

Dopamine (DA) release within the striatum is essential in reward-based learning, modulating motivation, decision-making, and reinforcement learning. The dopaminergic circuitry is critical in behavioral flexibility, particularly through reversal learning. This method tests the ability to adapt to changing conditions, which we partook in using cue lights and lever presses. In early reversal learning, phasic DA release in the striatum facilitates updating stimulus-response and response-outcome associations, enhancing decision-making. It helps regulate modifying previously learned responses when reinforcement associations shift via reward-seeking behaviors. Our study focuses on striatal DA dynamics during a probabilistic reversal learning task and examines DA release's causal influence on flexible decision-making. Utilizing fiber photometry and a genetically encoded DA sensor (GrabDA), we monitored DA fluctuations in the dorsal striatum (DS) and ventral striatum (nucleus accumbens, NAc) of mice trained to differentiate between two levers associated with different reinforcement probabilities (80% vs. 20%). Upon expert performance, we observed increased dopamine release in the dorsal striatum at reversal trial onset. Dopamine release increased in DS and NAc after correct rewarded choices, indicating DA's role in updating response-outcome associations. Further, we used closed-loop optogenetics to stimulate dopaminergic inputs to these striatal regions upon the first correct rewarded response. Testing whether enhanced DA release and newly correct lever presses accelerate learning contingencies. Relative to sham controls, stimulation of DA neurons in the (SNc)-DS and (VTA)-NAc pathways significantly improved reversal learning and choice strategies. The results highlight striatal DA's pivotal role in adaptive decision-making and the potential for dopaminergic manipulations to enhance flexibility.

PRESENTER: SARISHA GOLUHEWA, BIOENGINEERING
FACULTY MENTOR: DR. MILTON MCGIFFEN, BOTANY AND PLANT SCIENCES
PROJECT TITLE: DEVELOPING AN AI MODEL TO DETECT WEEDS IN CROPS FROM AERIAL IMAGES

Weed infestation in agricultural fields takes resources from crops, reducing the yield and quality of crops. Addressing this issue is crucial for improving crop productivity and sustainability.
Remote sensing is a transformative technology that is an efficient method for collecting data from large crop fields with reduced labor and potentially improved accuracy than traditional field scouting. This

project utilizes unmanned aerial vehicles (UAVs) to collect high resolution imagery from a broccoli field, which is then processed using Roboflow for annotations. The annotated images are used to train a machine learning model to distinguish weeds from crops. The ultimate goal is to completely automate the process so that drones automatically collect data and return actionable information directly to agricultural managers for timely interventions. Integrating UAV imagery with data science tools enhances weed management, reduces herbicide usage, and improves overall crop health.

PRESENTER: AMY GRAVES, PSYCHOLOGY
FACULTY MENTOR: DR. SACHIKO HAGA-YAMANAKA; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: ACTIVATION OF PARASYMPATHETIC NERVOUS SYSTEM AND PERIAQUEDUCTAL GREY INDUCED BY PREDATOR CUE STIMULATION.

Predator fear behaviors have evolved to be beneficial for survival. In addition to the typical fight or flight fear responses, mice exhibit innate freezing behavior when presented with predator cues in specific contexts. This project investigated if the parasympathetic nervous system (PNS), which typically regulates rest and digestion, is activated by predator cue stimulation in mice. For this purpose, c-Fos and choline acetyltransferase (CHAT) were examined for colocalization by antibodies to observe the activation of parasympathetic neurons in the dorsal motor nucleus of the vagus nerve (DMV) and nucleus ambiguus (NAmb) in mice exposed to predator cues. Additionally, this project also investigated the potential involvement of periaqueductal gray (PAG) in the predator defensive pathway. We hypothesized that c-Fos protein will be expressed in the parasympathetic neurons in the DMV, NAmb, and PAG of mice that show freezing behavior. After behavior analysis, predator cue-stimulated mice were divided into a high-freezing group and a low-freezing group. C-Fos activity was then compared to the freezing percentage observed per mouse. We found a positive correlation between percentage freezing and c-Fos activity in the DMV. Mice in the high-freezing group expressed high c-Fos activity in the DMV, while mice in the low-freezing group expressed low c-Fos activity. These results suggest the potential involvement of the PNS during freezing behavior in mice. Studying the neural mechanisms of innate fear response will help explore trauma and stress-related disorders related to the PNS.

PRESENTER: EMMANUEL GREEN, NEUROSCIENCE
FACULTY MENTOR: DR. VIJAYALAKSHMI SANTHAKUMAR; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: INCREASE IN BIRTH OF ADULT BORN DENTATE GYRUS NEURONS IN THE KAINIC ACID MODEL OF EXPERIMENTAL EPILEPSY

Rational: Epilepsy is a chronic neurological disorder marked by recurrent, unprovoked seizures, and memory deficits. The hippocampal dentate gyrus (DG) is crucial in memory processing and is often the focus for development of epilepsy. Recent studies have revealed a neuron subtype in the DG, semilunar

granule cells (SGCs), which are proposed to be involved in spatial memory. Here we examined whether DGs neurons including SGCs are born in the adult brain and in experimental epilepsy.

Methods: Male and Female C57BL/6J and NESTIN-Cre/ERT2-Tdt mice underwent Saline or Kainic Acid (2 mg/kg, i.p.) injections at 30-minute intervals until induction of status epilepticus (SE). After two hours of SE mice were treated with Diazepam (10 mg/kg, i.p.) and Tamoxifen (200 µL, i.p.) for expression of newborn granule cells. Six weeks post injury, mice were perfused with 4% paraformaldehyde and coronal hippocampal brain sections(50µm) were obtained for immunostaining. Tdt fluorescent sections were mounted and cells with morphology of granule cells and semilunar granule cells quantified.

Results: Kainic Acid treated animals reliably developed SE after 5 injections with a low mortality rate. Histology revealed an increase in TdT labeled adult born neurons in the DG in Kainic Acid treated mice (Controls: 0.075 GC/slice KA: 11.225GC/slice, 3 control, and 8 SE mice). Preliminary results failed to identify SGCs among adult-born neurons.

Conclusion: Our results demonstrate an increase in adult born granule cells after SE and suggest that SGCs are not generated in the adult neurogenic niche.

PRESENTER: PHUONG HA, BIOCHEMISTRY
FACULTY MENTOR: DR. EMMA WILSON, BIOMEDICAL SCIENCES
PROJECT TITLE: FUNCTIONAL CHARACTERISTICS OF TEMPERATURE SENSITIVE MUTANTS IN *TOXOPLASMA GONDII*

Toxoplasma gondii is an obligate intracellular parasite with complex mechanisms for survival and proliferation. This study investigates two temperature-sensitive *T. gondii* mutants, 10-73C1 (mutant #6) and 12-88A5 (mutant #23), each exhibiting specific defects in proteins essential to the parasite's cell cycle. Notably, both mutants were classified as G1 phase-defective based on genomic DNA content measurements and the use of cell cycle markers. These mutants were obtained through a large chemical mutagenesis screen involving more than 60,000 individual clones; mutants conditional lethal at high temperature were obtained at a 0.26% overall frequency. Genetic rescue using fosmid/cosmid recombination and/or whole genome sequencing were used to identify the defective proteins in these mutants. Mutant 10-73C1 harbors a defect in a HEAT-containing protein, while 12-88A5 is defective in Yip1A, a presumed Golgi/ER membrane protein. Preliminary results reveal that both proteins are indispensable for cell cycle progression and survival, with the HEAT-containing protein appearing particularly crucial for maintaining viability. Further studies will confirm the mutations are responsible for temperature lethality and using epitope-tagging methods we will characterize the expression and intracellular location of each protein.

PRESENTER: JOYCE HE, BIOCHEMISTRY
FACULTY MENTOR: DR. YADONG YIN, CHEMISTRY
PROJECT TITLE: EMULSION ASSISTED PHASE TRANSFER OF NANOMATERIALS: A UNIVERSAL AND REVERSIBLE STRATEGY

We report a versatile and reversible emulsion-assisted phase transfer method for nanomaterials, enabling efficient transition between water and oil phases while preserving or enhancing dispersity and physical properties such as fluorescence and magnetism. This method applies to nanomaterials of various sizes (sub-10 nm to hundreds of nanometers) and morphologies, including nanospheres and nanorods. The phase transfer mechanism involves retaining original ligands and adding a secondary ligand layer to modify surface properties, as confirmed by Fourier transform infrared spectroscopy and thermogravimetric analysis. Using sodium dodecyl sulfate (SDS) and sorbitan monooleate (Span 80) as representative surfactants, we demonstrate consistent dispersion, optical properties, and hydrophobic/hydrophilic transformations through contact angle measurements and photoluminescence analysis. Moreover, the phase transfer process is reversible, allowing nanomaterials to transition back to their original phase while maintaining their structural and functional integrity. This emulsion-assisted strategy expands the applications of nanomaterials in catalysis, biomedicine, and electronics, addressing limitations in traditional phase transfer methods.

PRESENTER: NICHOLAS HENG, BIOLOGY
ADDITIONAL PRESENTER: ALLAN MATHEW, COMPUTER ENGINEERING
FACULTY MENTOR: DR. MARTÍN GARCÍA-CASTRO, BIOMEDICAL SCIENCES
PROJECT TITLE: REASSESSING THE CONTRIBUTION OF NEURO-MESODERMAL PROGENITORS ON NEURAL CREST CELL DEVELOPMENT

Neural crest cells (NCCs) are a highly dynamic, multipotent population of cells unique to vertebrates, originating at the neural plate border during early embryonic development, and their failed development lead to many pathologies. They have extensive differentiation potential and migrate into diverse cell types, including neurons, melanocytes and craniofacial tissues. NCCs were thought to derive from neuroectodermal precursors. However, recent findings suggest that neuro-mesodermal progenitors (NMPs), characterized by coexpression of neural (Sox2) and Mesodermal (Brachyury) markers, may also contribute to NCCs. Importantly, the molecular transition from NMP to NCC has not been explored. To address this issue, we explanted NMP tissues from chick embryos, culture them, and monitor their progressive differentiation into mesodermal, neural, and importantly, NCCs.

We utilized triple immunostaining for key transcription factors to investigate lineage differentiation of NMPs: Sox2 for neural, Brachyury (Bra) for mesodermal, and Pax7 for NCCs, with particular interest in the transition from double $Sox2^+/Bra^+$ cells to any cell expressing Pax7. $Pax7^+/Sox2^+$ co-expression could indicate a neuroectodermal lineage, while $Pax7^+/Bra^+$ co-expression cells suggest a novel mesodermal origin.

Following incubation, explants co-expressing $Pax7^+/Bra^+$ were observed more often than $Pax7^+/Sox2^+$, challenging the traditional neuroectodermal hypothesis, and suggesting a possible path involving mesoderm/Bra^+ progenitors generating $Pax7^+$ NCCs. Further research will confirm our results, incorporating other NCC and mesoderm markers, and explore possible requirements of Bra^+ in Pax7 expression and NCC formation. These findings could reshape our understanding of the diversity of NCC forming mechanisms and be useful for treating associated pathologies.

PRESENTER: ERNEST HERNANDEZ, BIOLOGY
FACULTY MENTOR: DR. CHIA-EN CHANG, CHEMISTRY
PROJECT TITLE: COMPUTER GUIDED SCREENING OF NOVEL AND SPECIFIC CDK8 INHIBITORS BY TARGETING THE CDK8 KINASE MODULE COMPLEX

Cyclin-dependent kinase 8 (CDK8) is an enzyme that forms part of the CDK8 kinase module (CKM), in conjunction with proteins Med 13, Med 12, and CycC. The module regulates RNA polymerase II transcription through kinase-dependent and kinase-independent functions. CDK8 can be overexpressed via a pivotal oncogene, CDK8, in colon cancer and is amplified or dysfunctional in breast, prostate, blood, and cervical cancers. Inhibiting CDK8 in cancer cells has shown comparable anti-growth effects to cells with CDK8 knocked out of their genome. Thus, CDK8 inhibitors in anticancer drug development show promise, but the inhibitors in clinical trials lack specificity for CDK8. This challenge stems from the 91.8% structural similarity between CDK8 and CDK19, a cancer-preventing kinase that regulates blood cell growth. This presents a formidable hurdle in achieving selective inhibition while ensuring metabolic stability and therapeutic potency. To overcome this obstacle, an ensemble of CKM conformations derived from molecular dynamics (MD) simulations will be harnessed. Molecular docking programs, MOE and Autodock, will be used to pinpoint compounds that bind to CKM's active site. This diverse conformational array and protein-ligand binding simulation is instrumental in screening the National Cancer Institute (NCI) diversity set of drug candidates. The subsequent refinement phase hinges upon integrating in vitro results, incorporating computational methods such as Molecular Mechanics Poisson-Boltzmann Surface Area to yield free-binding energy predictions. Leveraging the interdependence of CDK8 on neighboring proteins may be useful for a novel inhibition strategy that lays the foundation for further exploration and optimization of drug candidates and poses.

PRESENTER: TONY HOANG, BIOLOGY
FACULTY MENTOR: DR. WEIFENG GU; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: ROLE OF *CMTR-1* GENE AND *CMTR-2* GENE IN PIRNA MODIFICATION

PiRNAs are a recently discovered class of small non-coding RNAs essential for maintaining genomic integrity, particularly in germline cells. Despite their critical role, the mechanisms underlying piRNA biosynthesis remain poorly understood. This study aims to address this gap by investigating piRNA

biogenesis in *Caenorhabditis elegans*, focusing on the largely uncharacterized roles of the *cmtr-1* and *cmtr-2* genes.

RNA synthesis and modification are fundamental to piRNA production. The capping process includes Cap 0, Cap 1, and Cap 2 modifications, with *cmtr-1* and *cmtr-2* responsible for methylating the 2'-hydroxy group of the first and second nucleotides, respectively. This study explores how these modifications influence piRNA development, with a particular emphasis on *cmtr-2*, whose cytoplasmic methylation may serve as a precursor for Piwi protein attachment and subsequent piRNA formation.

We hypothesize that piRNA biosynthesis is linked to *cmtr-1* and *cmtr-2* activity, particularly that *cmtr-2*-mediated methylation at the second nucleotide aligns with piRNA initiation at the third nucleotide. To test this, we will generate *cmtr-1* and *cmtr-2* mutants and employ next-generation sequencing to analyze small RNA changes. This study will provide valuable insights into the regulatory mechanisms governing piRNA biosynthesis and its broader implications for genomic stability.

PRESENTER: CALEB HONG, BIOCHEMISTRY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
PROJECT TITLE: TARGET PROTEIN RECOVERY FOLLOWING DESTABILIZATION TREATMENTS

Patients with type two diabetes commonly use the medication known as metformin to regulate blood sugar. Despite its wide use because of its ability to control blood sugar, the biochemistry of how it works in the body is still unknown, contributing to approximately 25 percent of patients experiencing untreatable symptoms, and 5 percent to discontinue the medication. Using Dr. Genereux's DNAJB8 assay and immortalized human embryonic cells (HEK293T) to produce and isolate misfolded proteins affected by metformin, we can develop a deeper understanding of how it works at the cellular level. We use gel electrophoresis in two ways, silver staining and western blot, as a quality control check for an adequate amount of protein present. This is followed with mass spectrometry techniques to understand and analyze the types of proteins affected by the medication. Currently, the literature indicates the potential of metformin to inhibit the mechanism of gluconeogenesis, thus we expect to see misfolded proteins found within the mitochondria in the mass spectrometry analysis. This has the potential to improve drug efficacy for patients diagnosed with type 2 diabetes as understanding the proteins affected by metformin is to understand its mechanism of action. Understanding what proteins are affected by metformin in diabetes patients has the potential to pave the way for further research to elucidate its effects and potential benefits.

PRESENTER: SAVANNAH HORTON, NEUROSCIENCE
FACULTY MENTORS: DR. YSABEL GIRALDO, ENTOMOLOGY AND DR. SUSHMITHA ARUMUGAM, NEUROSCIENCE
ADDITIONAL CONTRIBUTOR: SUSHMITHA ARUMUGAM, NEUROSCIENCE
PROJECT TITLE: HYPERGRAVITY DISRUPTS GEOTAXIS IN *DROSOPHILA MELANOGASTER*

Gravity is a constant, fundamental force that exists throughout the universe, exerting its influence on a macroscopic scale, affecting everything from the motion of celestial bodies to the launch of rockets escaping Earth's gravitational pull. At the same time, this force has a profound effect on the microscopic scale, informing how organisms move throughout the world. Gravity provides a reference for sensory integration on Earth; this is imperative for the central nervous system's (CNS) mediation of locomotion and spatial orientation. This study aims to assess the effects of hypergravity on *Drosophila melanogaster* locomotion. A custom-built centrifuge was used as a hypergravity simulator to expose the flies to the hypergravity environment. This study tests flies across the hypergravity continuum of three different g-levels: 4g, 7g, and 13g, each compared against control flies exposed to the Earth's natural gravitational environment (1g). To examine climbing behavior, the negative geotaxis response was observed with and without a startle stimulus after 24 hours of exposure to hypergravity. Negative geotaxis is the natural tendency of flies to move against the force of gravity. This study provides compelling empirical evidence indicating a relationship between hypergravity intensity and locomotor impairment. As hypergravity exposure increases, the climbing score decreases, indicating locomotor impairment. Understanding how hypergravity modulates locomotion in flies will create the foundation necessary to reveal the physiological mechanisms governed by gravity and would broaden the horizon for space travel. This research serves as a foundational building block in understanding how gravity modulates the nervous system to regulate locomotion.

PRESENTER: SARAH HOWICK, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. SHAWN WESTERDALE, PHYSICS AND ASTRONOMY
PROJECT TITLE: A LOCKED AND LOADED TIME PROJECTION CHAMBER

A Time Projection Chamber (TPC) is a type of scintillation-based detector meant to detect particles or radiation via their interactions with a target medium. This type of detector is used in various areas of interest for physicists, primarily in the areas of dark matter investigation and in neutrino research. Both of these phenomena are largely non-interacting and deposit very little energy when they do. As such, their investigation requires detection with high resolution and very little background noise. TPC's are used in various experiments in these areas due to their apparent ability to detect signals in the low energy regime. Several detectors make further design efforts to optimize for such a low-energy resolution, including the use of dopants in their target mediums, low-density materials, and materials with low radioactivity. We have designed a detector specifically to address the questions surrounding low-energy signal optimization named the Low-energy Optimization And Doping for Enhanced Detectors liquid-argon TPC (LOADED LAr-TPC). This is customizable TPC with a liquid-xenon doped liquid-argon target medium, meant to operate with interchangeable parts to create different design conditions that

can be altered to create different signal resolutions. When this TPC is placed in a neutrino beam, we can compare different neutrino signal resolutions and adjust the design conditions until we achieve the most optimal low-energy signal.

PRESENTER: WESLEY HUR, BIOLOGY
ADDITIONAL PRESENTER: RICKY LE, BIOLOGY
FACULTY MENTOR: DR. KERRY MAUCK, ENTOMOLOGY
PROJECT TITLE: EVALUATING LIGHT-DEPENDENT OLFACTORY RESPONSES IN ADULT BLACK SOLDIER FLIES FOR IMPROVED REARING PRACTICES

Black soldier flies (BSF; *Hermetia illucens*) are insects known for their ability to upcycle food waste into useful agricultural products such as fertilizers, soil amendments, proteins, fats, and chitin. These qualities make BSF larvae pivotal in the food waste recycling industry. Consequently, significant research has been dedicated to optimizing larval growth conditions, while adult BSF behavior remains largely unexplored. This gap may impede further improvements in rearing operations and overall production. To address this, we tested BSF adults using a Y-tube olfactometer—a robust assay for olfaction—to evaluate the olfactory preferences of adult BSF. We compared the response rate of adult BSF to a known attractant and a negative control. Our experimental setup involves varied light conditions ranging from no light, fluorescent lamps, and a custom-made UV full spectrum light to simulate outdoor conditions. Our preliminary results suggest that BSF adults exhibit a higher response to the known attractant under full spectrum light, suggesting that specific lighting conditions enhance responsiveness to olfactory cues. These insights imply that light may play a crucial role in key behaviors such as oviposition, mating, and attraction. By better understanding these processes, we can refine BSF rearing techniques, which could lead to advancements in the waste recycling industry.

