A Message from the Vice Provost & Dean

Welcome to a historic milestone in the life of our university: the **20th UC Riverside Undergraduate Research and Creative Activities Symposium!**

Two decades ago, this symposium began as a modest gathering of 36 students presenting their research over the course of a single morning. It was fueled by a singular, powerful belief: that undergraduate students should not just be consumers of knowledge, but **creators** of it. In his welcome letter for the first Symposium, the Vice Provost of Undergraduate Education, Dr. Andrew Grosovsky, noted that "undergraduate research, scholarship and creative activity form the essence of an undergraduate education…"

What started as a seed has grown into a cornerstone of the UCR experience. This year, we celebrate a record-breaking achievement with **486 student presenters** sharing their work over four days. From laboratory breakthroughs to artistic masterpieces, the sheer volume of research and creative activities on display speaks to the relentless curiosity and "Highlander Spirit" of our student body.

To our students: you are now part of a 20-year legacy of excellence. To our faculty and staff: thank you for your tireless mentorship and for turning curiosity into rigorous inquiry.

As we look back on twenty years of discovery, we also look forward to the impact your work will have on the world tomorrow.

Congratulations to all our presenters!

Dr. Louie F. Rodriguez, *Vice Provost and Dean of the Division of Undergraduate Education*

Center for Undergraduate Research & Engaged Learning

Schedule of Events:

Oral Presentations

EMERGING RESEARCH: Research projects that are not completed but are of significant interest to the research community.

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

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

Tuesday – April 21, 2026

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

Wednesday – April 22, 2026

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

Thursday – April 23, 2026

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

Poster Presentations

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

Friday – April 24, 2026

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

To view the full Symposium schedule and the abstracts for each of the student presentations, please scan the QR codes below or visit our website at https://engage.ucr.edu/research/symposium.

SYMPOSIUM SCHEDULE

PRESENTATION ABSTRACTS

We invite you to check our webpage in May to see the list of Best Presentation Award recipients from each college and school. Join us in celebrating their outstanding work!

Acknowledgements

The success of the Undergraduate Research & Creative Activities Symposium is made possible through a collective commitment to excellence. The Center for Undergraduate Research and Engaged Learning (CUREL) extends its sincere appreciation to the Symposium Planning Committee for their leadership, guidance, and unwavering support in bringing this event to fruition.

We are deeply grateful to our faculty mentors, whose dedication to teaching, mentorship, and scholarly engagement fosters the intellectual and professional growth of undergraduate researchers. We also recognize the student presenters, whose curiosity, perseverance, and countless hours of work in libraries, laboratories, creative spaces, and communities culminate in the innovative research and creative scholarship showcased here. We further acknowledge the many campus staff, faculty, and community partners who generously contribute their time and expertise to serve as moderators and judges. Their thoughtful feedback plays a critical role in enhancing the students' experience and advancing their professional development.

A special thank you to Dr. Bella Merlin from the Department of Theatre, Film, and Digital Production (TFDP) for sharing scenes from Act III of Anton Chekhov's *Three Sisters*. We are grateful to the talented student performers: Juliette Lazard (TFDP), playing the role of Irina; Aminah Davis-Macias (CWP), playing the role of Masha; and Sebastian Ocampo (TFDP), playing the role of Olga. We also extend our appreciation to the TFDP Production Team: Landis York (Costume), Kerry Jones (Scenic), and Sara Schatmeier (Technical Director), whose expertise brought the performance to life.

We also would like to thank the UCR Chordata Quartet for their wonderful lunchtime performance. The ensemble includes Dr. Stephanie Dingwall (First Violin, CNAS Divisional Dean of Student Academic Affairs), Emily Africa (Second Violin, 2nd-year MSE Ph.D. student, BCOE), Sophia O'Brien (Viola, 4th-year biochemistry/chemistry double major, CNAS), and Kytan Guu (Cello, 4th-year neuroscience major, CNAS). Their performance added a rich and memorable artistic dimension to the Symposium.

We would like to thank the Office of Research & Economic Development (RED) for their generous support of the awards recognizing the best poster and oral presentations in each college and school. Lastly, we thank the UCR Career Center, UCR Governmental Relations Office, and the UCR Advancement Office for connecting off-campus partners to this event and helping us showcase these amazing UCR students.