PRESENTER: AIN HUSSAIN, BIOLOGY
FACULTY MENTOR: DR. KENDRICK DAVIS, NEUROSCIENCE
PROJECT TITLE: MIGRAINE ASSOCIATION WITH MENTAL HEALTH AND ITS IMPACT ON UNIVERSITY STUDENT'S ACADEMIC PERFORMANCE

Migraine is a headache disorder that causes mild to extreme throbbing pain in the unilateral side of the head, either going left or right. Increasing levels of anxiety and stress could be a trigger of this headache disorder. These psychological triggers are commonly investigated in universities as universities are academically demanding and time-consuming, and students are under constant pressure. Achieving academic demands and performing well in university are critical for students. Migraines can cause functional disability, which can hinder and limit one's psychological and physical well-being. Functional disability can interfere with many aspects of students' academic performance. A literature review is

conducted to investigate the correlation between migraines and mental health, their prevalence and connectedness among university students, and how migraines affect students' educational performance. We predict that there will be a significant number of students suffering from migraines, and mental health triggers and outcomes associated with migraines will be confirmed.

Significance: Our aim of this research is to increase awareness of psychological triggers and outcomes associated with migraines. To increase the university's services for sufferers of migraines. Lastly, to increase awareness of the impact of migraines on university students' performance, including retention and completion.

PRESENTER: FIRDOUZ HUSSAIN, BIOLOGY
FACULTY MENTOR: DR. DAWN NAGEL, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: GABRIELA SALAZAR SORIANO
PROJECT TITLE: CLOCK REGULATION OF HEAT-INDUCED STRESS GRANULES IN PLANTS

The circadian clock is important for integrating environmental cues to coordinate processes with the time of day. The clock regulates many different biological processes and responses to environmental stresses, such as heat stress, through core clock genes like *CCA1* and *LHY*. Several studies have shown that the clock regulates transcription during heat stress in Arabidopsis, but less is known about how the clock controls mRNA dynamics during heat stress. Stress granules are membraneless organelles that are induced by heat stress and form by condensation of RNA binding proteins (RBPs) to sequester and protect specific mRNAs, which are prone to degradation at higher temperatures. However, it is still unclear whether stress granule formation is controlled by the clock or regulated in a time-of-day dependent manner. This project aims to elucidate the role of the clock in regulation of mRNA dynamics in response to heat stress. To do so, I am generating GFP and RFP tagged lines of RBP45a and RBP47b, known stress granule markers in Arabidopsis, driven by their native promoters. To investigate clock regulation of stress granule formation, these lines are being generated in the wild-type and the clock mutant, *cca1 lhy*. These lines will be used to quantify stress granule formation via fluorescence microscopy at different times of day. Results from this study will elucidate the role of the clock on mRNA sequestration through stress granule formation under heat stress. As climate change's effects intensify, understanding how environmental stresses impact plant growth and development will become more significant.

PRESENTER: CASSANDRA IRAHOLA, BIOLOGY
FACULTY MENTOR: DR. CAROLYN RASMUSSEN, BOTANY AND PLANT SCIENCES
PROJECT TITLE: CELL DIVISION AND ELONGATION DEFECTS LEAD TO SMALL CELLS AND ROOTS IN MAIZE *KATANIN* MUTANTS

Investigating plant microtubule dynamics and organization is crucial to understanding how cytokinesis results in different cell morphology outcomes. Microtubules are tubulin polymers facilitating cell division, elongation, and intracellular movement (Hashimoto, 2015). KATANIN, a microtubule-severing enzyme that uses ATP hydrolysis, has been previously shown to be important for cell division plane orientation and anisotropic cell growth (Luptovčiak et al., 2017). Past research identified a *Zea mays* (maize) *katanin* double mutant that reduces microtubule severing frequency, has abnormal asymmetric cell divisions, and a short-stature phenotype. My project examines the cellular and root phenotypes of loss-of-function *katanin* mutants in maize in comparison to wild-type siblings. Analysis of cell area and circularity from plants grown in the greenhouse suggests that *katanin* double mutants had 2 times fewer total cells that were also smaller and more isotropic when compared to wild-type siblings. Additionally, root growth experiments using seedlings grown on germination paper rolls show that, for *katanin* double mutants, the average root length was 3.5 times smaller and the linear growth rate was approximately 5 times slower than wild-type siblings. Future goals of this research include deeper investigation into the mechanisms by which KATANIN influences division plane positioning and subsequent cell shape. The discoveries made from this study deepen our understanding of the role that microtubule-severing proteins like KATANIN play in cell development and plant growth.

PRESENTER: NICHOLAS JIMENEZ, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. DAVID VOLZ, ENVIRONMENTAL SCIENCES
PROJECT TITLE: CRISPR-CAS9 MEDIATED KNOCKOUT OF A REGULATORY ELEMENT RELATED TO A LIGHT-DARK PREFERENCE BEHAVIOR IN LARVAL ZEBRAFISH

Larval zebrafish (*Danio rerio*) displays an innate light-dark preference, a complex behavior modulated with anxiety related biological processes. Recently, a genome-wide study discovered several causal genes for this behavior. However, the genetic network through which these genes act to affect the behavioral readouts remain largely unknown. This project aims to dissect the underpinning mechanisms by interrogating the role of an enhancer potentially paired with one of the causal genes, nos1, a highly conserved nitric-oxide synthase gene specifically expressed in neuronal cells. Previous work with CRISPR-Cas9 mediated genome editing technique targeting this 600bp regulatory element resulted in significant alterations of light-dark preference behavior. A heterozygous mutant with >300bp deletion inside this enhancer has been established. Crossing this mutant line will generate a mixture of homozygous KO, wild-type (WT), and heterozygotes that will be submitted to a well-established paradigm for characterizing the light-dark preference individually. Following behavior test, larvae will be genotyped with mutation specific PCR markers. In parallel, recorded behaviors will be analyzed with a suite of software to quantify the light-dark preference. The resulted genotypic and phenotypic data will be fit to a statistical pipeline to assess the difference between the three genotypes. Overall, this study

will create a stable KO of this enhancer element and provide solid evidence of its effect on the light-dark preference behavior, which could lay down a foundation for further investigation at the cellular and molecular level using single-cell based multi-omic assays and brain-wide neural activity imaging.

PRESENTER: ADAM JONES, BIOCHEMISTRY
FACULTY MENTOR: DR. MATTHEW CASSELMAN, CHEMISTRY
PROJECT TITLE: IMPACT OF LEARNING ASSISTANTS ON SENSE OF BELONGING IN ORGANIC CHEMISTRY

Organic chemistry is a well-known gateway course among those interested in STEM careers, known for its high level of difficulty and low passing rates. Contemporary research suggests that active learning is an effective way to engage students with the subject material and is associated with increased learning and lower failure rates within courses. Active learning classrooms may be structured in a variety of ways, the present study examined a partially flipped classroom that employed learning assistants as near-peer instructors to assist with weekly flipped activities. Learning assistants are undergraduate students who have recently taken the course, and performed well in the class. Learning assistants may have multiple impacts on the learning experience, one is an increased sense of community, a sense of interconnectedness among students and instructors. They serve as models for students in the course. This might promote discussion between students and learning assistants, developing connections between students in the classroom; where students are more able to ask questions, as well as more interactions between students outside the classroom. Students are surveyed on their experiences and sense of belonging to gauge the impact of learning assistants within the classroom and how learning assistants may enhance students' learning experiences. Our hypothesis is that learning assistant's presence and contributions in classrooms will result in students feeling a greater sense of belonging, which could account for improved student learning outcomes. The results of the surveys and interviews may guide instructors in practices to create the environment most conducive to student success.

PRESENTER: MADISON JULIANA, MATHEMATICS
FACULTY MENTOR: DR. QIXUAN WANG, MATHEMATICS
PROJECT TITLE: AGENT-BASED MODELING OF NEUTROPHILS CHEMOTAXIS IN WOUND HEALING

Wound healing in the human body involves an orchestration of various cellular response. At a skin wound, the body initiates signaling pathways where Damage-Associated Molecular Patterns (DAMPs) induce the initial recruitment of inflammatory cells, in particular, neutrophils. As the first responders to the injury site, neutrophils swarm to the wounded region in a chemotactic fashion to fight bacteria. In addition, neutrophils are short-lived, with a lifespan in blood circulation estimated to be less than 24 hours. Recent experimental results suggest that the short life of neutrophils contribute greatly to their populational chemotactic swarming behavior. To investigate the chemotaxis dynamics of neutrophils in wound healing, we develop a hybrid agent-based model on neutrophil swarming. We integrate an

agent-based submodel to model the neutrophils' wound-induced chemotactic movement, and a reaction-diffusion partial differential equation (PDE) to model signaling dynamics. To capture the short lifespan of neutrophil cells, we implement cell age information naturally into the agent-based submodel. With this hybrid model, we investigate the effect of neutrophils' short lifespan on their chemotaxis behaviors and identify the stochastic effects on neutrophil chemotaxis.

PRESENTER: RIKKI KAHN-YEE, MATHEMATICS
FACULTY MENTOR: DR. MYKHAILO POTOMKIN, MATHEMATICS
PROJECT TITLE: POPULATION AND CLUSTERING DYNAMICS OF ELONGATED BIOLOGICAL CELLS

Biological tissue formation is an essential process for cells to maintain and execute certain functions throughout the body. Studying the dynamics of tissue formation can offer various insights from wound healing to the advancement of medical treatment. This project aims to study the motility of elongated adipose-derived cells in heart tissue through a computational model that simulates the process of cell motility, proliferation and cell-cell interactions. Through the model, we varied the biophysical parameters and elucidated how these parameters affect the dynamics of cell density, cell clustering, and orientational order. In particular, we show how enhancing motility may facilitate faster formation of a monolayer of elongated cells.

PRESENTER: WASIM KHAN, DATA SCIENCE
FACULTY MENTOR: DR. NAN LI, ENVIRONMENTAL SCIENCES
PROJECT TITLE: SOIL MOISTURE TENSION FORECAST USING THE ARIMA MODEL IN CENTRAL CALIFORNIA

Soil tension is critical for irrigation management, drought and flood prediction, water resource management, and field-scale decision-making. To support precision agriculture, forecasting soil tension is essential for reliable derivative outputs.

This research used the Autoregressive Integrated Moving Average (ARIMA) model, a forecasting machine learning model, to account for trends and seasonal patterns in a dataset from thousands of fields between 2020 and 2022. Each entry contained a soil tension metric, measuring how tightly water molecules are held in the soil, along with features such as elevation, shade measurements, and Normalized Difference Vegetation Index (NDVI). These features were integrated as exogenous variables, with NDVI and elevation playing key roles in determining soil tension.

The objective was to forecast soil tension for a test region by training ARIMA on existing features to evaluate accuracy. While the dataset included various crops, the cherry plant was chosen due to minimal gaps and abnormalities. Other crops observed included walnuts, apples, and grapes. Each field was analyzed separately due to differences in data collection, crops, and observed features.

In conclusion, ARIMA shows promise for forecasting soil tension by incorporating trends, patterns, and exogenous variables like NDVI and elevation. While the model performed well for cherry plants, further refinement of its seasonal order is underway to improve accuracy and expand applicability to other crops. These efforts aim to enhance moisture management strategies in California agriculture.

PRESENTER: AYAZ KHWAJA, BIOLOGY
FACULTY MENTOR: DR. HUIMIN ZHANG; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: OPTIMIZING T CELL RECEPTOR SIGNALING FOR TH2 DIFFERENTIATION: INSIGHTS FROM AN IN VITRO APPROACH

T lymphocytes are a subset of white blood cells that act to protect the body from pathogenic infection as a key player in the adaptive immune system. There are two main subsets of T lymphocytes, distinguished by the presence of the cell surface markers CD4 and CD8. CD4-bearing T lymphocytes, also known as T helper (T_H) cells, mainly act by producing signaling molecules known as cytokines. These cells can be further classified into various subtypes, with T Helper 2 (T_H2) cells being the focus of this study. T_H2 cells play a protective role against helminths and are also crucial in the pathophysiology of chronic inflammatory diseases, such as allergic responses.

The T_H2 response is primarily characterized by the secretion of a cytokine known as Interleukin-4 (IL-4). This study aims to establish an in vitro model to differentiate naive CD4+ T cells into T_H2 cells. Using this model, we will be able to determine the optimum amount of signaling necessary at the T Cell Receptor (TCR) for T_H2 differentiation. With the capability of efficiently recapitulating Th2 differentiation in vitro, we can thus dissect the molecular components necessary for the differentiation of a CD4+ T cell into a T_H2 cell. Further, an in vitro platform can be used to evaluate how certain environmental factors and chemical compounds may affect T_H2 differentiation and polarization.

PRESENTER: ANNA KIM, BIOCHEMISTRY
FACULTY MENTORS: DR. YING-HSUAN LIN, ENVIRONMENTAL SCIENCES AND DR. LINHUI TIAN, ENVIRONMENTAL SCIENCES
PROJECT TITLE: COMPOSITION ANALYSIS AND QUANTIFICATION OF CARBONYLS IN E-CIGARETTE VAPING EMISSIONS

E-cigarette emissions, which contain various harmful substances, significantly contribute to indoor air pollution and raise concerns about further exposure to vaping byproducts. The main components of e-liquids include glycerol (VG), propylene glycol (PG), and various flavorings, such as carbonyls, alcohols, and terpenes. Carbonyls are of specific concern in vaping emissions because of their chemical reactivity and toxicity. They can be produced not only from the direct transfer of e-liquids but also as byproducts during the vaping process. In this study, the composition of e-liquids and e-cigarette aerosols was determined using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass

spectrometry (LC-MS) coupled with dinitrophenylhydrazine (DNPH) derivatization. The DNPH-carbonyls in both e-liquids and vaping emissions were quantified to distinguish the sources of carbonyls. To collect the e-cigarette particles for analysis, we simulated the vaping process in a $2m^3$ PTFE chamber, and the emitted aerosols were collected onto filters. From the GC-MS analysis of e-liquids, carbonyls accounted for the highest proportion among the 20 most abundant compounds. In the quantification of e-liquids and vaping aerosols, more carbonyls were found in e-cigarette aerosols due to the chemical transformation of e-liquids into aerosols, along with some newly generated carbonyls. Overall, these findings demonstrated that both commonly reported and unique carbonyls are formed and associated with chemical transformation during vaping. Furthermore, such a conclusion suggests the carbonyls released during vaping may present potential health implications when inhaled based on their quantity in the vaping emissions and their chemical properties.

PRESENTER: NANDHINI KOTHAPALLI, BIOCHEMISTRY
ADDITIONAL PRESENTER: JUSTIN DANG, BIOLOGY
FACULTY MENTOR: DR. ZHENYU JIA, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: MARIANO RESENDIZ, BOTANY AND PLANT SCIENCES
PROJECT TITLE: INVESTIGATION OF POMEGRANATE (*PUNICA GRANATUM*) FRUIT QUALITY VIA SNP ANALYSIS AND PHENOTYPIC EVALUATION

Punica granatum, known as pomegranate, shows substantial variation in fruit quality traits, making it a vital crop for genetic and breeding studies. In this study, we perform bioinformatic and statistical analysis on pomegranate genomes, targeting areas of the genome differing in characteristics regarding fruit quality and juice by performing single nucleotide polymorphism calling (SNP) with juice chemistry data and consumer feedback. SNP calling identifies single-base changes in DNA sequences relative to a reference genome. SNP calling was performed on four pomegranate varieties: Eversweet, CV_857, Phoenicia, and Wonderful, using a reference genome, Tunisia, to identify genetic differences. These varieties were evaluated over three years by an unbiased sample (≥80 participants per year) who rated fruit traits like sweetness, acidity, seed hardness, and color, with an overall preference score as the dependent variable. Additionally, juice chemistry traits—including Brix, pH, and antioxidant content—were quantified to provide objective measures of fruit quality. SNP-phenotype correlation analysis will be conducted to identify genetic variants associated with the desirable fruit characteristics. Principal Component Analysis (PCA) and regression models will assess the relationship between genotypic variation and phenotypic qualities, like the fruit's physical and chemical profiles. This study integrates the genetic, phenotypic, and biochemical data to foundationally examine pomegranate fruit quality within the engineered varieties. Future work will visualize potential genomic-phenotypic relationships through the SNPs and perceived sensory data. The SNP dataset will be expanded to include more pomegranate genomes and validate any associations made to larger populations, in hopes of improved pomegranate crop quality.

PRESENTER: DIMITRI KOUNTOURIS; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. MICHAEL ADAMS, CELL BIOLOGY AND NEUROSCIENCE
PROJECT TITLE: ANALYSIS OF JEWEL WASP (*AMPULEX COMPRESSA*) VENOM ACTION ON THE COCKROACH BRAIN USING THE BRAIN SLICE APPROACH

Ampulex compressa is a tropical parasitoid wasp, renowned for its unique reproductive strategy involving envenomation of the host brain, thus hijacking its locomotory behavior for subsequent exploitation as a food source for larval progeny. Following venom injection, stung animals exhibit hypokinesic "Parkinson's-like" behavior. Our research group investigates mechanisms underlying hypokinesia, in particular its effect on D2-like dopamine receptor signaling.

PRESENTER: RISHITHA KRISHNAKUMAR, BIOCHEMISTRY
FACULTY MENTOR: DR. KEVIN KOU, CHEMISTRY
PROJECT TITLE: APPLICATION OF RHODIUM(III) CATALYZED C-H FUNCTIONALIZATION TO THE SYNTHESIS OF BIOACTIVE NATURAL PRODUCTS AND DERIVATIVES

The development of C-H functionalization is a useful strategy that allows for the direct modification of C-H bonds. In traditional synthesis, it takes multiple steps to introduce a new functional group, which reduces efficiency. However, rhodium (III) catalyzed C-H functionalization offers a direct approach that enables the easy merger of different molecular fragments into new products modified with various functional groups. This approach is particularly valuable for the synthesis of natural products that have intricate structures and display biological activities. This project aims to synthesize the following three target molecules: harmalacinine, naucleactonin-4, and camptothecin through a common precursor. These molecules are inherently hard to synthesize due to their intricate structure and the need for precise bond formations. We propose to synthesize the target molecules through rhodium(III)-catalyzed C–H activation developed in the Kou lab, which would give rise to a more efficient synthetic route that streamlines analog synthesis, thereby, accelerating drug discovery efforts. My contribution to this project focuses on the synthesis of key molecular fragments that serve as crucial intermediates for the target molecules. I am actively optimizing reaction conditions to enhance the reaction yields to ensure that these fragments can be efficiently coupled using the catalyst. I have synthesized four molecules through multi-step synthesis, all of which are characterized by nuclear magnetic resonance spectroscopy, infrared spectroscope, and mass spectrometry.

PRESENTER: ANIKA KUMAR, BIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: INVESTIGATING COLOR GENE INHERITANCE IN GUPPIES AND *POECILIA WINGEI*.

I investigated the independent contribution of Y-linked supergenes vs segregating genetic variation of male color genes in domesticated guppies and *Poecilia wingei*. I worked with harlequin domestic guppies, which are ornamented and have bright orange bodies. Similarly, female domestic guppies have colorful fins. Male *Poecilia wingei* exhibit conspicuous coloration to attract females while female *Poecilia wingei* have dull gray coloration to hide from predators. Wild guppies demonstrate Y-linked supergene control of the color gene, but this limits the evolutionary potential. Males inherit one Y-chromosome that lacks recombination and limits variation since the genes on the Y-chromosome are passed down exclusively from father to son. Therefore, to evolve brighter coloration, recombination needs to happen between the X-chromosome and the pseudoautosomal portion of the Y-chromosome. Selection for diverse patterns in domestic guppies happens via the magnification of this segregating genetic variation. To dissect this complexity, I performed reciprocal crosses of domestic guppies and *Poecilia wingei* followed by brother-sister matings. All males from F1 and F2 crosses that produced 10 or more male offspring were photographed when mature. Next, I used the program Colormesh to quantify the color pattern by assigning RGB values to a grid cell and mapping data values to make a colormap. Each spot on the graph will allow the sibling and half-sibling color patterns to be interpreted. My hypothesis is that if autosomal or X-linked genes contribute coloration, we would observe segregation patterns inconsistent with a single-allele Y-linked model.

PRESENTER: RICKY LE, BIOLOGY
FACULTY MENTOR: DR. KERRY MAUCK, ENTOMOLOGY
PROJECT TITLE: QUANTIFYING THE EFFECTS OF INDOLE ON BLACK SOLDIER FLY ATTRACTION AND OVIPOSITION BEHAVIOR

Black soldier fly (BSF) larvae are used worldwide for their proficiency in upcycling organic food scraps and transforming it into a digestate that can be used as fertilizers and soil amendments. As such, BSF larvae are instrumental in the waste recycling industry. However, while there is considerable research dedicated to optimizing rearing of BSF larvae, very little is known about adult BSF behavior. Understanding adult behavior is valuable because it could improve adult mating and egg laying in rearing operations, ultimately leading to increased BSF production and more waste recycling. In this study, we tested whether addition of an attractive compound (indole) to an egg laying substrate would increase adult fly oviposition. We used a cage assay to measure BSF oviposition and landing rates when nearby indole. We documented the frequency that the BSF landed on wooden cutouts treated with indole and weighed the eggs left in those cutouts. Analysis of the results revealed that there was no statistically significant difference in BSF landing rates between indole-associated and control cutouts. However, BSF females laid significantly more eggs in indole-associated cutouts compared to control cutouts! These findings suggest that indole addition to the oviposition area does not increase the number of flies visiting, but does increase the number of eggs laid by flies that do visit the site. As such,

it is important to examine not just attraction but also post-landing behavior, such as egg laying, which can also be influenced by chemical cues.

PRESENTER: DIANE LE, NEUROSCIENCE
FACULTY MENTOR: DR. KHALEEL A. RAZAK, NEUROSCIENCE
PROJECT TITLE: DEVELOPMENT OF PERINEURONAL NETS IN THE IC, AC, AND MPFC OF WILD-TYPE & MOUSE MODEL OF FRAGILE X SYNDROME

Fragile X Syndrome (FXS) is a neurodevelopmental disorder and a leading genetic cause of autism, characterized by cognitive impairments and sensory hypersensitivity. It results from a mutation in the Fmr1 gene, leading to the loss of fragile X mRNA ribonucleoprotein (FMRP), which disrupts synaptic connections and the balance between excitatory and inhibitory neural networks. Perineuronal nets (PNNs), specialized extracellular matrix structures surrounding inhibitory neurons, play a crucial role in stabilizing synaptic connections and maintaining inhibition. This study investigates whether the absence of FMRP leads to reduced PNN expression in brain regions critical for auditory processing, specifically the medial prefrontal cortex (mPFC), inferior colliculus (IC), and auditory cortex (AC). We hypothesize that diminished PNN expression in Fmr1 knockout (KO) mice contributes to heightened sensory hypersensitivity observed in FXS. To examine this, we assess PNN density in the mPFC, IC, and AC of Fmr1 KO and wild-type (WT) mice at different developmental stages. By analyzing postnatal days P21, P30, and P90, we aim to determine whether changes in PNN expression emerge early, potentially identifying a critical window for intervention. Histological and imaging analyses are conducted on five mouse brains per genotype and age group to quantify PNN density. Comparing PNN expression between Fmr1 KO and WT mice across development will provide insight into how FXS affects inhibitory network maturation in auditory and cognitive regions. If significant reductions in PNN density are observed in Fmr1 KO mice, these findings will enhance our understanding of sensory processing abnormalities in neurodevelopmental disorders and may inform potential therapeutic strategies for managing auditory hypersensitivity.

PRESENTER: HARRISON LIN, MICROBIOLOGY
ADDITIONAL PRESENTER: JAKE HUYNH, BIOLOGY
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: ALEXANDRA ARCENAS, JEFFREY DELGADO, AND BRANDON OLIVER
PROJECT TITLE: ACCUMBAL ENDOCANNABINOIDS ATTENUATE COCAINE RELAPSE

Relapse is a significant challenge in treating substance use disorders, as individuals frequently revert to drug or substance use after a period of abstention. The relapse process is mainly driven by the activation of the medial prefrontal cortex (mPFC). The mPFC sends excitatory signals to the nucleus accumbens

(NAc), a central component of the brain's reward system. Long-term cocaine use significantly amplifies this excitatory input, promoting drug craving and making sustained abstinence more difficult. Conversely, the endocannabinoid (eCB) system plays a crucial role in regulating neurotransmitter release. Endocannabinoids act on CB1 inhibitory receptors to suppress excitatory signaling. This supports the notion that enhancing eCB activity, specifically through the elevation of 2-arachidonoylglycerol (2-AG), could reduce excitatory input to the NAc, thereby diminishing craving or drug-seeking behavior. In this study, we examine the impact of elevating NAc eCB levels on cue-induced cocaine craving during protracted abstinence. Mice implanted with bilateral intracranial cannulae undergo 10 days of self-administered i.v. cocaine training in 2-hour sessions, followed by a two-week abstinence period without cocaine access or associated cues. At the end of abstinence, the mice are administered a monoaglycerol lipase (MAGL) inhibitor, JZL184 (5µg/µl), directly into the NAc to elevate 2-AG levels, before reinstatement sessions where relapse is triggered by reintroducing cocaine-paired cues. Pretreatment with JZL184 attenuates cocaine relapse compared to vehicle conditions. These findings in this study indicate and highlight the eCB system as a promising therapeutic target to mitigate cocaine craving and prevent relapse.

PRESENTER: LOUIS LIN, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. ANDREW JOE, PHYSICS AND ASTRONOMY
PROJECT TITLE: AUTOMATED EXFOLIATION MACHINE FOR PRODUCING TWO-DIMENSIONAL, VAN DER WAALS MATERIALS

In 2D materials research, the objective is to explore the intrinsic properties of certain materials and their interactions. One of the key processes is mechanical exfoliation, a method using regular 3M magic scotch tape to isolate atomically thin layers from bulk materials by effectively peeling the back the material surface to cleave at the weak interlayer van der Waals forces. Although performing this method by hand has been proven to be highly effective, it comes with a challenge – yield inconsistency. To address this, we built a machine to replace the process, minimize human error, and ensure standardization. We have created a prototype of the Lego exfoliation machine capable of producing monolayers of various 2D materials, including graphene, TMDs, and hBN of desired thicknesses. Through this machine, we can calibrate and control the parameters of the process, such as the peeling speed and angle. We analyze samples exfoliated from our machine by evaluating microscope images to extract the statistics on our exfoliation yield. Our machine has shown efficiency through consistent exfoliation results, and improved accessibility to a starting researcher. The use of Legos makes the design flexible, allowing for easier implementation of improvements than traditional machining of mechanical parts.

PRESENTER: ISABELLE LOAISIGA, BIOLOGY
FACULTY MENTOR: DR. CHRIS CLARK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: THE EFFECTS OF SMOKE ON HUMMINGBIRD BEHAVIOR AND LUNG HEALTH

This study investigates the effects of smoke exposure on the behavior and lung health of wild-caught Anna's hummingbirds. On the day of the experiment, twelve birds were placed in individual insect cages with a syringe of 30 mL of nectar solution. Half the birds, the smoke group, were placed inside an environmental chamber and exposed to charcoal-filtered smoke created by heated wood chips in a food smoker. The remaining six birds, the control group, were placed in a separate environmental chamber without smoke. After four hours, half of each group was euthanized immediately to study short-term effects on the lungs, including acute inflammation, immune cell infiltrates, and carbon deposition. The other half were euthanized one week later to study long-term effects on the lungs, such as fibrosis and structural damage. A necropsy was performed on all the birds, and their lungs were processed for immunohistochemistry and analyzed after Hematoxylin and Eosin (H&E) staining. Observational results showed no differences in behavior between the two groups during the experiment. Statistical results using T-tests showed no difference in food consumed by the smoke group versus the control group and male versus female. Additionally, neither group had significant data on weight loss or gain after the experiment. Further results will be discussed in the paper. Overall, this research aims to advance our understanding of avian respiratory physiology and behavior and enhance our understanding of the size and density of particulates that affect hummingbird lungs after wildfires.

PRESENTER: MADISON LOPER, CHEMISTRY
FACULTY MENTOR: DR. ANA BAHAMONDE, CHEMISTRY
PROJECT TITLE: LOW-TOXICITY TANDEM RING-OPENING CYANATION OF CYCLOPROPYL KETONES

Nitrile functional groups (CN) are prevalent in pharmaceuticals, bioactive compounds, and materials. However, conventional methods for incorporating nitrile groups often require toxic cyanide sources. In response to this, alternative cyanide sources have been developed, although many alternatives form toxic hydrogen cyanide (HCN) during workup or in situ. Herein we report a novel method for cyanation utilizing benzonitriles as non-toxic cyanide donors enabled by nickel (Ni) catalysis for the formation of new C-CN bonds. This work describes the activation of cyclopropyl ketones which undergo tandem ring-opening cyanation to yield γ-cyanoketones. Optimization of this reaction is achieved through fine-tuning the reaction conditions, including substrate variations and screening of ligands to maximize yield and selectivity. Additional research is required to gain mechanistic insights, which will be pursued through kinetic studies and synthesis of key reaction intermediates. Improved mechanistic understanding is anticipated to provide valuable information on C-CN activation, advancing cyanation techniques and their utility in chemical synthesis and industrial applications.

PRESENTER: ANGIE LOPEZ, CHEMISTRY
FACULTY MENTOR: DR. JACK EICHLER, CHEMISTRY
PROJECT TITLE: USING A MIXED METHODS ANALYSIS TO EVALUATE HIGHER ORDER LEARNING IN LARGE ENROLLMENT ORGANIC CHEMISTRY COURSES

In higher education STEM programs, foundational courses like organic chemistry provide prerequisite knowledge essential for upper-division chemistry and biology courses. This study aimed to enhance students' understanding of historically challenging organic chemistry concepts through instructional strategies informed by the three-dimensional learning (3DL) framework. Higher-order learning strategies (HOLS) were implemented to foster success in organic chemistry by integrating core disciplinary ideas, cross-cutting concepts, and scientific practices. In-class HOLS activities prompted students to recall foundational chemistry principles and apply scientific practices to connect with current course content. A mixed-methods research design was employed to evaluate the cognitive and affective impacts of HOLS interventions, using a pseudo-crossover design to mitigate instructor influence. This approach alternated treatment and control conditions between two courses, enabling comparison of performance outcomes under traditional and HOLS-based instruction. Quantitative analysis, including inferential statistical evaluation of 3DL assessment items, and qualitative thematic analysis of student interviews revealed significant improvements in performance and an increased recognition of the value of 3DL strategies. These findings contribute to ongoing efforts to integrate reform-oriented instruction into traditional undergraduate chemistry curricula.

PRESENTER: XIAOHUI MA, STATISTICS
FACULTY MENTOR: DR. YINGZHUO FU, STATISTICS
PROJECT TITLE: ECONOMIC IMPACT OF COVID-19 PREVENTION POLICIES: A COMPARATIVE ANALYSIS OF CHINA AND THE UNITED STATES

The COVID-19 pandemic had a devastating impact on the economies of many countries, including China and the United States. To understand the effects of different pandemic prevention policies on economic performance, this study examines key economic indicators—unemployment rates and housing prices—in both countries during the pandemic period. Utilizing a multi-linear regression model and spatial analysis, we investigate the relationship between different quarantine levels and economic fluctuations. Our findings provide insights into how varying governmental interventions influenced labor markets and real estate trends, offering valuable implications for future pandemics and similar contexts.

PRESENTER: ELISE MACH, NEUROSCIENCE
FACULTY MENTOR: DR. KEVIN KOU, CHEMISTRY
PROJECT TITLE: DUAL BRØNSTED/LEWIS ACID-CATALYZED FRIEDEL-CRAFTS ALKYLATION TO ACCESS ARYL C-GLYCOSIDES

Many modern medications and natural products are linked to carbohydrate structures, rendering them more difficult to synthesize, both in terms of yield and selectivity. The demand to synthesize glycosylated bioactive molecules has exponentially increased in the past few decades. As an example, Jardiance is a medication prescribed as an effective treatment for type 2 diabetes, heart disease, and chronic kidney disease. However, the cost of the medication is shockingly high at $20 per tablet. The price is likely a result of the low-yielding, 9-step synthesis to make the glycosylated molecule. Other strategies aim to synthesize the molecule in fewer steps, but these strategies involve the use of toxic and environmentally hazardous reagents. To target the aryl C-glycosides present in essential molecules, I propose a 3-step synthesis with cost-effective, abundant reagents. My strategy to develop this method involves a Friedel-Crafts-type electrophilic aromatic substitution. In traditional Friedel-Crafts alkylations, reactivity is often only observed for *activated* electrophiles, whereas *unactivated* electrophiles were poor substrates. Our group discovered a simple solution to render unactivated electrophiles reactive by employing a combination of Brønsted and Lewis acid catalysts. This approach enabled both unactivated tertiary and secondary alcohols to serve as alkylating agents. With these precedents in mind, I plan to extend this dual Brønsted and Lewis acid catalysis to access aryl C-glycosides given that carbohydrates are unactivated secondary alcohols. Preliminary results indicate the formation of the desired product, and I will survey a variety of catalysts, solvents, temperature, substrates, and other conditions to optimize this method.

PRESENTER: AKHIL MALHOTRA, BIOLOGY
FACULTY MENTOR: DR. MATTHEW CASSELMAN, CHEMISTRY
PROJECT TITLE: ENHANCING CHEMISTRY EDUCATION: ANALYZING THE IMPACT OF 3-D MODELS USING EYE-TRACKING TECHNOLOGY

In the evolving landscape of chemistry education, the role of 3-D models has become a valuable element in student comprehension, especially in light of the discipline's high drop/fail rate. As spatial reasoning is a crucial skill in mastering molecular structures, identifying the most effective learning tools is essential for improving student outcomes. The proposed research investigates the effectiveness of physical and digital models, aiming to determine which modality has greater potential to improve spatial molecular learning and comprehension. It navigates an under-explored area, seeking to understand how these different tools can influence spatial comprehension and understanding of chemical structures. Building upon previous research that analyzed the efficacy of digital versus physical models without the aid of eye-tracking technology, this proposed study aims to deepen our understanding by incorporating such devices. Eye-tracking technology offers a novel way to assess cognitive engagement, providing quantifiable data on how students interact and perform with these models. By utilizing this technology, we are able to view students' focus areas, giving a new perspective on their learning processes.

Preliminary notions are that due to inherent 3-D and tactile attributes, physical models will be superior compared to their digital counterparts in facilitating a deeper understanding of molecular structure. Should this hold true, the potential implications for future chemistry education practices are profound, suggesting a reevaluation of the effectiveness of digital tools in favor of hands-on learning aids in an ever-increasing digital world.

PRESENTER: DAVID MATTA, BIOENGINEERING
FACULTY MENTOR: DR. SCOTT PEGAN, BIOLOGICAL SCIENCES
ADDITIONAL CONTRIBUTORS: DAVID GONZALEZ, AMRITPAL JALF, VANESSA MORESCO, JOSEPH GARCIA, JONATHAN NYUGEN, BRYAN TORRES, ADAM GODZIK, AND ERIC BERGERON
PROJECT TITLE: DEISGYLATION ACTIVITY DISCOVERED WITHIN OTUS FROM NEWLY IDENTIFIED TAMDY NAIROVIRUSES OF HUMAN HEALTH CONCERN

Crimean Congo Hemorrhagic Fever Virus (CCHFV) is a member of the Bunyaviridae family of tick-borne nairoviruses and is categorized as a World Health Organization prototype virus and CDC Category A pathogen of interest. The virus has up to a 40% mortality rate and there are currently no FDA approved therapeutics for it.

To evade the innate immune response, these nairoviruses have the capacity for deISGylation activity via an encoded viral ovarian tumor domain-like (vOTU) protease, which undoes the post-translational modifications of interferon-stimulated gene product 15 (ISG15). That deISGylation activity/preference is not conserved across all vOTUs of nairoviruses, rendering it necessary to characterize vOTU-ISG15 binding specificity across ISG15s from several species against various nairovirus OTUs.

To characterize vOTU-ISG15 binding specificity, BioLayer Interferometry (BLI) was utilized. BLI utilizes biosensors to compare interference patterns of white light reflection between a reference and bound biomolecules, allowing for the association and dissociation of the proteins of interest to be precisely calculated.

Approximately 100 vOTU-ISG15 interactions were investigated, and interestingly, PCTN robustly bound to the ISG15s, while SGLV did so more specifically. Moreover, a few ISG15s bound to all the vOTUs tested. By characterizing these interactions, surveillance of these nairoviruses and their preferences can be utilized to better understand reservoirs and spread of emerging nairoviruses.

PRESENTER: MADELINE MENDEZ, BIOLOGY
FACULTY MENTOR: DR. CHRISTOPHER CLARK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: INFLUENCE OF FACIAL RUFF REFLECTOR FEATHERS ON THE HEARING OF THE BARRED OWL

This research examines the impact of the reflector feathers on the sound perception of the Barred Owl (*Strix varia*), a large North American owl species. As in most owl species, the Barred Owl has a facial disk, a circular arrangement of fluffy feathers (auricular feathers) forming a concave disk-like shape, surrounded by a dense facial ruff. The facial ruff is composed of thin, stiff, and dark feathers called reflector feathers. The ruff extends behind the owl's ears and preaural flap, a movable skin flap in front of the ear canal. To research this, ten Barred owl heads will be tested with different conditions, manipulating head elevation, ear flap position, and the removal of different feather tracts. A speaker playing white noise will be placed in front of the owl and small microphones placed in the ear canal will record what is heard. The collected audio data will then be analyzed to determine how reflector feathers influence the Barred Owl's hearing. Previous research on a distantly related species of owl, Barn Owl (*Tyto alba*), has shown that facial ruffs composed of reflector feathers acted as a "sound collector", significantly amplifying sounds directly in front of the owl, especially those of higher frequencies. We expect our findings on the Barred Owl to align with the results found in the Barn Owl and find that the owl heads with reflector feathers would perceive sounds at higher frequencies at louder amplitude than owl heads tested without their reflector feathers intact.

PRESENTER: ETHAN MILLER, BIOLOGY
FACULTY MENTOR: DR. KEVIN KOU, CHEMISTRY
PROJECT TITLE: REACTIVE INTERMEDIATES AND THEIR PURPOSE IN MEDICINE

Reactive intermediates play a key role in the synthesis of bioactive organic molecules. Previous studies have demonstrated their effectiveness in creating unique chemical products.
Specifically, the Kou lab intends to develop oxenium chemistry to synthesize diaryl ether bonds that are found in bioactive molecules used in the treatment of various diseases. Oxenium intermediates are highly reactive, hypervalent, cationic oxygen species. In order to stabilize these intermediates, we propose to integrate a Lewis-basic neighboring group that can form a Lewis adduct with the oxenium ion, potentially through six-membered cyclic intermediates. However, most neighboring groups are difficult to remove, which limits their versatility in synthesis. Additionally, the leaving group of the oxenium precursor generates different outcomes, which can complicate the reactivity. In this work, I will explore inventive solutions to these problems by developing a novel dual system that incorporates both a neighboring group and a leaving group in the same molecule. The success of this approach can expand the versatility of diaryl ether formation by generating a wider array of substrates compared to previous methods. We plan to apply this new method to the first total synthesis of berbamine, a selective and potent CaMKIIγ inhibitor for lymphoma therapy.

PRESENTER: MIA MIYATAKE, MICROBIOLOGY
FACULTY MENTOR: DR. JASON STAJICH, MICROBIOLOGY AND PLANT PATHOLOGY
PROJECT TITLE: THE IDENTIFICATION AND POTENTIAL IMPACTS OF FUNGAL AIR CONTAMINANTS IN BUILT ENVIRONMENT

Fungal growth or contamination in the built environment has always been a concern for research integrity and human health. The purpose of this project is to collect cultures and identify the fungal species from buildings and test whether any also have the evidence for antifungal resistance. Samples were collected from four laboratories on the UCR campus in Boyce Hall, Spieth Hall, and the Multidisciplinary Research Building in November 2024. Passive air sampling and swabbing of surfaces was used to collect samples. I prevented bacterial contamination by using MEYE plates treated with the antibiotic kanamycin. Over eighty different fungal groups have been collected and isolated from the collection plates. DNA extractions were conducted using the Powersoil, Blood and Tissue and Extract-N-Amp procedures. The ongoing work for this project includes PCR, Sanger sequencing and antifungal resistance tests. I predict we will find the presence of common environmental fungal species and any fungal groups being studied in the labs. Antifungal resistance is not typically anticipated for environmental fungal species, but resistance may arise from strains exposed to agricultural fungicides. The findings of this project will contribute to the understanding of fungal air contaminants present in on-campus laboratories and stress the importance of fungal mitigation techniques.