Gladis Herrera-Berkowitz
Director, Center for Undergraduate Research & Engaged Learning

UCR Center for Undergraduate Research & Engaged Learning

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

Our Dedicated and Talented Students

UCR Faculty and Staff

Division of Undergraduate Education Team

Dr. Louie F. Rodriguez, Vice Provost and Dean of Undergraduate Education

Gladis Herrera-Berkowitz, Director of CUREL

Dr. Jennifer Kavetsky, Program Manager, CUREL

Larry Rodriguez, Program Manager, CUREL

Danielle White, Program Manager, CUREL

Genesis Gonzalez, Marketing Manager, Undergraduate Education

Shanshan Liao, Web Developer

Mona Nelson, Executive Manager and Assistant to the Vice Provost

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Dr. Alejandra Dubcovsky, History

Israel Fletes, XCITE

Dr. Kritika Gupta, Health & Wellness

Gladis Herrera-Berkowitz, CUREL

Dr. Yasemin Irepoglu Carreras, Political Science

Dr. Jennifer Kavetsky, CUREL

Dr. Robert McKee, Bioengineering

Dr. Bella Merlin; Theatre, Film, & Digital Production

Dr. Seán O'Leary, Biochemistry

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Event Sponsors

Thank you to the supporters who have contributed to the success of this year's event.

UC RIVERSIDE Research and Economic Development

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UCR 15 YEAR ANNIVERSARY Power of the Peers

UCR XCITE Center for Teaching and Learning

UNIVERSITY OF CALIFORNIA WASHINGTON PROGRAM UCDC

STUDENT PRESENTERS

In alphabetical order of lead presenter by faculty mentor's college:

Marlan and Rosemary Bourns College of Engineering

PRESENTER: MAJD ABOUZAKI; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL PRESENTER: YASMINE ROMERO, BIOCHEMISTRY
FACULTY MENTOR: DR. XIAOPING HU, BIOENGINEERING
PROJECT TITLE: FUNCTIONAL CONNECTIVITY AS A NEURAL BIOMARKER FOR AUDITORY PERCEPTION IN OLDER ADULTS

Abstract: Functional Magnetic Resonance Imaging (fMRI) is a neuroimaging technique used to measure the Blood Oxygen Level Dependent (BOLD) signal as a proxy for neural activity. By analyzing the statistical correlations between BOLD signals across various brain regions, we can define a measure called functional connectivity, which is a map of intra-brain communications.

In this study, using the MRI scanner at UCR Center for Advanced Neuroimaging, we gathered fMRI scans of 47 older adults as they were performing an auditory task. The task had them identify whether two sounds were either similar or different. By testing different difficulty levels, we measured how quickly a participant goes from confused to perfect accuracy as tasks become easier (slope) and the exact point at which they begin to accurately distinguish between the two sounds (threshold). We then used subjects' functional connectivity to see if we could predict their slope and threshold in performing the task.

Using functional connectivity, we were able to predict the threshold with a correlation coefficient of 0.418 and p-value of 0.006 between the predicted and observed values, which shows that auditory perception could be predicted using functional connectivity. Brain regions from the frontoparietal, auditory cortex, and default mode network were the most prominent predictors.

Using functional connectivity to predict auditory performance could be a biomarker for predicting perceptual ability. Perceptual abilities decline earlier than cognition, so predicting perceptual changes can help predict cognitive deterioration and provide a crucial head start for intervention.

PRESENTER: JOSE BARBOSA, MECHANICAL ENGINEERING
ADDITIONAL PRESENTER: JOCELYN ESCALANTE, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. FATEMEH ASGARINEJAD, ELECTRICAL AND COMPUTER ENGINEERING
PROJECT TITLE: FEW-SHOT BRAIN TUMOR CLASSIFICATION IN MRI USING TRANSFER LEARNING AND CROSS SCANNER HARMONIZATION

Abstract: Developing Deep Neural Network Models for accurate and timely brain tumor detection using magnetic resonance imaging (MRI) is essential for effective diagnosis and treatment planning. However, developing reliable deep learning models for brain tumor classification remains challenging due to limited medical data and inconsistencies across imaging scanners. To address these challenges, we propose a framework for few-shot brain tumor classification that implements transfer learning and cross-scanner harmonization on the FastMRI Brain Dataset. Few-shot learning is particularly valuable in the medical

field, where dataset acquisitions are limited to regulations, the need for specialist review, and a limited number of available cases. We use pre-trained convolutional neural networks, significantly reducing computational and memory requirements compared to training models from scratch. Since the dataset contains scans acquired from both 1.5T and 3T MRI scanners, we use cross-scanner harmonization to mitigate variations caused by different scanners' specific characteristics, including intensity scales, to ensure consistent feature representations and improve model generalization across heterogeneous data sources. Also, Few-shot learning enables robust model training with minimal samples, as medical data is often scarce. In this work, we present a framework designed to improve classification performance and robustness under limited data conditions. We also perform a thorough analysis of related works and provide a scalable and generalizable solution for real-world clinical applications.