PRESENTER: HANNAH MOORE, BIOCHEMISTRY
FACULTY MENTOR: DR. S. HOLLIS WOODARD, ENTOMOLOGY
ADDITIONAL CONTRIBUTORS: MEGHAN MOORE, KERRY MAUCK, AND JOCELYN MILLAR
PROJECT TITLE: STARVATION AND ITS EFFECTS ON BUMBLE BEE PHEROMONE PRODUCTION

Habitat loss and climate change are becoming more widespread, leading to declining resources and increasing the likelihood of starvation for animals within these deteriorating habitats. Pollinators face further issues because of their reliance on flora and the decline of flowers due to urbanization. In bumble bees, the lack of floral resources can lead to starvation, the effects of which on metabolism occur within only six hours. As pheromone production depends on metabolic precursors, a rapid metabolic decline likely reduces pheromone production and subsequently disrupts pheromonal communication. To explore the relationship between pheromone production and starvation, we collected pheromones from live bees (young adult males and female workers) inside a volatile collection system chamber, with *ad libitum* access to 60% sucrose nectar (fed) or access to plain water for 24 hours (starved). To determine the identity of pheromones, we performed gas chromatography/mass spectrometry analyses on the collected compounds and verified them with standards. We found sex-specific impacts of starvation on pheromone production. In males, we found that a male marking pheromone (2,3-Dihydrofarnesol) decreases under starvation conditions. Because of this, starvation may affect male mating success by lowering their ability to attract virgin queens. In workers, we found a pheromone (Z-9-Tricosene) present in honey bee foraging recruitment increases with starvation. This pheromone has not previously been identified in bumble bees, but potentially acts as a way to

encourage conspecific foraging. All of this indicates that the decline of floral resources will impact how and what bumble bees communicate with each other.

PRESENTER: NATHAN NGUYEN, BIOLOGY
FACULTY MENTOR: DR. ANDRE OBENAUS, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: JIAMIN YAN, COLEEN DOAN, GREER CISNEROS, CHRISTOPHE DUBOIS, AMANDINE JULIENNE, MATHILDE MALINCONI, NASHWAAN ALI KHAN, AND JEROME BADAUT
PROJECT TITLE: BRAIN AND CEREBROVASCULAR ALTERATIONS AFTER KNOCKING OUT CAVEOLIN-1 IN MOUSE ENDOTHELIAL CELLS

Objectives: Caveolin-1 (Cav-1) is expressed in various brain cells, but primarily in endothelial cells (EC) of the vasculature. Cav-1 is involved in regulation of lipid and cholesterol metabolism, transport of molecules, blood-brain barrier (BBB) integrity and vascular function. The role of Cav-1 in ECs and their response to brain injury remains unclear. We developed a mouse model with Cav-1 knocked out (KO) in EC (EC-Cav1) and here we report brain and vascular morphological alterations.

Method: Using the Cre/Lox system under the Cdh5 promoter, EC Cav-1 mice with endothelial Cav-1 KO were derived. Male and female EC-Cav1 mice were characterized at postnatal-days (PND) 17 and 47 using magnetic resonance imaging (MRI), histology, vessel painting, immunohistochemical and Western blots, and compared to wild-type (WT) mice.

Results: At PND17 and 47 EC Cav-1 mice had increased cerebrum volumes compared to the WT mice with females exhibiting increased volumes in 83% regions assessed but only 50% in males. EC Cav-1 mice showed decreased brain cortical vessel density, vessel length and junction density at PND47, but not at PND17. Middle cerebral artery vessel density was lower in PND17 males but unchanged in PND47. At PND47, histology indicated a 6% increase in cortical thickness with higher cellularity. Whole-brain western blot found no significant Cav-1 differences between genotypes.

Conclusions: EC-Cav1 mice exhibited alterations in brain size and vascular features, suggesting a key role of endothelial-Cav-1 in brain maturation.

PRESENTER: PHILIPP NGUYEN, CHEMISTRY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
PROJECT TITLE: DETERMINING THE MISFOLDED PROTEOME DUE TO EXPOSURE TO DIMETHYL FUMARATE

Dimethyl Fumarate (DMF) is an FDA-approved drug widely used for treating multiple sclerosis and psoriasis, yet its mechanism of action remains incompletely understood. To investigate its potential cytotoxic effects on proteostasis, this study aims to characterize proteins that undergo misfolding upon cellular exposure to DMF in HEK293T cells. Using an analytical proteomics approach, we can identify misfolded proteins and assess their interactions with Hsp40 chaperones. In particular, DNAJB8, a member of the Hsp40 chaperone family, is used as a tool to capture and analyze misfolded substrates. Our preliminary results indicate that DMF exposure leads to changes to DNAJB8, forming isoforms identified using a technique called silver staining. In addition, using Orbitrap LC-MS and FragPipe, we were able to identify peptides that have undergone quantitative differences, such as fold changes comparing the control and drug-treated samples. Further quantitative analysis such as determining the chemical changes to the extent of these misfolding events and the actions for cellular stress responses. These findings allow a deeper understanding of DMF's impact on proteostasis, especially towards the mechanism of action, with potential changes to current therapeutic treatments and further studies towards toxicological effects on the proteome.

PRESENTER: PRESTON NGUYEN, PSYCHOLOGY
FACULTY MENTOR: DR. ANDRE OBENAUS, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: DR. AMANDINE JULLIENNE
PROJECT TITLE: SEX-SPECIFIC DIFFERENCES IN BRAIN DEVELOPMENT TRAJECTORIES OF HAβKI MICE

Objectives: Current mouse models of Alzheimer's disease (AD) do not accurately represent the disease pathology reported in human AD patients. The human amyloid β knockin (hAβKI) mouse model was developed to more accurately mimic AD pathology. This longitudinal study characterizes structural brain changes in hAβKI mice relative to wildtype (WT) controls using in vivo T2-weighted magnetic resonance imaging (MRI).

Methods: hAβKI mice underwent in vivo T2-weighted imaging using a 9.4T magnet system at 6, 12, and 18 months to determine whole brain and regional volumes. T2 scans were segmented using ITK-SNAP and processed using FSL, N4 Bias Field Correction, and a modified Australian Mouse Brain Mapping Consortium Atlas was applied via Advanced Normalization Tools. Whole brain (WBV), cerebrum only volumes (CBV), regional volumes, and their T2 values were extracted.

Results: In male mice, there was no significant difference in brain volumes between WT and hAβKI groups at any time point. At 6 months, WT females showed significantly greater WBV and CBV than hAβKI females. By 18 months, WBV and CBV volumes in hAβKI females were identical to WT females. Comparison within hAβKI mice revealed that males had significantly greater WBV than females.

Conclusions: The hAβKI model exhibits sex-specific differences in brain volume trajectories. In females, hAβKI mice have slower brain volume development but eventually are similar to WT mice by 18 months. In contrast, hAβKI males do not share this pattern. These results underscore the importance of considering sex as a variable in AD research.

PRESENTER: CONSTANZA PEREZ, MICROBIOLOGY
FACULTY MENTOR: DR. MARTIN GARCIA-CASTRO, BIOMEDICAL SCIENCES
PROJECT TITLE: SINGLE CELL TRANSCRIPTOMIC ANALYSIS OF NEURAL CREST ORIGIN

Neural crest cells (NCCs) are a unique embryonic population of vertebrates endowed with a bewildering differentiation potential as these cells can generate neurons and ganglia of the peripheral nervous system, melanocytes of the skin, and bone and cartilage of the head amongst many other derivatives. Neural Crest ill development leads to significant pathologies including orofacial clefts and cancers like melanoma. They are thought to originate through inductive interactions between anterior neuroectoderm (NE) and non-neural ectoderm (NNE) or mesoderm and ectoderm. Single-Cell Transcriptomics (scTranscriptomics) offers the opportunity to explore even earlier events in the origin of NCCs by addressing the progression of putative progenitors during their specification and commitment to the NCC lineage. While current efforts using Single-Cell RNA Sequencing (scRNAseq) have failed to shed light into earlier events in NCC formation, I propose to utilize CIARA (Cluster Independent Algorithm for the identification of markers of RAre cell types), a novel algorithm, dedicated to identify rare populations based on scTranscriptomics, hoping to illuminate the mechanisms behind early events in NCC formation at the single cell level. These studies will enhance our general understanding of NC biology and will accelerate translational efforts towards diagnostic and therapeutic strategies.

PRESENTER: KIM NHUNG, BIOLOGY
FACULTY MENTOR: DR. WENDY SALTZMAN; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: IMPACTS OF CONCURRENT PREGNANCY AND LACTATION, AND PERIODIC FOOD RESTRICTION, ON OFFSPRING DEVELOPMENT IN THE CALIFORNIA MOUSE

In mammals, maternal conditions can have pronounced effects on the development of offspring. High energetic demands and/or low availability of energetic resources can lead to poor physical and physiological conditions of mothers and long-term impairments in their offspring. Females in many species conceive shortly after giving birth, leading to concurrent pregnancy and lactation (CPL), a condition thought to impose very high energetic demands. In addition, environmental stressors such as food scarcity can be costly for both mothers and their offspring. We assessed the effects of CPL and food restriction on offspring development in the California mouse (*Peromyscus californicus*). We quantified fat mass, lean mass, and body mass of pups from mothers who were either pregnant and lactating or

pregnant only during their previous postpartum period. Half of the mothers in each condition underwent food restriction (removal of food for 24 hours every fourth day) while rearing their previous litter, while the other half did not. Body composition of pups was assessed using MRI scans on postpartum days 14, 21, and 28. We predict that both CPL and food restriction will negatively affect offspring development, especially when occurring simultaneously. More specifically, we anticipate that pups of mothers that were concurrently pregnant and lactating with food restriction will show the slowest increases in fat mass, lean mass, and body mass, while pups from pregnant-only mothers without food restriction will have the fastest growth. Our findings will provide new insights into the effects of maternal reproductive demands and food availability on offspring development.

PRESENTER: ABIGAIL NOGUERA, PLANT BIOLOGY
FACULTY MENTOR: DR. EXEQUIEL EZCURRA, BOTANY AND PLANT SCIENCES
PROJECT TITLE: PHENOTYPIC PLASTICITY OF EXTRAFLORAL NECTARY PRESENCE IN *FEROCACTUS ROBUSTUS*: A COMPARISON BETWEEN BOTANICAL GARDENS AND NATIVE HABITATS

Many cacti in the genus *Ferocactus* bear structures called extrafloral nectaries (EFNs) on their areoles. These tiny structures secrete nectar to attract ants which fend off herbivores like cactus bugs. Although sources have assumed all species of *Ferocactus* bear EFNs, they have not been officially described in all species. *Ferocactus robustus*, a species native to Mexico, has not been confirmed to have EFNS. Although there is no literature or documentation supporting EFN presence in *F. robustus* in the wild, specimens at UC Riverside's Botanical Garden clearly have active EFNs that are tended by ants. The aim of this experiment is to discover if the environmental conditions in botanical gardens support increased EFN formation in *F. robustus* compared to their native ranges. Changes in environmental factors including water availability, soil nutrients, humidity, or temperature may influence EFN formation in this species. To test this, I will compare the average number of EFNs per areole of *F. robustus* specimens in several botanical gardens to those in the field. I will also collect data from *Ferocactus cylindraceus*, a species known to bear EFNs in botanic gardens and in the field to see if EFN variation in this species is comparable to that of *F. robustus*. I hypothesize that if expression of EFNs in *F. robustus* exhibits phenotypic plasticity, then botanical garden specimens will have more EFNs per areole than those in their native ranges due to reduced environmental stress. This research may provide insights into the evolutionary advantages of EFNs in *Ferocactus*.

PRESENTER: KERUBO ONDIEKI, MATHEMATICS
FACULTY MENTOR: DR. MYKHAILO POTOMKIN, MATHEMATICS
PROJECT TITLE: MODELING METACHRONAL WAVES IN NEMATODE POPULATIONS VIA OSCILLATOR SYNCHRONIZATION

Systems with oscillating self-propelled swimmers, such as nematodes, exhibit autonomous movement and can synchronize their oscillatory motions to form metachronal waves. These wave patterns are

amplified by bordertaxis, that is, an increased concentration of the swarm at boundaries, such as the edge of a water droplet containing the nematodes. This increased concentration leads to stronger interactions between nematodes at the boundary, resulting in synchronized swimming at a lower frequency than individual swimming. In this project, we develop and test mathematical models of oscillator synchronization to investigate the mechanisms behind metachronal waves in nematode swarms. Using numerical simulations, we analyze how the amplitude and frequency of these waves depend on key biophysical parameters.

PRESENTER: WESLEY ONG; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. TIMOTHY HIGHAM; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: THE EFFECTS OF BODY SIZE ON STRIKE ACCURACY IN LARGEMOUTH BASS

Successful prey capture is key to the survival of fishes. Most fishes feed by exerting force on prey using rapid buccal cavity expansion, which creates a negative pressure inside the mouth relative to the fluid around it. Proper use of this suction force, as well as the fish's ability to position and time its strike, can determine its accuracy, which can therefore be used as a measure of feeding success. Though there are studies investigating how feeding occurs in many fish species, not much is known about how the accuracy of feeding changes throughout different stages of fish ontogeny. Changes in morphology, sensory perception, and muscle coordination are inevitable during the development of largemouth bass to adulthood. It's important to investigate these shifts as it provides a greater understanding of predator-prey relationships throughout development, a new narrative into how size contributes to biomechanics and functional ecology in aquatic predators, and how we can accommodate these changes in conservation efforts and management. We hypothesize that smaller fish will be less accurate at feeding, while larger fish of the same species will be more accurate. To test these hypotheses, we will take lateral and ventral high-speed video of largemouth bass *(Micropterus salmoides*) across a wide size range feeding on non-evasive prey. We will then model the ingested volume of water to calculate the accuracy index of all feeding events.

PRESENTER: VALERIE PADILLA, MICROBIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: DIMA SAFFOUR
PROJECT TITLE: OPPORTUNISTIC EFFECTS OF *MYCOBACTERIUM* IN FISH ORGANS

Several strains of *Mycobacterium* such as *fortuitum, chelonae,* and *marinum* cause chronic and often fatal bacterial infection prevalent across innumerable species of marine, brackish, and freshwater fish. Little is known concerning the route of infection, transmissibility, bacterial localization, and possible corresponding phenotypes causing this bacterium to be difficult to manage in both diagnosis and treatment. Filling this research gap would benefit many aspects of fish culture, ranging from lab settings

to aquaculture. Currently, this bacterium is observed to be endemic in populations of lab fish and hatcheries leading to a wide range of symptoms such as emaciation, uncoordinated swim patterns, and abnormal spine curvature. Through this research, we hope to learn more of the specificities of the disease, such as how it manifests in different organ systems and how this can be correlated to its transmissibility. By identifying which organs are most impacted, we can determine which conditions and specific tissues are ideal for diagnosing the establishment of *Mycobacterium* colonies for future use in developing methods for detecting the bacteria in environmental samples. This would be achieved through identification of "sick" looking individuals by an acid-fast stain on the spleen, dissection, DNA extraction of select organs, and PCR. Findings could be applied diagnostically and contribute towards improvements in current procedures of how fish are screened for infection and treatment.

PRESENTER: JASON PALOS, MATHEMATICS
FACULTY MENTOR: DR. QIXUAN WANG, MATHEMATICS
PROJECT TITLE: SHORT LIFE OF NEUTROPHILS MAY LEAD TO TRANSIENT SWARMING IN WOUND HEALING-INDUCED CHEMOTAXIS

Neutrophils are the first responders during the inflammatory immune response. Neutrophils are highly receptive to chemoattractant released by damaged tissue, causing them to migrate toward the wound site via highly orchestrated chemotaxis. Once at the wound site, neutrophils aggregate to form substantial cell clusters called neutrophil swarms that significantly contribute to wound healing by fighting bacteria and aiding in the remodeling of new skin tissue. Interestingly, biologists have established that neutrophils have a lifespan of about 24 hours, which is very short relative to the average 4-6 week duration of skin wound healing. Inspired by these biological findings, we extend the classic Keller-Segel partial differential equation (PDE) model of chemotaxis to an age-structured chemotaxis PDE to additionally consider the contribution of frequent cellular death on neutrophil swarming dynamics. To study spatiotemporal dynamics of neutrophil swarming, we develop numerical methods to solve the governing continuum equation. We then employ Latin hypercube sampling (LHS) and compute partial rank correlation coefficients (PRCCs) to assess the model parameters that drive periodic behavior in neutrophil recruitment to skin wounds. The global sensitivity analysis reveals that wound size and neutrophils' age of death are negatively correlated with periodicity in swarm cell density. Meanwhile, cellular consumption of chemoattractant and the introduction rate of new cells are positively correlated to periodic behavior in neutrophil swarming dynamics.

PRESENTER: LESLEY PHAM, BIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: SEXUAL CONFLICT IN HIGH AND LOW PREDATION POPULATIONS OF *POECILIA RETICULATA*

Guppy fish are a diverse species representing a system dominated by different populations with drastically different life histories. Many distinct factors influence a population but my research

specifically looks at sexual conflict, a battle between males and females over control of mating. It is resolved in their respective populations so it may not be as easy to see but when populations are disturbed, evidence of sexual conflict can be seen. Therefore, the question is how is conflict resolved in populations of guppies with different histories? Even within the same species, there will be high and low predation systems: fish in high predation systems are more susceptible to predation than fish in low predation systems. Due to this difference, they will have different optimums which were measured by comparing sperm performance, specifically bundle dissociation, in ovarian fluid from both populations to gauge the level of sexual conflict and impact of life history. For this project, ovarian fluid was extracted from females and sperm bundles were extracted from males. Sperm bundles were placed in 3 different treatments: Hank's Balanced Salt Solution (HBSS) as the control, ovarian fluid from its population, and ovarian fluid from the opposite population. The dissociation was then measured and timed and will be used to determine any present sexual conflict.

PRESENTER: ANZIE PYO; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. JERNEJ MURN, BIOCHEMISTRY
PROJECT TITLE: CELLULAR QUIESCENT INDUCED BY RAPID DEPLETION OF RNASE MRP

Abstract unavailable due to ongoing research which is pending publication.

PRESENTER: AUBREY QIAN, MATHEMATICS
FACULTY MENTOR: DR. THEODORE GARLAND; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: THE ELEVATED PLUS-MAZE TEST AS AN INDICATOR OF BEHAVIOR IN HIGH RUNNER MICE SELECTIVELY BRED FOR VOLUNTARY WHEEL RUNNING

We are studying the personality axes of high runner (HR) mice with the elevated-plus maze (EPM) test to gain insight into the behavioral effect of artificial selection for higher voluntary wheel running in laboratory mice. For over 100 generations, mice have been bred in four independent, non-selected, control (C) lines and four selected (HR) lines bred for high voluntary wheel-running behavior. Over time, this has resulted in HR lines running three-fold more revolutions than the C lines on days 5 and 6 of a 6-day period of wheel running access and developed changes in various other traits (such as heart mass) that are conducive to locomotion. They have also evolved some differences in other behaviors, such as increased stereotypic behavior. A series of five behavioral tests were administered to both C and HR mice to test if certain behaviors have evolved differently between the C and HR mice.

The elevated plus maze is an established method of measuring anxiety in rodents. A maze with two open arms and two closed arms is elevated 1 meter above ground. In our experiment, mice are put in the center and allowed to move around the maze freely for five minutes. We analyze video recordings of the experiment with TopScan software to determine movement paths and how long the mice spend in

each segment of the maze. The project will produce data on anxiety and exploratory behavior and will contribute to our understanding of the overall effects of artificial selection on mouse behavior.

PRESENTER: REYNA QUINONEZ, MATHEMATICS
FACULTY MENTOR: DR. KIERAN SAMUK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: ENHANCING ANEUPLOIDY DETECTION IN GAMETES THROUGH A SINGLE-CELL RNA SEQUENCING PIPELINE

Single-cell RNA sequencing (scRNA-seq) has revolutionized our understanding of how cells function, providing unprecedented insights into gene expression at the single-cell level. In this project, we present part of a pipeline designed for scRNA-seq analysis of gametes with a specific focus on enhancing the detection of aneuploidy. Aneuploidy, the abnormal chromosomal content within cells, is a hallmark of numerous genetic disorders and cancers.

Our pipeline contains various steps such as quality control and differential expression analysis where we aim to find aneuploid cells. Using published data from "Single-cell sperm transcriptomes and variants from fathers of children with and without autism spectrum disorder" by Tomoiga et al. (2020), we implement computational methods to infer paternal haplotypes and analyze crossover events. This approach enables us to examine meiotic recombination patterns and identify potential chromosomal segregation abnormalities. By analyzing these crossover profiles and reconstructing paternal haplotypes, we can gain insight into chromosomal segregation as deviations can be an indication of potential aneuploidies.

PRESENTER: MELANIE QUINTANA, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. ELIA SCUDIERO, ENVIRONMENTAL SCIENCES
PROJECT TITLE: EVALUATING NEAR-GROUND CANOPY SENSING FOR LEAF MOISTURE CONTENT MAPPING IN MICRO-IRRIGATED ORCHARDS.

Leaf moisture content is an important indicator of tree health and status. In large orchards, assessing leaf moisture content supports precision irrigation decision-making and the identification of stress. This study aims to evaluate near-ground sensing, including visible and near-infrared active reflectance, passive infrared temperature, and passive microwave temperature, to measure tree canopy water content at high spatial resolution (<2 m) in a navel orange orchard (Citrus × sinensis Osbeck). The research was conducted at the University of California, Riverside's Experiment Research Station from November 2024 to January 2025. Measurements were collected in 11 rows on a 1-acre orchard. Sensors were mounted on the side of an all-terrain vehicle. Ground-truth data were collected at 10 selected trees by harvesting leaves, determining their fresh and dry weights, and measuring canopy density based on a reference volume. In the January 6 survey, the leaf water content, i.e., the mass of water divided by the dry weight, averaged 1.70 g/g (standard deviation = 0.15 g/g). The average canopy

density was 840.95 g of fresh weight per m3 (standard deviation 451.3 g/m3). The sensors showed weak or no correlations with canopy ground-truth measurements. The best correlation on January 6 was observed between the Normalized Difference Vegetation Index and average leaf water content, with a correlation coefficient = 0.40. Reasons for weak correlations may include failure to capture canopy water dynamics appropriately and errors in collating sensor data with plant data. Future research is needed to assess the viability of the tested sensors.

PRESENTER: GAYATRI RAUT; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTORS: DR. FRANCES SLADEK; MOLECULAR, CELL AND SYSTEMS BIOLOGY AND DR. SONIA DEOL, MICROBIOLOGY AND PLANT PATHOLOGY
PROJECT TITLE: CAN INTERMITTENT FASTING IMPROVE MITOCHONDRIAL FUNCTION IN MICE WITH OBESITY-RELATED METABOLIC DISEASE?

Mitochondria are small organelles in the cytoplasm of eukaryotic cells that are primarily responsible for producing nearly all of the cell's energy. Obesity is known to reduce mitochondrial biogenesis and function, thereby decreasing the energy molecule ATP. In contrast, intermittent fasting is known to increase mitochondrial function and ameliorate obesity-related metabolic diseases. Previous data from the lab showed that livers of mice on a 12-hour fast had increased expression of several genes involved in ketogenesis and mitochondrial function. In this project, we examined the effect of a high-fat diet based on soybean oil (SO), the most highly consumed cooking oil in the U.S., as well as an intermittent fast on mitochondria number and function in the liver. We compared the effects to an isocaloric high-fat diet based on grass-fed beef tallow and thiamine supplementation. We also examined the role of the transcription factor HNF4a in mitochondria function. An alternative isoform of HNF4a (P2-HNF4a) has been associated with fasting in the liver. Here, we show that mice expressing only P2-HNF4a may have increased mitochondrial function, consistent with their resistance to SO-induced obesity and improved longevity. Our preliminary results show intermittent fasting decreases mitochondrial DNA content, suggesting improved mitochondrial function. Future experiments will examine the role of ketogenesis, a process in the liver mitochondria that produces energy from fatty acids, in SO-induced obesity, intermittent fasting, and HNF4a function.

PRESENTER: SOPHIA REDDY, BIOCHEMISTRY
FACULTY MENTOR: DR. ALLISON HANSEN, ENTOMOLOGY
PROJECT TITLE: INVESTIGATING THE IMPACT OF HOST PLANT DIETS ON PSYLLID BACTERIOCYTE GENE EXPRESSION

The role of an insect's microbiome in insect-plant interactions is a dynamic area of research, yet significant knowledge gaps remain regarding the impact of nutritional endosymbionts in these complex relationships. While nutritional endosymbionts enable many insect species to thrive on nutrient-imbalanced diets, such as plant sap and wood, it remains unclear whether these insects actively regulate

their symbionts when feeding on different host plant diets. Psyllids are sap-feeding insects that host nutritional symbionts in specialized insect cells called bacteriocytes. The obligate bacterial symbiont, *Carsonella*, synthesizes essential amino acids that are necessary for insect survival. To investigate how host plant diet affects psyllid gene regulation in bacteriocytes, *Bactericera cockerelli* nymphs were reared on pepper or tomato. Bacteriocytes were dissected in 5th instar nymphs, and total RNA was extracted and sequenced. Gene expression analysis revealed only a small subset of differentially regulated genes between diets, primarily linked to starvation responses and cytoskeleton-associated functions. To better understand the phenotypic effects of host plant diet on psyllid fitness and bacteriocytes, bioassays revealed that psyllids feeding on tomato had more bacteriocytes and higher fitness than those on pepper. This suggests that diet plays a crucial role in both insect fitness and the production of bacteriocytes. Overall, these findings highlight key gene candidates to investigate to determine if they regulate their symbiotic cells and nutritional symbiont in response to host plant diets. Given that psyllids, including *B. cockerelli*, are major agricultural pests and disease vectors, understanding their biology and symbiotic relationships can inform pest management strategies.

PRESENTER: JORDAN REYES, BIOLOGY
FACULTY MENTOR: DR. KARTHIKEYAN CHANDRASEGARAN, ENTOMOLOGY
PROJECT TITLE: MOSQUITO BODY MASS VARIATION AFFECTS PERMETHRIN SUSCEPTIBILITY IN *AEDES AEGYPTI*

Mosquitoes, particularly *Aedes aegypti*, are an extremely invasive species in the United States, including California. They are prominent vectors for arboviruses that cause diseases such as dengue, Zika, and chikungunya, which pose significant public health threats. The most common method of controlling mosquito populations involves the use of chemical insecticides, including permethrin, picaridin, DEET, etc. However, this approach is becoming less effective due to the rise of insecticide resistance and environmental concerns regarding increased dosages and new chemical formulations. Previous research on insecticide resistance has largely considered mosquito populations as homogeneous, overlooking individual variations in traits such as body mass that may affect susceptibility to insecticides. My study addresses this gap by examining the relationship between mosquito body mass and resistance to permethrin across various dosages. We utilized both lab-derived (Rockefeller strain) and field-collected (susceptible and resistant) *Ae. aegypti* females and manipulated their adult body mass by altering their larval rearing conditions. Lower larval densities led to heavier mosquitoes due to increased food availability per capita, while higher densities resulted in lighter individuals. The experimental design includes exposing these mass-variant adult mosquitoes to specific doses of permethrin and evaluating their susceptibility rates using the CDC bottle bioassay. I hypothesize that heavier mosquitoes are less susceptible to permethrin compared to lighter individuals. My research aims to provide essential insights into body mass-specific resistance mechanisms, potentially guiding the development of more effective and environmentally sustainable mosquito control strategies.

PRESENTER: DIMA SAFFOUR, BIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: VALERIE PADILLA
PROJECT TITLE: TRANSMISSION OF MYCOBACTERIUM STRAINS BETWEEN MOTHER AND OFFSPRING

Mycobacterium is an endemic pathogen that impacts wild and lab reared populations of fish species, some of which we have observed in our lab. *M. chelonae, M. fortuitum,* and *M. marinum*, in particular, are strains found to induce pathogenicity. In the literature, there's been increasing numbers of studies regarding Mycobacterium because it's been a prevalent problem in fish hatcheries and lab reared stocks. However, there is still a research gap in determining maternal transmission in livebearing fish. In this study, I'll be looking at *Poeciliopsis gracilis* which is a livebearing species in our lab. Because the mode of provisioning in livebearing fish is internal, the mother and offspring likely share an immune system. This study aims to observe whether infected female fish can pass Mycobacterium to their offspring during development. Females displaying physical symptoms of Mycobacterium such as irregular swim patterns, skin lesions, and spine deformities will be collected, and an acid-fast stain will be performed on spleens from these fish to identify Mycobacterium rods. From there, we can determine the treatment groups, mothers found not infected by Mycobacterium, and positive mothers which would present with acid-fast rods. Other organs such as the gills, brain, liver, and ovary will undergo DNA extraction, and be analyzed using PCR. Following that, I'll determine whether a positively infected mother has passed down mycobacteria into the embryos developing in the ovary. Understanding how transmission occurs from mother to offspring in livebearing fish can contribute to existing knowledge on disease management in aquatic species.

PRESENTER: PAUL SAUCEDO, CHEMISTRY
FACULTY MENTOR: DR. ANA BAHAMONDE, CHEMISTRY
PROJECT TITLE: SUSTAINABLE NI-CATALYZED HYDROCYANATION ENABLES ACCESS TO NITRILES

Although nitriles are versatile building blocks and a prevalent motif in polymer synthesis, natural products, and commercial drugs, the extreme toxicity of their common precursors precludes their sustainable and safe synthesis in both academic and industrial settings. Identifying non-toxic CN sources is difficult due to the strength of C– CN bonds. This challenge has inspired us and other groups to identify and develop safer protocols using non-toxic CN sources. The theme of this research strategy is the design of a safe process that avoids the use of toxic CN sources and precious earth metals, thereby providing a means for an environmentally friendly approach to the synthesis of nitriles. The development of this protocol will provide access to a variety of medicinally relevant functional groups that are of general interest to the synthetic community, such as amines, amides, N-heterocycles, ketones, and other carbonyl-containing compounds. Herein, we have identified conditions that allow for C–CN bond activation for intermolecular Ni-mediated cross-coupling, which poses the potential for new Ni-catalyzed cyanation chemistries.

PRESENTER: BRICE SAUNDERS, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. MIGUEL ARRATIA, PHYSICS AND ASTRONOMY
PROJECT TITLE: PREPARATION FOR BEAM TEST AT JEFFERSON LAB

I was recently invited to attend a trip to Jefferson National Laboratory to set up and install a prototype detector. Throughout the week's work trip, lots of work and effort was put into ensuring that the detector was operational and taking data. I assisted in the transportation and assembling of the prototype at Jefferson National Laboratory. Many components are delicate and need to be treated with the highest level of care which is why I assisted in the transportation of components with the utmost caution, taking them on the plane and keeping them safe. Once landed I focused on completing radiation training which would ensure my safety and allow me to enter the accelerator site. Once trained the rest of the time was spent assembling the prototype piece by piece doing it carefully to ensure that no components were damaged. This included building a dark box so that no outside light could interfere with the prototype's collection of data. This build process focused on installing boards with SiPM tiles and connecting them to CAEN units to be able to wirelessly collect data. Once the prototype was built focus shifted to running tests to ensure that it was working properly. To test the prototype without using the beam that Jefferson Lab would create, we ran cosmic data on particles that would enter our prototype to ensure that it was collecting data.

PRESENTER: SARAH SERRANO, BIOLOGY
FACULTY MENTOR: DR. DAWN NAGEL, BOTANY AND PLANT SCIENCES
PROJECT TITLE: SUBCELLULAR LOCALIZATION OF SELECT *BBX*S IN RESPONSE TO HEAT

Climate change has led to increasing temperatures and negative impacts on crop production. In plants, the internal clock or circadian clock regulates how plants adapt to their environment, including response to stress such as heat. This research aims to characterize genes that play a role in the clock control of heat stress responses. Based on a previous study, we selected a group of transcriptional regulators, the *B-box* genes (*BBX*s), that are regulated by the circadian clock and responsive to heat stress at one or more times of the day. The *BBX* genes can be divided into five subfamilies and several members are involved in various growth and developmental processes in plants. Seven *BBX*s were selected to determine their subcellular localization under heat stress, providing insights into their regulatory function. For this assay, each gene of interest was placed into a construct containing a green or red fluorescent protein (GFP or RFP) tag and expressed with a constitutive promoter (*35S*). Constructs were then transiently transformed into *Nicotiana benthamiana* (Tobacco) leaves using a tobacco infiltration assay. Tobacco was grown in controlled conditions and then heat-stressed for 1hr. Infiltrated tobacco leaves were imaged using confocal microscopy to determine gene localization in both ambient and heat stress conditions. Preliminary results show that some of the *BBX*s change their subcellular localization after being exposed to heat stress. Understanding how these genes function in response to heat stress could help to make plants more heat tolerant and also increase crop production.

PRESENTER: JESSICA SHAO, BIOCHEMISTRY
ADDITIONAL PRESENTER: ZEEBA DARUWALLA, BIOCHEMISTRY
FACULTY MENTOR: DR. SEAN CUTLER, BOTANY AND PLANT SCIENCES
PROJECT TITLE: SYNTHESIS AND CHARACTERIZATION OF ABA-RECEPTOR ANTAGONISTS

As global temperatures rise and arid landscapes increase in scope, abiotic stress limits plant growth and productivity both in agriculture and natural ecosystems. In order to maintain crop yields, it is critical to understand the underlying mechanisms of how plants respond to abiotic stress. Stress responses are heavily regulated by the hormone abscisic acid (ABA). The ABA signaling pathway regulates germination, transpiration, root growth, water use, and stress responses which act as limiters on plant growth and development. In this study, we identify potential new ABA receptor antagonists that suppress these ABA-mediated stress responses and characterize their activity in plant model organisms. Initial candidate molecules identified from previous chemical screening were first synthesized, then characterized using *in vitro* phosphatase activity assays. Promising candidates were then taken forward to *in vivo* assays in the plant model organism *Arabidopsis thaliana*, to identify the effects of these antagonists on seed germination and root growth. These structures contribute to the growing body of ABA receptor antagonists and their possible application as useful research tools for studying the mechanisms of abiotic stress responses in plants.

PRESENTER: SEKIROU SHIMONO, MICROBIOLOGY
FACULTY MENTOR: DR. ANSEL HSIAO, MICROBIOLOGY AND PLANT PATHOLOGY
PROJECT TITLE: EXPLORING BIOFILM PRODUCTION AND ITS EFFECTS ON COMMENSAL MICROBE SURVIVAL IN *VIBRIO CHOLERAE* INFECTION

Vibrio cholerae, the causative agent of cholera, induces gut dysbiosis in human hosts, leading to various inflammatory diseases. Dysbiosis is triggered by the host immune response—through oxidative stress (OS)—when the presence of *V. cholerae* is detected. In this study, we investigate how *V. cholerae* takes advantage of the host-mediated OS response to select for the co-survival of the typical biofilm-producing *Bacteroides thetaiotaomicron* strain, which promotes pathogen growth. Our in vitro data show that the biofilm-producing *B. thetaiotaomicron* strain metabolizes mucin—a carbohydrate source—secreting nutrients that promote *V. cholerae* growth. We further examined the fitness of *B. thetaiotaomicron* strains and *V. cholerae* in vivo using fecal and intestinal samples collected from the adult CD1 mouse model. Additionally, antibiotic sensitivity tests reveal that *B. thetaiotaomicron* strains are resistant to gentamicin (200 µg/ml) and sensitive to erythromycin (25 µg/ml). To distinguish the quantification of fitness between the *B. thetaiotaomicron* strains, we conjugated an erythromycin-resistant gene into one of the strains. These findings have the potential to further our understanding of biofilm utilization in gut-localized infections and could serve as the basis for novel dysbiosis therapeutics.

PRESENTER: TALEEN SHOMAR; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. ERICA HEINRICH, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: VERONICA PENUELAS, KATHY PHAM AND SHYLEEN FROST
PROJECT TITLE: PROGESTERONE AND ESTROGEN INFLUENCE BASELINE BREATHING PARAMETERS AND CHEMOREFLEXES IN MENSTRUATING WOMEN

The hypoxic and hypercapnic ventilatory responses (HVR, HCVR, respectively) are the reflex increases in breathing in response to decreases in arterial oxygen or increases in arterial carbon dioxide partial pressures. Despite decades of research examining the effects of sex hormones progesterone and estrogen on ventilatory chemoreflexes, there remains no strong consensus and data are conflicting. Some studies have reported differences in the HVR in menstruating women compared to men and postmenopausal women, but data within menstruating non-pregnant women are less conclusive. We directly measured plasma progesterone and estradiol levels, as well as the HVR and HCVR using the Duffin modified rebreathing chemoreflex method, in 40 healthy, nonpregnant menstruating women. We hypothesized that higher progesterone levels would be associated with elevated HVR as previously reported in some studies. Our results indicate that higher progesterone levels, were either not associated with HVR, or associated with a moderate decrease in HVR depending on the level of isocapnia during testing (HVR at 50 mmHg $ETPCO_2$: $r_s = 0.12$, $p = 0.47$; HVR at 55 mmHg $ETPCO_2$: $r_s = -0.43$, $p = 0.03$). Similar results were obtained for estradiol/progesterone ratios (HVR at 50 mmHg $ETPCO_2$: $r_s = -0.02$, $p = 0.92$; HVR at 55 mmHg $ETPCO_2$: $r_s = -0.47$, $p = 0.02$). There was no association between progesterone and HCVR or the ventilatory recruitment threshold when measured in hyperoxic or hypoxic conditions. Overall, these findings indicate that the impact of progesterone on the isocapnic HVR in menstruating women may be moderate at lower hormone levels.

PRESENTER: JACQUELINE SHUM, MICROBIOLOGY
FACULTY MENTOR: DR. MARGARITA CURRAS-COLLAZO; MOLECULAR, CELL AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: ELENA KOZLOVA, ARTHA LAM, AND SAMIHA ALAM
PROJECT TITLE: VALIDATING CCK-SAP-MEDIATED DEAFFERENTATION OF CCK-RESPONSIVE VAGAL AFFERENT NEURONS USING CCKAR RNA *IN SITU* HYBRIDIZATION

Roughly ⅓ of veterans from the 1991 Persian Gulf War experience gastrointestinal and neurological pathologies characterized as Gulf War Illness (GWI). Studies demonstrate that these symptoms are associated with neuroinflammation and gut barrier and microbiome alterations. However, how gut-brain signaling contributes to GWI pathophysiology is poorly studied. In this study, as a first step to assessing the gut-brain axis in GW, we used the cholecystokinin (CCK)-saporin (CCK-SAP) method to produce vagal deafferentation and examined the proinflammatory response to the pathogenic stimulant, lipopolysaccharide (LPS). C57BL/6N adult male mice underwent bilateral selective vagal deafferentation through the injection of the neurotoxin, saporin, conjugated to CCK (CCK-SAP) (250nL, 250 ng/uL) into the nodose ganglia (NG), while the control group received Blank-SAP. After 6d of

deafferentation mice were stimulated with LPS (0.1mg/kg ip) and sacrificed 2h later. LPS-stimulated plasma IL-6 levels were significantly lower in CCK-SAP vs Blank-SAP mice (p<0.05, 3-10/group). *In situ* hybridization (RNAscope) was used to examine levels of CCK A receptors (*Cckar*) on cell bodies of VANs in NG. Using computer-assisted densitometry software (QuPath) we found significantly lower counts (47.86%) of *Cckar* positive cells per total cells (DAPI staining) in CCK-SAP mice vs Blank-SAP mice (p<0.05, n=5/group). These results suggest that vagal deafferentation using CCK-SAP method can be used to study the role of CCKAR VANs in inflammatory cytokine responses associated with gut brain interactions underlying GWI. Supported by DoD (MCC), UCR Student Minigrants (JS, SA).

PRESENTER: VALERIA SIMONYAN, BIOLOGY
FACULTY MENTOR: DR. ERIN WILSON-RANKIN, ENTOMOLOGY
PROJECT TITLE: EFFECTS OF HERBIVORE AND MECHANICAL DAMAGE ON NECTAR RESOURCES IN A NATIVE *PHACELIA*

Many native plants depend on pollinators to effectively transfer pollen and promote seed production. Nectar quality and floral display size are key floral characteristics that influence pollinator visitation. However, when a plant is exposed to damage, this can lead to changes in the quality of floral resources and floral display. As a result, flowers may receive fewer interactions with pollinators, which can reduce the plant's fitness. In our study, we used desert bluebells (*Phacelia campanularia*) to assess (1) whether manually administered mechanical leaf damage will evoke the same reaction in the plants as caterpillar related feeding damage, and (2) how leaf damage affects the floral resources produced by damaged plants.

We set up 18 study blocks containing 3 plants each (1 control, 1 herbivore damaged, and 1 mechanically damaged). We measured the initial leaf area of each plant using the app, LeafByte. Then, we introduced caterpillars to the designated plant within each block and monitored the damage for 2-3 days. The amount of leaf damage was replicated manually on the plants in the mechanically damaged treatment using pinking shears. Once the plants began to flower, nectar volume was sampled and the nectar quality (sugar concentration) was analyzed using a handheld refractometer. We also counted the number of flowers and measured floral width as a proxy of display size.

PRESENTER: TANISH SINGH, BIOLOGY
FACULTY MENTOR: DR. AHMED EL-MOGHAZY, MICROBIOLOGY AND PLANT PATHOLOGY
PROJECT TITLE: ANTIMICROBIAL ACTIVITY OF AVOCADO POMACE EXTRACTS AGAINST FOODBORNE PATHOGENS IN READY-TO-EAT FOOD

Ready-to-eat (RTE) foods have long been a convenient choice for Americans over the years, but they pose a significant risk of foodborne illness. According to the CDC, foodborne pathogens cause approximately 48 million illnesses, 128,000 hospitalizations and 3,000 deaths annually in the U.S. RTE

foods can be exposed to foodborne pathogens at any production stage, from live animal operations to final retail handling and home preparation. Accordingly, effective intervention strategies must be implemented in order to reduce foodborne illnesses. One promising approach to improving food safety and extending shelf life of RTE foods is the use of plant-based antimicrobial extracts, such as avocado pomace extracts. Avocado pomace, a byproduct of avocado processing, is rich in bioactive compounds with antimicrobial and antioxidant properties, which can reduce foodborne disease and spoilage risks and making it a natural alternative to chemical preservatives. In this ongoing study, the total phenolic content of aqueous avocado pomace extracts is being evaluated, along with their antimicrobial efficacy at varying concentrations against foodborne pathogen models, including *Escherichia coli* and *Listeria innocua*. Preliminary findings suggest that avocado pomace extract has the potential to be a safe and sustainable food additive for enhancing the safety and shelf life of RTE foods.

PRESENTER: DYLAN SMOCK; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTORS: DR. BENJAMIN MAKI, ENVIRONMENTAL TOXICOLOGY AND DR. SAMANTHA YING, ENVIRONMENTAL SCIENCES
PROJECT TITLE: INVESTIGATING ORGANIC CARBON AMENDMENT DEGRADATION UNDER OXIC AND ANOXIC CONDITIONS IN MANAGED AQUIFER RECHARGE BASIN SOILS

Managed aquifer recharge (MAR) is a suite of methods used to replenish groundwater supply. Aquifer replenishment uses a range of water sources such as surface water, treated wastewater, and stormwater. In the critically overdrafted basins of Pajaro Valley, farm owners are using a unique MAR method, DSC-MAR, which allows for on-farm infiltration of untreated stormwater. Small infiltration basins (~4 acre) are installed on the farmland and surrounding stormwater is funneled into the basin. However, untreated stormwater in agriculturally-dense regions like Pajaro Valley can have high concentrations of pollutants including nitrates. To perform in situ remediation of stormwater nitrate, carbon-rich media such as almond shells and wood mulch have been added to the aquifer basins to induce denitrification, a naturally occurring soil microbial process that reduces nitrate to nitrogen gas, which is impacted by carbon availability and quality.

However, the impacts of wet-dry cycling during seasonal rainfall events on carbon-rich amendments in MAR basins is not well understood. In this project, we used batch reactors to compare organic carbon release and degradation from carbon-rich amendments subjected to oxic, anoxic, or oscillating oxic-anoxic conditions. By assessing the influence of oxic-anoxic conditions on carbon amendment breakdown, we can determine which conditions promote dissolved organic carbon release and enhanced carbon media degradation. This would then allow for better insight into carbon amendment management at DSC-MAR sites for longer term in situ treatment of nitrate contamination in infiltrating waters.

PRESENTER: CASEY SOUDERS, BIOCHEMISTRY
FACULTY MENTOR: DR. KEVIN KOU, CHEMISTRY
PROJECT TITLE: EXPLORING THE UTILITY OF MONOVALENT OXYGEN CATIONS IN CHEMICAL SYNTHESIS

Oxonium ions are a well-established form of oxygen-centered cations, and these electrophilic oxygens serve a wide variety of functions in synthetic organic chemistry. However, oxenium ions, also known as oxylium ions, are a far less established source of electrophilic oxygen in synthesis. These monovalent oxygen cations typically exist as an aryloxenium ion, where the oxygen atom is covalently bonded to an aromatic component that stabilizes the positive charge through resonance. The major limitation of aryloxenium ions is that the resonance effect often leads to the aromatic component outcompeting the oxygen for reactivity thus; resulting in functionalization of the aromatic region instead of the oxygen atom. This study aims to synthesize aryloxenium ions that exhibit higher reactivity at the oxygen atom instead of the aromatic region by installing a Lewis basic neighboring group *ortho* to the oxygen atom. A Lewis basic neighboring group will interact with the oxenium ion, serving to promote the localization of the positive charge at the oxygen atom in favor of the aromatic region. This stabilization provided by the neighboring group may also provide additional benefit by allowing the oxenium ion to form at lower temperatures than previous methods have achieved. The localization of the positive charge around the oxygen atom should be sufficient to promote functionalization at the oxygen atom over the aromatic region. The utility of using aryloxenium ions for oxygen-functionalization will be surveyed via a substrate scope analysis.

PRESENTER: ANTHONY STEVENS, BIOCHEMISTRY
FACULTY MENTOR: DR. KEVIN KOU, CHEMISTRY
PROJECT TITLE: TOTAL SYNTHESIS OF SPIRALANFURANTONE A

Spiroalanfurantone A is a eudesmanolide-furan sesquiterpenoid adduct biosynthesized by *Inula helenium* in China and several other countries within Asia, Africa, and America. The isolation of spiroalanfurantone A from natural sources is difficult and results in low yield; this is problematic as its medicinal properties are highly valuable. More specifically, spiroalanfurantone A has been identified as a nitric oxide production inhibitor, meaning it has potential to reduce the severity of memory loss conditions and can combat migraine headaches. One important aspect of the synthesis is that biologically, scientists will be able to further explore the importance of nitric oxide cycle inhibition. Chemically, this complex natural product, along with a plethora of its derivatives have never been synthesized. Thus, synthesizing this molecule chemically is critical for future biomedical and chemical innovation. This project includes a seventeen-step synthesis involving a novel type-one intramolecular furan Diels-Alder reaction to form an underexplored 1,1-disubstituted alkene and a reductive oxabicycle ring-opening reaction which develops the tricyclic lactone core of spiroalanfurantone A. At this time, we have successfully completed ten of the seventeen synthetic reactions with reproducible results. Throughout the next year, I expect to complete the remaining seven steps to access the complex natural product in just seventeen total steps. With the completion of the seventeen-step strategy,

spiroalanfurantone A would become more easily accessible across the world and would be highly beneficial for future biochemical and biomedical evaluations.

PRESENTER: HARRY STOLTZ, MATHEMATICS
FACULTY MENTOR: DR. THOMAS KUHLMAN, PHYSICS AND ASTRONOMY
PROJECT TITLE: A MATHEMATICAL MODEL FOR GENETIC MOSAICISM

Genetic Mosaicism is a rare condition where every cell in the developing brain is genetically unique. Generally studied from a biological point of view, we explore the action of transposons and retrotransposons using techniques from linguistics and physics. We construct a Mosaicism "grammar" *G* using transposons and retrotransposons to create production rules, and then apply mathematical linguistics literature to gain insight into the language L(G). Finally, we use Levenstein's distance function as a Lagrangian to analyze differentiation pathways.

PRESENTER: SREENIDHI SURINENI, BIOMEDICAL SCIENCES
FACULTY MENTOR: DR. SIKA ZHENG, BIOLOGICAL SCIENCES
ADDITIONAL CONTRIBUTOR: DAVID NIKOM, BIOMEDICAL SCIENCES
PROJECT TITLE: AUTOMATED DETECTION AND QUANTIFICATION OF AXONAL SWELLING IN AN ALZHEIMER'S DISEASE MODEL USING A MACHINE LEARNING METHOD

Automated detection and classification of pathological features in neurodegenerative diseases, such as Alzheimer's disease (AD), is crucial for understanding disease progression and developing therapeutic interventions. Axonal swelling, an early pathological marker in AD, is traditionally quantified manually, which is time-consuming and prone to variability. To address these challenges, we developed ASCAM (Axonal Swelling Classification and Analysis Model), a two-part machine learning solution. ASCAM first uses a classification model to distinguish images containing axonal swellings from those without, followed by an object detection model that accurately identifies and quantifies swellings in stained pons brain sections from AD mouse models.

The object detection model was trained on 7,144 images and tested on 188, with ground truth annotations provided by a blind observer. Data augmentation techniques, such as rotation and scaling, were employed to enhance generalization. Using a deep learning architecture optimized for small object detection, the model achieved a boundary F-score of 0.6636 at a 4-pixel threshold and a Pearson's correlation of 0.961 with manual quantification. The classification model, which differentiates swelling-positive from swelling-negative images, achieved a validation accuracy of 93%, streamlining the analysis pipeline.

Together, these models provide a scalable solution that significantly reduces the time and variability associated with manual methods, offering a robust tool for neurodegenerative disease research. This method can also be adapted for detecting other pathological features across various staining techniques, with potential applications in neurodegenerative, cancer, and inflammatory disease research.

PRESENTER: LOVLEEN SWATCH, NEUROSCIENCE
FACULTY MENTOR: DR. EDWARD ZAGHA; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: THE FUNCTION OF MOTOR CORTEX FOR A SELECTIVE DETECTION TASK IN MICE

How do we filter out distractions and respond to relevant cues? Everyday scenarios, such as driving on a busy highway or navigating through a grocery store, require us to perform this cognitive function. Various frontal cortex regions play roles in directing goal-directed behavior. The motor cortex (MC) plays a vital role in motor skill acquisition and execution. While traditionally associated with movement initiation (Sreenivasan et al., 2016) and motor preparation (Chen et al., 2017), recent studies suggest contradictory roles, such as movement suppression (Ebbesen et al., 2017), and motor learning (Kawai et al., 2015; Mizes et al., 2024). The role of MC is still debated as studies show additional involvement in sensory processing and choice-related activities (Zhang & Zagha, 2023). The tongue-jaw motor cortex (tjM1) has been suggested to play a specialized role in task-specific motor output (Mayrhofer et al., 2019). To investigate this, we trained mice in a sensory discrimination task and examined tjM1's contribution to task performance after learning. We alternated between saline control and muscimol injections, to induce suppression in tjM1 in expert mice (defined as $d' \geq 1$). While saline injections sustained expert-level performance, suppression of tjM1 led to a stable reduction in discrimination ability. The overall tendency to respond was initially reduced with tjM1 suppression, but was compensated for throughout the session. Our findings highlight tjM1 as a critical region for performing a sensory-motor selective detection task. Future experiments will explore its role in decision-making, providing deeper insights into how MC circuits contribute to goal-directed behaviors.

PRESENTER: KURT TAMARU, BIOLOGY
FACULTY MENTOR: DR. JOY XIANG, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: KAREN ZHAO, LALIV TADRI, DANH NGUYEN AND VALENTINA TORRES
PROJECT TITLE: EXAMINING THE REGULATORY ROLE OF SARS-COV-2 ORF9C ON TRANSLATION

SARS-CoV-2, the virus responsible for the COVID-19 Pandemic, is a positive-sense single-stranded RNA virus. The SARS-CoV-2 genome codes for 15 Open-Reading Frames (ORFs) that encode 29 viral proteins. Despite the surge of research on this virus, many functions of SARS-CoV-2 proteins still remain unknown. Therefore, we systematically characterized SARS-CoV-2 proteins to determine their role in regulating gene expression and found ORF9c to display the strongest upregulatory effect on translation. ORF9c is

an accessory protein that potentially plays a role in the virus' life cycle in evading host immune response, yet little is known about its role in regulating gene expression. We hypothesized that its regulatory activity depended on cellular translation initiation factors. Using AlphaFold3 to predict protein structure and interactions, we noted and mutated possible points of interaction between ORF9c and translation initiation factor eIF4G. We also truncated the predicted transmembrane domain which may play a role in anchoring ORF9c to the endoplasmic reticulum for RNA recruitment and translation. Using a dual Renilla and Firefly luciferase assay, we found the Q41A point mutation displayed a 50% decrease in translation upregulation when compared to wildtype ORF9c and the deletion of its transmembrane domain abolished its upregulatory activity. Inhibition of ORF9c's upregulatory behavior at these two mutation sites indicates the potential importance of its interaction with eIF4G and its transmembrane domain for regulating gene expression. Further characterization of ORF9c, a protein conserved among bat coronaviruses, can provide insight into the development of therapeutics and help safeguard against SARS-CoV-2 and potential SARS-like viruses.

PRESENTER: CHRISTIAN TAN, BIOLOGY
FACULTY MENTOR: DR. WENDY SALTZMAN; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: THE DEVELOPMENT OF PARENTAL BEHAVIOR IN THE BIPARENTAL RODENT *PEROMYSCUS CALIFORNICUS*

In many mammalian species, females show pronounced changes in their behavioral responses to infants across pregnancy and the postpartum period. In 5-10% of mammals, fathers, in addition to mothers, provide care for their offspring. However, the timeline over which the onset of paternal responsiveness develops is not well understood. For both sexes, reproductively inexperienced animals often avoid or attack infants, whereas parents show strong parental responsiveness. We quantified the behavior of the biparental California mouse, *Peromyscus californicus*, to examine how virgin males transition into parental fathers and the possible sex differences in this process. Each male and female mouse was tested with an unfamiliar, neonatal pup for 10 minutes at a single time point either shortly before or after being paired with an opposite-sex mate, across the female's gestation (days 2, 11-12, 20-21, and 30-31), or after the birth of their first litter. We predict that virgin males and females will show little or no parental behavior, whereas mothers and fathers will be highly parental. We further anticipate that males will show increasing parental responsiveness across their mates' pregnancy, whereas females will not become parental until shortly after giving birth. Finally, we predict that males will exhibit more parental behavior than females at every time point. Our findings will provide new, detailed information about the onset of parental behavior in males and females of a biparental species and will lay the foundation for future studies examining the neural mechanisms of this behavioral plasticity.

PRESENTER: JOHN TATE, BIOCHEMISTRY
FACULTY MENTOR: DR. ERNEST MARTINEZ, BIOCHEMISTRY
PROJECT TITLE: THE DOMAINS OF YEATS2 MAY HAVE A PIVOTAL ROLE IN REGULATING RIBOSOMAL PROTEIN GENES

Despite technological advances, cancer remains one of the leading causes of death in the United States. One of the recent ways that cancer has been thought to arouse is through irregular post translational modifications of histones. For instance, the addition of an acetyl group causes there to be more electron density on a histone leading to a loss of attraction to DNA. Under physiological conditions, histone acetylation is controlled by histone acetyltransferases (HATs) and histone deacetylases (HDACs). Furthermore, some novel histone acetyl transferases such as ATAC have been thought to play a broader role than acetylation. However, analysis of ATAC is complicated since some of its subunits such as YEATS2 have yet to be fully characterized. For instance, YEATS2 is comprised of two domains (a YEATS domain and a C-terminal histone fold domain) that have very little information. In the context of cancer therapy this is important as treatments targeting a domain are likely to be very successful. In recent years there has been more information being published about the YEATS domain of YEATS2. However, there is not much information regarding the importance of the C-terminal histone fold domain. This is problematic as this domain has been thought to play a negative role in transcription. Recently, it was found that YEATS2 is required for the expression of ribosomal protein genes. As a result, it would be interesting to identify ribosomal proteins genes that are affected by mutations in the domains of YEATS2.

PRESENTER: OHNMAR THWIN, BIOLOGY
FACULTY MENTOR: DR. DAWN NAGEL, BOTANY AND PLANT SCIENCES AND DR. RACHEL STROUT, BOTANY AND PLANT SCIENCES
PROJECT TITLE: HEAT STRESS PHENOTYPING ASSAYS TO INVESTIGATE THERMOTOLERANCE IN *ARABIDOPSIS THALIANA*

Plants are constantly exposed to environmental stresses, with abiotic stresses affecting their survival and growth. Among these, heat stress triggers complex transcriptional signaling cascades that regulate thermotolerance. In this study, we optimized a phenotyping assay to assess plant responses to heat stress by measuring basal and acquired thermotolerance in the plant model *Arabidopsis*. We tested a range of temperatures and treatment durations based on previously published protocols, using wild type (Col-0) and a heat sensitive mutant *hsp101*. We identified effective treatments to assess basal thermotolerance through assaying survival and treatments to assess acquired thermotolerance by investigating survival and hypocotyl elongation. Using this optimized approach, we examined heat stress survival across lines overexpressing or mutating the circadian clock genes *CCA1* and *LHY*. Results showed that altering the expression of key clock genes did not have thermotolerance effects. Additionally, we explored the role of BBX transcription factors in regulating hypocotyl elongation in response to heat stress. Based on our findings, BBX24 potentially acts as a repressor to hypocotyl growth. Future research will focus on further optimizing this assay and investigating additional mechanisms involved in plant heat stress responses.

PRESENTER: LY TRAN, NEUROSCIENCE
FACULTY MENTOR: DR. KIERAN SAMUK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: TESTING THE NEUROMORPHOLOGICAL CORRELATES OF PATERNAL CARE BEHAVIOR IN THREESPINE STICKLEBACKS

Researchers have long studied the relationship between parental care behavior and brain size in vertebrates. This idea, known as the Parental Brain Hypothesis (PBH), suggests that the complex behavior of parental care requires additional resources in the brain dedicated to cognition and sociability. Two closely-related species of threespine sticklebacks (*Gasterosteus aculeatus*), the "common" and "white" forms, differ greatly in paternal care behavior. Whilst the common males care for offspring from conception to birth, white males perform almost no care at all. Previous research has shown that white males have relatively smaller brains per body mass than common males, suggesting that the PBH may play a role in this system. However, the neurological structures contributing to the behavioral differences between them are currently unknown. We aim to utilize this "natural knockout" to investigate potential neural structures associated with paternal care in the male common and white threespine sticklebacks. Our current work includes optimizing diceCT staining parameters to provide accurate digital 3D reconstruction of the brains. We will then conduct volumetric/structural analyses to determine differences in brain size and structure between the two species. We predict that the white stickleback males will have a volumetric decrease in brain structures associated with cognition relative to common stickleback males. Our findings may further contribute to the understanding of or cultivate more questions about the correlation between parental care and brain size/structure.

PRESENTER: HARRISON TRAN, BIOLOGY
FACULTY MENTOR: DR. KATE OSTEVIK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: ALLELOCHEMICAL POTENTIAL: SHORTPOD MUSTARD LEACHATE AS A NATURAL HERBICIDE FOR SUNFLOWER GERMINATION CONTROL

Synthetic herbicides, while effective, pose significant environmental and health risks, prompting the search for sustainable alternatives. This study investigated the potential of allelochemicals, specifically leachate from Shortpod Mustard (*Hirschfeldia incana*), as a natural herbicide to inhibit the germination of Common Sunflower (*Helianthus annuus*) seeds. The experiment compared the germination rates of sunflower seeds treated with varying concentrations of Shortpod Mustard leachate (0%, 10%, 20%) and a synthetic herbicide containing glyphosate. Results demonstrated that a 20% leachate concentration significantly reduced sunflower seed germination, with effectiveness comparable to the synthetic herbicide. Statistical analysis, including ANOVA and Chi-squared tests, supported these findings, showing a strong negative correlation between leachate concentration and germination rates. These results suggest that Shortpod Mustard leachate might be a viable, eco-friendly alternative to synthetic herbicides, offering a sustainable solution for weed management while minimizing environmental impact.

PRESENTER: RYAN TSIAO, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. MIGUEL ARRATIA, PHYSICAL SCIENCES
PROJECT TITLE: PEDESTAL ANALYSIS IN A SIPM-ON TILE HADRONIC CALORIMETER PROTOTYPE FOR THE ELECTRON-ION COLLIDER

Detecting fragment particles from the electron-ion collisions taking place in the future Electron-Ion Collider is crucial for understanding the internal structure of the proton. Our prototype hadronic calorimeter utilizes SiPM on-tile technology to quantify the energy deposited by these fragments while generating a high-resolution map of the particle showers. The prototype, recently installed in Jefferson Lab Hall D, will detect ~4GeV positrons to test its performance under particle exposure. In order to operate the detector, we calibrate each channel independently, in order to improve the energy resolution of the detector. In this study, we analyze the noise characteristics of each channel to ensure that each is working correctly. Additionally, we use the results of our analysis to omit the noise from events recorded by our detector. We also investigate the correlation between noise and temperature to understand how performance will vary in thermal fluctuations. Insights from this analysis will validate the quality of data returned by our channels, guide calibration of event data, and inform our approach to handling temperature fluctuations.

PRESENTER: ABHISHTA UMESH, BIOLOGY
FACULTY MENTOR: DR. VINCENT LAVALLO, CHEMISTRY
PROJECT TITLE: APPLICATIONS OF CARBORANE ANIONS: SYNTHESIS AND DEVELOPMENT OF ELECTROLYTES FOR ENHANCED BATTERY SYSTEMS

Climate change, driven by greenhouse gas emissions from nonrenewable energy sources, has become a global concern that has led towards utilizing renewable energy sources and thereby the development of efficient methods to store this energy. Lithium-ion batteries (LIBs) are currently at the forefront of technology, but are limited by the low natural abundance of lithium and the inherent safety hazards they possess. Alongside the developments in LIBs, researchers have investigated alternative, multivalent battery systems that are more abundant and can deliver more charge per ion. However, these alternatives are also rife with issues arising from chemical instability of the electrolyte components. Therefore, the investigation of developing high-performance battery electrolytes is essential for improving energy storage efficiency and mitigating such safety hazards. To further these fields, we aim to implement carborane anions to improve the inherent stability within an electrochemical cell. These anions exhibit high thermal and electrochemical stability, which aids in withstanding chemical decomposition and consumption of the electrolyte. In this poster presentation, we will discuss the synthesis of the 10-vertex carborane anion and the synthetic techniques used to functionalize the anion with aim to yield desirable properties for battery systems. To analyze the chemical composition and purity of the anions, we employ multinuclear NMR spectroscopy and mass spectrometry. Subsequently, we explore synthetic routes to pair these anions with the desired metal cations under anhydrous

conditions. Our future work entails the implementation of these salts as ion conductors in secondary battery systems and the characterization of the electrochemical data.

PRESENTER: SAMYUKTHA VEDULA, BIOLOGY
ADDITIONAL PRESENTER: SHAYLA NGUYEN, BIOLOGY
FACULTY MENTOR: DR. MANUELA MARTINS-GREEN; MOLECULAR, CELL AND SYSTEMS BIOLOGY
PROJECT TITLE: THE EFFECTS OF N-ACETYL-CYSTEINE, GENTAMICIN, AND CIPROFLOXACIN ON BACTERIAL BIOFILM IN VITRO IN THE PRESENCE OR ABSENCE OF HIGH OXIDATIVE STRESS AND HIGH GLUCOSE LEVELS

Chronic wounds become colonized by pathogens, primarily bacteria, and these infections often result in the development of biofilms. Unfortunately, antibiotics alone often fail to resolve chronic wound infections, partly because antibiotics are ineffective at killing bacteria in biofilms. Persistent biofilms in chronic wounds significantly delay wound healing. The purpose of this study is to determine whether *Enterobacter cloacae (Ec), Pseudomonas aeruginosa (Pa),* and *Staphylococcus xylosus (Sx)* can naturally form biofilm, the effects of N-acetyl-cysteine (NAC), gentamicin, and ciprofloxacin on biofilm growth, and the impact of high levels of oxidative stress and glucose on their efficacy. The bacteria were cultured *in vitro* and allowed to form biofilm for 24 hours. They were then treated with N-acetyl-cysteine (NAC) and NAC+gentamicin+ciprofloxacin, under conditions of high levels of oxidative stress (OS)—by adding hydrogen peroxide—and elevated d(+)-glucose levels. We found that, when used by itself or with antibiotics, NAC is able to significantly dismantle existing biofilm, even when the bacteria are combined. However, with high OS, NAC isn't as effective at dismantling existing biofilm, especially when the bacterial strains are combined. Similar effects are seen with high glucose levels. The combination of these two conditions has no additional significant impact on biofilm dismantling. In conclusion, NAC alone significantly dismantles existing biofilm, especially when combined with antibiotics, but NAC is less effective at dismantling biofilm when high OS and high glucose levels are present. Nevertheless, NAC, when combined with antibiotics, is still effective in dismantling biofilm.

PRESENTER: JUSTIN VINUYA, BIOCHEMISTRY
ADDITIONAL PRESENTER: ADAM IZAGUIRRE, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. ABASIOFIOK M IBEKWE, ENVIRONMENTAL SCIENCES
PROJECT TITLE: IMPACT OF TREATED MUNICIPAL WASTEWATER ON ANTIMICROBIAL DEVELOPMENT IN *E. COLI* AND *ENTEROCOCCUS*

In this experiment, we evaluated the impact of treated municipal wastewater (TMW) spiked with varying levels of antibiotics—trimethoprim, sulfamethoxazole, and erythromycin—on *E. coli* and *Enterococcus* recovered from the edible portion of lettuce, spinach, carrots, and radish that had been irrigated with TMW for eight weeks. The study was conducted in twenty-four large outdoor growing

tanks filled with sand. Over approximately eight weeks, these tanks were irrigated once daily with either tap water or treated municipal wastewater containing 0, 10, or 100 ppb of antibiotics. Water samples were analyzed weekly for the presence of *E. coli* and *Enterococcus*. Antibiotic resistance was assessed using the Sensititre system, which facilitates inoculation, incubation, reading, and interpretation to determine the potential transfer of antibiotics from TMW to the edible portion of crops. The findings would help us understand which antibiotics are most transferable to bacteria in the agricultural environment. Knowing the presence of antimicrobial resistance in agricultural environments may provide guidance for food protection and public health.

PRESENTER: SHIVALI VISHWAKARMA, BIOLOGY
ADDITIONAL PRESENTER: NEHA VALLURI, BIOLOGY
FACULTY MENTORS: DR. LOUIS SANTIAGO, BOTANY AND PLANT SCIENCES AND DR. GABRIELLE MONEYMAKER, BOTANY AND PLANT SCIENCES
PROJECT TITLE: CAMOUFLAGE: DETECTING HIDDEN CAM PHOTOSYNTHESIS IN GIANT DESERT ROSETTES

As temperatures and extreme weather events increase, climate change is becoming a pressing issue for the environment. Droughts impact ecosystems globally, especially deserts. Physiological tools, such as determining photosynthetic pathways, help us understand how plants respond to drought and climate change. Our study focuses on the photosynthetic adaptations of giant desert rosettes (GDR) and whether they perform latent Crassulacean Acid Metabolism (CAM) in addition to C_3 photosynthetic pathways. Latent CAM is hidden CAM that plants may use in addition to the main C_3 pathway. We aim to determine if latent CAM exists in GDR species, including *Yucca, Nolina, Hesperoyucca, Dasylirion,* and *Aloedendron*. Using stable isotope ratios and acid titration, we will assess whether these plants conduct latent CAM or C_3 photosynthesis. We hypothesize that GDRs from historically drier, lower-altitude climates will perform latent CAM due to their adaptive response to water availability. An inventory of twenty GDRs in the UCR Botanical Garden was created. Three leaf samples will be collected from each plant and analyzed at UC Riverside's Facility for Isotope Ratio Mass Spectrometry. We will use acid titration to detect latent CAM, as CAM plants exhibit high morning acidity from overnight malic acid accumulation, which decreases by night as it converts to CO_2 for photosynthesis. For the same 20 plants sampled for isotopes, three leaf samples will be collected in the morning and evening. As climate change intensifies droughts, CAM photosynthesis may be critical for desert ecosystems. Conservation strategies can use this knowledge to protect or reintroduce drought-resilient species, supporting biodiversity and ecosystem resilience.

PRESENTER: JORDAN WIMBERLY, NEUROSCIENCE
FACULTY MENTOR: DR. IRYNA ETHELL, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: VICTORIA WAGNER, NEUROSCIENCE
PROJECT TITLE: EFFECTS OF SNAP-5114 INJECTION ON PV CELL ACTIVITY IN FXS MOUSE MODEL

Fragile X Syndrome (FXS) is a genetic disorder caused by a loss of function of the FMR1 gene, leading to similar symptoms as autism, including sensory hypersensitivity and cortical hyperexcitability. Recent observations in humans and Fmr1 knockout (KO) animal models of FXS suggest symptoms are mediated by abnormal GABAergic signaling. As most studies have focused on neuronal mechanisms, the role of astrocytes in mediating defective inhibition in FXS is largely unknown. We found that KO mouse astrocytes have increased GABA and GABA synthesizing enzyme GAD 65/67. Astrocytes can transport GABA, affecting extracellular GABA levels contributing to tonic inhibition. We hypothesized that KO astrocytes were releasing excess GABA and that would result in less active parvalbumin-positive (PV) inhibitory neurons. Using an astrocyte-specific Fmr1 knockout (cKO), we pharmacologically blocked astrocyte-specific GABA transporter GAT3 using SNAP-5114 or vehicle-treated mice prior to perfusion, and immunostained auditory cortex, frontal cortex, and hippocampus for either GABA and astrocyte marker GS or PV and cFos, an indicator of recently active cells. This work can provide insight into astrocytic regulation of GABAergic signaling as a potential therapeutic approach for hypersensitivity in FXS.

PRESENTER: PENELOPE WU; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: SPERM SELECTIVITY IN POECILIIDAE

During the journey from sperm to the egg, there are barriers in which females' bias paternity through cryptic female choice. As female reproductive biology evolves further complexity, these barriers can have a much larger impact on sperm success. Livebearing fish family Poeciliidae represents a perfect system to study the impact of increasing reproductive complexity on sperm success through cryptic female choice (CFC). Several species in the family have the functional equivalent of a mammalian placenta, making them a unique model to study CFC. Non-placental species practice pre-copulatory mate choice and have males that are brightly colored and courtship displays. Males of placental species lack these traits. Females instead rely on post-copulatory mate choice (CFC). For a female to bias paternity, she must have some method of sperm selection, which can be through sperm-fluid interaction, sperm storage, or sperm-egg interactions. We know from previous work that females reduce provisioning to embryos sired by foreign males. We are trying to determine if they can also discriminate among stored sperm and in that way influence which male's sperm fertilize eggs. If sister females are mated with males of the same species from two different populations, in theory they will favor the male from her own population. We designed an experiment where females are artificially inseminated with sperm of males from the same population and from a different one. Sperm will be

isolated from the ovary and quantified through flow cytometry. We predict that sperm from her own population will have better survival.

PRESENTER: KAYDENCE ZELEDON, BIOLOGY
FACULTY MENTOR: DR. NATALIE HOLT; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: THE EFFECT OF EARLY-LIFE EXERCISE ON MUSCLE-TENDON UNIT MORPHOLOGY IN MICE

In the past decade, exercise levels have declined leading to an increased risk of health-associated complications, decreased motivation and capacity to move. Early-life exercise, (engaging in physical exercise at an early childhood period) has been suggested to increase motivation in later life due to changes to the musculoskeletal system that increase ease of exercising. This study examines the morphological physiological effects of early-life exercise on the musculoskeletal system, particularly the muscle-tendon units, hypothesizing that a body that has been exposed to higher levels of endurance exercise during growth will have morphological features that promote endurance running in later life such as a reduced muscle mass, reduced muscle fiber length, increased muscle pennation angles, increased tendon length and reduced tendon width. Laboratory mice were raised with different opportunities to exercise with a control group having no exercise wheel access, a low exercise group having access to a non-resistant exercise wheel, and a high exercise group with access to an exercise wheel with minimal resistance, and the number of wheel revolutions during growth monitored. At the end of the growth period (3 months) and later in life after a 3-month washout period (6 months), mice were euthanized and muscle-tendon unit morphology of the triceps surae muscle groups will be determined.

PRESENTER: CORI ZUVIA, NEUROSCIENCE
FACULTY MENTOR: DR. PRUE TALBOT; MOLECULAR, CELL AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTOR: ANN SONG; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
PROJECT TITLE: EVIDENCE THAT SARS-COV-2 VIRUS IS A HUMAN TERATOGEN IN PREGNANT WOMEN WITH COVID-19

Little is known about SARS-CoV-2 infection of human embryos and fetuses in pregnant women with COVID-19. Previously, we established a “disease-in-a-dish model” to identify drugs that can inhibit SARS-CoV-2 infection during prenatal development. H9 human embryonic stem cells (hESCs) were differentiated into three germ layers (endoderm, mesoderm, ectoderm) and infected with SARS-CoV-2 pseudoparticles. Interestingly, ectoderm had a much higher infectability than endoderm and mesoderm, supporting the idea that SARS-CoV-2 is a human teratogen and that nervous system derivatives are particularly susceptible to SARS-CoV-2 infection. Based on these data, we hypothesized that neural stem cells (NSCs) derived from H9 hESCs (ectodermal lineage) are susceptible to SARS-CoV-2 infection. Immunocytochemistry showed that NSCs expressed the neural markers, NESTIN and PAX6, indicating successful differentiation. These cells were used to confirm the expression of SARS-CoV-2 infection

machinery, the ACE2 receptor and the TMPRSS2 protease. In addition, SARS-CoV-2 pseudoparticles representing both wild-type and Omicron variants successfully infected NSCs, supporting our hypothesis. Taken together, our data are consistent with the conclusion that SARS-CoV-2 is a teratogen affecting embryonic and fetal neural cells. These results will benefit the embryos/fetuses of pregnant women with COVID and help minimize loss or damage to the unborn.

STUDENT PRESENTERS

In alphabetical order of lead presenter by college:

School of Education

PRESENTER: SIYA BHAKTA, PSYCHOLOGY
FACULTY MENTOR: DR. KINNARI ATIT, EDUCATION
ADDITIONAL CONTRIBUTOR: ALEXIS FENGER
PROJECT TITLE: EXAMINING THE EFFECTS OF VIRTUAL VS. PHYSICAL LEGO MODELS ON 3D SPATIAL LEARNING

Science, Technology, Engineering, Math (STEM) learning is challenging as it requires the comprehension of 3D spatial content (Stull et al., 2012). Educators frequently use external manipulatives to support students' understanding of 3D spatial information. Previous research has investigated whether physical or virtual models lead to larger learning gains in STEM specific topics, but results remain mixed (Casselman et al., 2021; Justo et al., 2022). However, whether virtual or physical models support student's 3D spatial learning through a domain-general lens is not well-understood. Additionally, there is a lack of understanding of the differences in cognitive load students experience when interacting with the two model types. Cognitive load refers to the mental effort it takes to process information, and is crucial for assessing the level of difficulty students experience with different types of models. My study will compare students' perceived cognitive load after constructing virtual or physical LEGO models. The coloring task will serve as the control group and is included to give a baseline cognitive load to compare with the other conditions. Cognitive load will be measured using a 5-point Likert scale where participants will score their perceived difficulty after constructing each model from 1(least difficult) to 5 (most difficult). Ayres et al. (2021) suggests subjective measures of cognitive load are a valid method of comparing cognitive load differences. Participants' ratings of cognitive load will be compared across conditions using a between-subjects ANCOVA. Results will inform instructors on the best practices for integrating digital tools to support 3D spatial learning.

PRESENTER: ALEXANDRA COLLAO, LIBERAL STUDIES
FACULTY MENTOR: DR. JOSÉ DEL REAL VIRAMONTES, EDUCATION
PROJECT TITLE: VOCES QUE IMPORTAN: A SYSTEMATIC LITERATURE REVIEW OF THE EXPERIENCES OF LATINX COMMUNITY COLLEGE TRANSFER STUDENTS

Latinx students often enroll in community colleges as a pathway to transfer to four-year institutions and earn their bachelor's degrees. However, data reflects disparate rates at which Latinx community college students are transferring to four-year institutions. In this systematic literature review I use a thematic analysis approach to identify and synthesize common challenges and barriers faced by Latinx community college transfer students. Specifically, I focus on the experiences of these students during their time at community college and after they transfer to a four-year institution. The findings showed students

experienced challenges that can be described as nonacademic, academic, and institutional and highlight the need for equity driven programs, policies, and practices that can help foster success among Latinx community college transfer students at both the sending and receiving institutions. Additionally, this systematic literature review on the transfer experiences of Latinx community college students, reveals recommendations that will better support their ability to navigate within these spaces using various types of cultural and social capitals. This review concludes by acknowledging the need for more on-going research that values the unique experiences of Latinx community college transfer students so that researchers may continue to provide accurate and impactful recommendations to community college and four-year institution leaders and policy makers in order to improve transfer rates and degree attainment.

PRESENTER: NATALIE DAHL, EDUCATION
FACULTY MENTOR: DR. BEGOÑA ECHEVERRIA, EDUCATION
PROJECT TITLE: TEACHING SOCIAL EMOTIONAL LEARNING SKILLS THROUGH FAIRY TALE-BASED MINI PLAYS

Social-emotional learning (SEL) is essential for the holistic development of children, fostering emotional regulation, empathy, and social adeptness. This project integrates SEL principles with creative storytelling by developing five mini plays based on classic fairy tales, each corresponding to a core SEL skill: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. By engaging in theatrical performances, children enhance their communication skills, confidence, and ability to navigate social dynamics. The familiar narratives of fairy tales make SEL concepts more accessible and engaging, reinforcing lessons through imaginative play. Designed as an easily implementable unit for educators, this project includes structured lesson guides, vocabulary resources, comprehension checks, and printable scripts, offering a dynamic and interactive approach to SEL instruction. Through this method, students develop critical life skills while fostering creativity, collaboration, and cultural awareness.

PRESENTER: WENDY NABOURS, EDUCATION
FACULTY MENTOR: DR. MICHAEL SOLIS, EDUCATION
PROJECT TITLE: OPPORTUNITIES TO RESPOND IN THE CLASSROOM TO ENHANCE LEARNING FOR STUDENTS WITH LEARNING DISABILITIES

As many students diagnosed with learning disabilities face disadvantages learning in the classroom, there is an increasing need to better understand how educators can level the playing field and aid students in overcoming these challenges. Previous research has shown that students with learning disabilities respond well when presented with Opportunities to Respond (OTR). In several studies, the incorporation of Opportunities to Respond within the existing curriculum increased student outcomes for students with learning disabilities. This study uses data collected by SERA (Special Education

Research Accelerator) through methods of observation within the fourth and fifth grade Science classroom. The study aimed to collect data in order to gain an understanding of how students with learning disabilities are currently receiving science instruction. For the purpose of this study, this data will be examined to determine (1) the types of OTR a target student identified with a learning disability received during science instruction and (2) the frequency of OTR the target student received during science instruction, as compared to the rest of the class.

PRESENTER: ABIGAIL PELLITTERI, PSYCHOLOGY
FACULTY MENTOR: DR. WESLEY SIMS, EDUCATION
PROJECT TITLE: AN EVALUATION OF THE PRESCHOOL LIFE SKILLS CURRICULUM FOR STUDENTS WITH AND WITHOUT DISABILITIES

Preschool Life Skills (PLS) is an intervention-based curriculum to proactively teach preschool-level children how to exhibit vital life skills prior to behavior-inducing events occurring. PLS follows a multiple-week curriculum for teachers to systematically teach children skills to mitigate behaviors in the classroom, beginning with the child learning to answer to their own name and ending with sharing skills. The curriculum builds upon itself in skills involving instruction following, functional communication, tolerance and friendship. In this study, 272 students in 20 preschool classes were studied on the number of prosocial behaviors and disruptive behaviors before and after the curriculum intervention. This study was completed in classrooms where half of the students have an Individualized Education Program (IEP) and the other half do not have an IEP. Individualized Education Programs are used in this study as a proxy for students with identified disabilities in the school setting. Students were evaluated individually before and after the intervention as well as compared between groups. Frequency-based behavior charts were used to observe student behaviors and frequencies will be compared to themselves and one another. The aim of this study is to determine the efficacy of the Preschool Life Skills Curriculum for students who have an Individualized Education Program (IEP) and students who do not have an IEP. Analysis and interpretation of results is currently ongoing.

PRESENTER: ALEXANDRA ROCHIN, EDUCATION
FACULTY MENTOR: DR. SUNEAL KOLLURI, EDUCATION
PROJECT TITLE: A CRITICAL DISCOURSE ANALYSIS ON THE CALIFORNIA PUBLIC HIGH SCHOOL HISTORY/SOCIAL STUDIES CURRICULUM FRAMEWORK

Public education has historically been developed and taught in a manner that reflects U.S. cultural hegemony. This concept stems from the theory of a dominant class, which teaches a dominant narrative that shapes the culture of society (Apple, 2019). Within the historical and sociopolitical context of the United States, past education theorists have examined what public education, ideology, and pedagogy represent. This qualitative study seeks to conduct a critical discourse analysis of the current California

public high school history/social studies curriculum framework, look at its development process using a critical analysis approach through a sociopolitical lens, and identify key themes through the language and narratives. This project uses Paulo Freire's theory that a critically engaged education best prepares students for future development in civic engagement. The research explores whether the California public high school history-social studies framework provides a critically engaged curriculum that enhances students' knowledge and social awareness. A critical examination of the framework reveals the relationship between public education and political and cultural ideologies. This analysis informs the critical discourse analysis of a chapter from the curriculum framework and the stated goals and objectives as a fundamental curriculum for all students attending public high schools across California. The study aims to determine if the curriculum allows teachers to present knowledge using the "problem-posing" method, which promotes critical analysis and understanding based on praxis (Freire, 1970), and to assess whether the framework offers practical education on concepts such as politics, civic engagement, global relations, and social consciousness.

PRESENTER: OMISHA SANGANI, BIOLOGY
FACULTY MENTOR: DR. ROBERT REAM, EDUCATION
PROJECT TITLE: UNDERGRADUATE RESEARCH EXPERIENCE AND IMPLICATIONS FOR HEALTH AND WELLBEING: QUANTITATIVE AND QUALITATIVE INSIGHTS

Undergraduate research is a high-impact practice, helping students foster confidence and motivation for future careers. Yet, balancing research with coursework/employment may limit its access, especially for marginalized students. The overall impact of research participation on broader educational experiences and well-being remains understudied. This multi-method study addressed two questions: (1) How does student research participation correlate with outcomes in cardiometabolic and mental health–controlling for factors such as ethnicity, gender, and socioeconomic status? (2) What supportive factors or barriers underlie students' decisions to engage in research and how do they perceive its effects? This study draws from the 3E Study, a longitudinal cohort study investigating educational and economic determinants of health among diverse college students. We will use survey data (N = 922) to examine differences in mental health outcomes (symptoms of depression, anxiety, and perceived stress) and cardiometabolic health outcomes (BMI, blood pressure, and body fat) between undergraduates participating in faculty-mentored research (n = 76) and those who do not. Students reporting research involvement were invited to one-on-one interviews, which will be thematically analyzed. Participants are asked to describe how research affects their health, college experience, and career aspirations. They were also asked to identify barriers in accessing research, and ways their identities encouraged or dissuaded them from research. By examining the potential health impact of research involvement, we will be able to encourage implementation of programs providing accessible opportunities. Understanding the nuances that affect students' decision to pursue research will guide practices to effectively reach students of all backgrounds.

PRESENTER: MEGAN SILVA, PSYCHOLOGY
FACULTY MENTOR: DR. KINNARI ATIT, EDUCATION
PROJECT TITLE: EXAMINING PATH RECREATION AND MEMORY FOR OBJECT LOCATIONS IN AN OPEN-FIELD MINECRAFT ENVIRONMENT

This study investigates how passive route learning impacts spatial memory and navigation in an open-field environment. Spatial memory is the recall of specific object and object-location information, while spatial navigation refers to a process that includes spatial memory along with perceptual, idiothetic, and decision-making components. Navigation relies on the formation of cognitive maps, which are developed by integrating spatial relationships between physical landmarks and objects and can be passively acquired by observing another person exploring an environment. Though most prior literature has tested the two constructs together, this study distinguishes between and separately tests object memory and navigation in an open field environment using the Minecraft Memory and Navigation (MMN) task. Participants watched a narrated video of an avatar traversing the Minecraft environment and encountering twelve different objects en route. Participants then completed two tasks. First, in a recognition memory task, they were asked to recreate the learned path and find the twelve target objects. Second, in a recall memory task, they were asked to replace the twelve target objects back in the correct locations in the environment. Regressions controlling for gender and video game experience revealed a separation between object and sequential memory versus location memory, indicating that memory of objects themselves is distinct from recognition memory of objects when situated in the environment. Additionally, better path memory was associated with better recall of object-location information.

STUDENT PRESENTERS

In alphabetical order of lead presenter by college:

School of Medicine

PRESENTER: KULPREET CHHOKAR; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. JENNIFER ZAMORA, MEDICINE
PROJECT TITLE: THE IMPACT OF UCR STUDENT-RUN CLINICS VS. LOCAL PHARMACIES ON UNDERSERVED PATIENT POPULATIONS

Does affordability versus free influence commitment to taking medications? In Riverside and San Bernardino County, underserved populations (low-income communities, homeless individuals, elderly population, etc.) exhibit countless barriers to accessible healthcare services, including medication provision. According to the 2018-2022 U.S. Census Bureau, 9.2% of Riverside County's population is uninsured, while the remaining have limited coverage. The UCR Student-Run Clinics attend to the necessities of underserved patients by providing free healthcare examinations, medications, and other services. I hypothesize underserved patients benefit from UCR Student-Run clinics as they receive access to essential medications at no cost. I will be volunteering at the following four clinics in Riverside and San Bernardino County: The Riverside Free Clinic, The Coachella Valley Free Clinic, and The Inland Vineyard Free Clinic and its outreaches (Jurupa Valley Riverbed). A survey will be distributed to a population of 40-50 patients from the aforementioned student-run clinics to assess the healthcare experiences and medication adherence rates of underserved populations. I anticipate the results of this study will bring light to the medical needs of marginalized populations and provide insight for physicians and policymakers to enhance the quality of care for underrepresented patients.

PRESENTER: DINA MIRMOTALEBISOHI, BIOLOGY
FACULTY MENTOR: DR. BRANDON BROWN; SOCIAL MEDICINE, POPULATION, AND PUBLIC HEALTH
PROJECT TITLE: CATERING TO PATIENTS WITH DISABILITIES WITHIN THE INLAND EMPIRE: A SYSTEMATIC REVIEW

Individuals with disabilities in the Inland Empire face significant barriers to healthcare access, even despite the policies in place aimed at promoting equitable medical services. The Inland Empire, encompassing Riverside and San Bernardino counties, has a population exceeding 4.6 million. According to data from the California Health Interview Survey, as of 2016, approximately 29.2% of adults in Riverside County reported having a disability (UCLA Center for Health Policy Research, 2016). A systematic search of the literature and case studies was conducted, focusing on 21 studies published from 2000 onward. Articles were selected based on relevance to key accessibility issues, with data extracted on study population, methodology, and healthcare barriers. This systematic review examines both the experiences of disabled individuals and the structural barriers that impact healthcare access

and covers both established health centers and clinics within the Inland Empire to provide a comprehensive analysis of accessibility challenges and patient experiences. Key barriers identified include inaccessibility in healthcare facilities, limited accessible transportation options. Beyond these structural obstacles, patients with disabilities frequently report feeling misunderstood or overlooked in clinical settings. Many express frustrations with communication barriers. These experiences contribute to feelings of medical mistrust, often leading individuals to avoid seeking necessary care. Findings highlight the urgent need for targeted interventions, including the enforcement of design standards in healthcare facilities, expansion of paratransit services, and notably: a comprehensive disability-focused provider training. Addressing both structural and experiential barriers is critical to advancing equitable healthcare access for patients with disabilities in the Inland Empire.

PRESENTER: VISHRUTH NAGAM, BIOLOGY
FACULTY MENTOR: DR. ADAM GODZIK, MEDICINE
PROJECT TITLE: GENE EXPRESSION BIOMARKERS FOR EPILEPSY: IDENTIFICATION THROUGH INTEGRATIVE EVIDENCE-BASED GENOMICS ANALYSIS

Epilepsy is the spectrum disorder characterizing seizures that otherwise do not have other plausible medical explanations. Approximately 50 million people worldwide are affected by epilepsy. My capstone research project performs integrative evidence-based genomics analyses, utilizing large-scale gene expression data to analyze differential gene expression in epilepsy and identify a consistent gene expression profile for epilepsy. The aim of the project is to improve our understanding of the molecular mechanisms and pathology of epilepsy. In addition, my project's findings would contribute to the development of genetic tests that could expedite the diagnosis of epilepsy.

PRESENTER: BHAKTI PARMAR, NEUROSCIENCE
ADDITIONAL PRESENTERS: KHOA LE, BIOLOGY; ASHWIN KUNASEELAN, BIOLOGY; SRIJANI KRISHNAN, NEUROSCIENCE; AND JEEVAN RAO, NEUROSCIENCE
FACULTY MENTOR: DR. BRANDON BROWN, MEDICINE
PROJECT TITLE: GRAPHIC MEDICINE: REVOLUTIONIZING HIV EDUCATION AND ADVOCACY IN RIVERSIDE THROUGH COMIC NARRATIVES

Riverside County has a higher incidence rate of HIV in comparison to the state and national benchmark, with a majority of new cases among people under age 50 years. There is little education available on the topic of HIV in the classroom, mostly limited to some elective courses. We created a graphic novel on HIV, including what it is, how to obtain HIV testing, current treatments, and HIV-related advocacy, with the intent to educate populations in the classroom setting and reduce HIV stigma. Our novel includes key figures in the history of HIV, including activists, educators, and researchers who transport the reader

through key events which shaped the HIV pandemic and help build health literacy around the topic, as well as build interest in community health research. The effectiveness of the graphic novel will be assessed through a survey that is derived from the Health Belief Model consisting of 7 questions assessing the students' knowledge, attitude, and perceptions of HIV using a 5-point Likert Scale. We anticipate a positive increase in the students' understanding of HIV with the graphic novel, and in turn a greater awareness of HIV, the experiences of those living with it, and local resources available. In doing so, the stigma surrounding HIV can be more effectively mitigated, and we can facilitate the next generation of academic researchers who work on the HIV topic.

PRESENTER: SHRUTISRI SONEKAR, PSYCHOLOGY
FACULTY MENTOR: DR. ROSEMARY TYRRELL, MEDICINE
PROJECT TITLE: BRIDGING THE PATIENT-PHYSICIAN DISCONNECT

While 71% of healthcare providers prioritize patient engagement, merely 29% of patients rate their providers highly in this regard, highlighting a significant gap in the patient-physician connection (CWD Healthcare). To bridge this divide and improve healthcare outcomes, it is imperative to address education around the patient-physician connection through medical education. Medical institutions should emphasize the importance of addressing region-specific inequities and diverse patient needs with compassion and perspective (Curricula for Empathy and Compassion Training in Medical Education). These skills would be taught through interactive learning modules and applied in real-world opportunities. For this project, modules will be based on the main regional disparities of the Inland Empire, such as food insecurity, air pollution, and mental health (Prevention Institute). To explore medical student and patient satisfaction, gathering feedback through surveys is crucial to analyzing the need and impact of these modules. Gauging readiness for a potential shift in the curriculum will serve as a guiding compass for ongoing reform. By equipping medical students with the skills needed to connect with patients from all backgrounds, we can foster a more inclusive and patient-centered healthcare system. Improving medical education can eventually close the disconnect between patient expectations and provider practices and pave a more conducive healthcare environment.

PRESENTER: YIMON THWE, BIOLOGY
FACULTY MENTOR: DR. DANIEL NOVAK, MEDICINE
PROJECT TITLE: EMPOWERING YOUR HEALTHCARE JOURNEY: A GUIDE TO SUPPORT THE DEVELOPMENT OF SELF-ADVOCACY SKILLS FOR THE AFRICAN-AMERICAN, BLACK, AND CARIBBEAN COMMUNITY

Speaking up during doctor's appointments can be challenging for many people, especially for marginalized populations like the African American, Black, and Caribbean community in California. However, it is a vital skill that could influence how patients make health decisions. According to a 2023

report by the California Healthcare Foundation, more than one in four Black Californians avoid care due to concerns of unfair treatment (Cummings, 2023). This leads to many Black patients refraining from asking questions, in fear that they will be judged or treated poorly. Research indicates that one factor that can help patients get the care they deserve is the ability to self-advocate during clinical encounters. To help patients develop self-advocacy skills, we created a workbook to assist Black patients in navigating patient-physician interactions. Built on principles from *Smith's Patient-Centered Interviewing* by Robert Smith, the workbook provides a theory- and evidence-based approach to self-advocacy that engages patients in understanding their health state, articulating their healthcare goals and values, and proactively preparing for their healthcare visits. The completed workbook will support patients in an experimental learning community built by the UCR School of Medicine PRIME-ABC program to develop self-advocacy in Black patients in the Inland Empire. With this resource, patients will feel more confident advocating for themselves by transferring skills gained from the learning community into their interactions with physicians. The effectiveness will then be measured via participant satisfaction metrics conducted during 3- and 6-month follow-ups with patients in a community engagement studio.

PRESENTER: ILA YOUSSEFI, PSYCHOLOGY
FACULTY MENTOR: DR. NICHOLAS SHEETS, MEDICINE
PROJECT TITLE: PSYCHIATRIC AND SUBSTANCE USE CONCERNS TREATED IN US EMERGENCY DEPARTMENTS: A REVIEW OF THE SAMHSA DATABASE

The frequency of U.S. emergency department (ED) visits related to psychiatric and substance use concerns continues to rise, accounting for approximately one in eight visits nationwide. The Substance Abuse and Mental Health Services Administration (SAMHSA) collects extensive data on mental illness and substance use disorders, providing critical insights into these growing concerns. This study aims to analyze SAMHSA data to determine whether the frequency of psychiatric and substance use-related ED visits varies significantly across different patient demographics, such as age, gender, race/ethnicity, socioeconomic status, and insurance coverage. A particular focus will be placed on the impact of homelessness as a contributing factor to disparities in healthcare access and outcomes. The methodology includes a comprehensive analysis of SAMHSA's publicly available datasets, which contain information from surveys and administrative records. The study will examine demographic trends in psychiatric and substance use-related ED visits, identifying potential disparities in healthcare utilization. Additionally, collaboration with local hospitals and organizations serving unhoused individuals will provide further context on barriers to care. Expected outcomes include identifying demographic groups disproportionately affected by psychiatric and substance use-related ED visits, highlighting the role of homelessness in exacerbating health disparities. Findings from this research will inform healthcare policy and intervention strategies aimed at improving mental health and substance use disorder services, particularly for vulnerable populations. By addressing gaps in care and proposing targeted solutions, this study aims to contribute to a more equitable healthcare system for individuals facing psychiatric and substance use challenges.

PRESENTER: CHRISTINA ZHU, BIOLOGY
FACULTY MENTOR: DR. DANIEL NOVAK; SOCIAL MEDICINE, POPULATION, AND PUBLIC HEALTH
PROJECT TITLE: EVALUATING SEVERITY AND LONG-TERM OUTCOMES IN PEDIATRIC ANOXIC BRAIN INJURY AND STROKE UTILIZING TRINETX

Pediatric anoxic brain injury and pediatric stroke are significant causes of mortality and long-term neurodevelopmental disabilities. Pediatric anoxic brain injury is damage to the brain that is caused by a complete lack of oxygen, whereas pediatric stroke is damage to the brain that is caused by blood flow to a part of the brain being blocked or a blood vessel in the brain rupturing. Comparing the outcomes would help healthcare providers in selecting treatment strategies; however, there are currently very few studies comparing pediatric anoxic brain injury and pediatric stroke. In this retrospective observational cohort study, we utilize the clinical data in TriNetX, an electronic health record (EHR) database, to compare the severity and outcomes of these two conditions. We hypothesize that infants with anoxic brain damage will exhibit higher rates of comorbidities compared to those with non-traumatic stroke. Additionally, we will examine the differences in treatments being used, including therapeutic hypothermia and stroke-specific pharmacological and therapy interventions. The capstone project seeks to contribute to the current understanding of pediatric anoxic brain injury and pediatric stroke severity and long-term impacts with a novel approach using TriNetX. This allows for a more comprehensive analysis of cases in the US. Ultimately, this study aims to support healthcare providers in selecting effective treatment strategies, propose avenues for future research, and improve long-term patient outcomes.

STUDENT PRESENTERS

In alphabetical order of lead presenter by college:

School of Public Policy

PRESENTER: KARIN FUNAKI, PSYCHOLOGY
FACULTY MENTOR: DR. BRUCE LINK, PUBLIC POLICY
PROJECT TITLE: THE IMPACT OF PARASOCIAL CONTACT ON OUR TENDENCY TO STIGMATIZE PEOPLE WITH MENTAL DISORDERS

Parasocial contact is a psychological relationship formed through media. Previous research has examined its role in reducing stigma toward minority groups via TV and celebrity content, but little is known about its effects through social media. This study surveyed 357 participants on their experiences with individuals with mental disorders exhibiting socially positive and negative behaviors via social media, direct contact experiences, and responses to a vignette depicting a character with bipolar disorder, including perceived dangerousness, preferred social distance, relatability, and negative attitudes.

Regression analyses showed that positive parasocial contact was associated with lower perceived dangerousness (p = 0.0) and greater relatability (p = 0.0), while negative parasocial contact was linked to higher perceived dangerousness (p = 0.061) and lower relatability (p = 0.01). Higher perceived dangerousness was related to greater social distance (p = 0.0), and relatability was negatively correlated with negative attitudes (p = 0.0). Results remained consistent when focusing on parasocial contact with individuals with bipolar disorder. However, parasocial contact did not strongly correlate with negative attitudes (p = 0.355), whereas direct contact did (p = 0.04489), likely due to the difference in the constructs of the two variables.

Results demonstrate that greater positive parasocial contact with someone with mental disorder through social media may reduce stigma by decreasing perceived dangerousness and increasing relatability, leading to greater social acceptance of individuals with mental disorders.

PRESENTER: EMILY MANUS, PUBLIC POLICY
FACULTY MENTOR: DR. BRUCE LINK, SOCIOLOGY
PROJECT TITLE: THE LATINX HEALTH PARADOX: A FACADE OF WELLNESS

The Latinx Health Paradox, an epidemiological finding, states that Latinx people, despite having lower income, education and power, live longer than their non-Latino counterparts. With this in mind it is essential to ask how knowledge about the paradox might shape the perspectives of policy makers and the general public concerning the health of the Latinx community. The paradox creates the illusion that the Latinx community is thriving in terms of health, but it does not acknowledge the difference between

mortality and quality of life. I plan to investigate whether the Latinx Health paradox as it is generally portrayed shapes people's beliefs about the health needs of Latinx people. I hypothesize that the traditional view of the Latinx Health paradox creates a facade around Latino health. This facade influences researchers and policymakers to think that protective health policies for Latinos are not necessary because they are living for a long time without health issues but that is inaccurate. Such a facade influences peoples' beliefs about Latino's health, thus negatively impacts the resources and policies needed to support Latinx Health. To test this, a survey was constructed. The survey presented two different portrayals or vignettes of the Latinx Health Paradox to test my hypothesis that the Latino health paradox is a dangerous veil over the Latino community, creating a facade of wellness, detrimental to the health of Latinos. The randomly assigned vignettes were then followed by a set of questions that measured respondents' opinions on Latino health outcomes after reading the vignette.

PRESENTER: EMILY SARASHINA, PUBLIC POLICY
FACULTY MENTOR: DR. BRUCE LINK, PUBLIC POLICY
PROJECT TITLE: THE BIOLOGICAL AND PSYCHOSOCIAL FACTORS ON WHY WOMEN LIVE FEWER DISABILITY-FREE YEARS

One thoroughly researched yet unexplained phenomenon is that women live longer than men on average. However, a 2023 study by Shawn Bauldry defined years lived free of serious physical or mental disability as "disability-free years." While Bauldry's research focused on comparisons between race and ethnic groups, his results also highlighted that women live longer than men despite experiencing more years with a disability. Curiously, Bauldry's paper did not explore the potential factors explaining why women are more likely to develop a disability earlier in life than men. Therefore, this paper will conduct an integrative review on the factors contributing to this health disparity. These factors highlight the inequities in healthcare and societal structures that affect an individual's quality of life. Existing literature was collected on the biological and psychosocial factors of the three most common disabilities in women: low back pain, headaches, and depression. The findings reveal a positive correlation between depression and stressful life events, such as emotional abuse and poverty. Additionally, biological factors such as fluctuating hormone levels during the menstrual cycle and pregnancy, increase the risk of chronic headaches, low back pain, and depression. Furthermore, medical professionals' reliance on the biomedical approach rather than the biopsychosocial approach, creates a barrier for chronic pain intervention. Overall, these factors elucidate the psychosocial and biological complexities between disability-free years and gender. This paper concludes with solutions, such as intersectional health research and programs broadening the implementation of the biopsychosocial model in healthcare.