PRESENTER: TRUSHA BHAGWAT; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. YUJIE MEN, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTOR: DAISY HERRERA
PROJECT TITLE: ANTIMICROBIAL RESISTANCE IN SOIL UNDER DIFFERENT IRRIGATION REGIMES: PHENOTYPE TO GENOTYPE

Abstract: Antimicrobial resistance (AMR) poses a serious threat to human health and the environment. The development and dissemination of antibiotic-resistant bacteria (ARB) in the environment can occur through horizontal gene transfer (HGT) and is facilitated through selective pressures. In the environment, manure and treated wastewater (TMW), can introduce contaminants to soil. Conventional treatments for wastewater and manure are insufficient for the complete removal of antibiotics, ARB, and antibiotic-resistant genes (ARGs) resulting in residual levels of these contaminants in these sources. In this large pot study, Cephalexin-resistant environmental *Escherichia coli* were isolated from soil amended with/without manure and irrigated with TMW or tap water. Cephalexin-resistant *E. coli* counts were compared across treatments. Minimum inhibitory concentration (MIC) tests were conducted to approximate levels of resistance for all samples. Whole genome sequences are being analyzed to identify genes responsible for the observed resistance. Extended Spectrum Beta Lactamase (ESBL) producing *E. coli*, will be further tested for multidrug resistance across the Cephalosporin antibiotic class.

PRESENTER: ANDREA BOWLING, BIOENGINEERING
FACULTY MENTOR: DR. CHUNG-HAO LEE, BIOENGINEERING
PROJECT TITLE: SHAPE RETENTION AND RECOVERY IN SHAPE MEMORY POLYMER FOAMS: IMPLICATIONS FOR ANEURYSM TREATMENT

Abstract: A brain aneurysm is a bulging artery that can rupture, often causing severe debilitation or death. A potential patient-specific treatment uses a polyurethane shape memory polymer (SMP) foam that is compressed for endovascular insertion and then expanded with heat to fill the aneurysm space. By blocking blood flow, SMP foams reduce rupture risk and improve patient outcomes. However, their long-term durability and recovery behavior must be understood before safe medical implementation. This project examines the durability, shape retention, and recovery time of SMPs through repeated compression tests, to enable future patient treatment.

I will fabricate twenty-seven (n=27) SMP foams with 10%, 15%, and 20% infill densities using fixed ratios of three monomers: (i) hexamethylene diisocyanate (HDI), (ii) N,N,N0,N0-tetrakis (hydroxypropyl)

ethylenediamine (HPED), and (iii) triethanolamine (TEA). Nine samples will undergo 15 compression cycles at 60°C to obtain stress-strain data, with recovery time recorded by camera and microscope images taken every five cycles to assess structural damage. Nine samples will undergo 10 cyclic compressions at 60°C, followed by 10 cyclic compressions at room temperature. The remaining nine samples will undergo compression tests after recovering only 50%. Stress-strain results will be compared across infill densities and recovery levels using a two-way ANOVA to determine how repeated compression influences the SMPs' thermo-mechanical properties.

In a well-designed SMP, repeated compression should have minimal impact on shape retention and recovery time. The findings of this research will clarify the feasibility of SMP foams for long-term, high-reliability biomedical applications.

Presenter: Melina Caraballo, Environmental Engineering
Faculty Mentor: Dr. Amanda Rupiper, Environmental Engineering
Project Title: Evaluating Acid Activation Parameters of Biochar for Ammonia Adsorption

Abstract: Ammonia emissions from agricultural systems are an ongoing environmental challenge, and gas adsorption is a common treatment method. Biochar is charred organic material usually made from wood or agricultural straw that has proven to be a low-cost and effective adsorbent for ammonia removal. Acid activation of biochar is known to increase ammonia adsorption capacity, but the effects of specific preparation parameters, such as acid concentration and rinsing method, are not well understood. During activation, biochar is soaked in phosphoric acid and then rinsed to remove residual unbound acid, which could otherwise react with ammonia and interfere with future adsorption measurements. This study focuses on the acid activation step for woodchip biochar pyrolyzed at 500 °C for 15 minutes. Three parameters were investigated: particle size (ground vs. unground), phosphoric acid concentration (15%, 30%, and 45%), and rinsing method (two rinses, five rinses, or a one-hour soak using 20 mL of DI water). pH was measured before and after treatment and used as a comparative indicator of potential ammonia adsorption. Samples were prepared at 1 g per condition, resulting in 18 combinations, and the experiment was repeated to improve reliability. Preliminary results show post-activation pH values ranging from 2.2–3.3, compared to initial values of 8.8–9.7. Unground biochar strains consistently showed lower pH values than their ground counterparts, likely due to the difference in particle size. Samples treated with higher acid concentrations (45%) produced lower pH values than those treated with 15% acid, which is consistent with expected trends.

Presenter: Colin Daily, Bioengineering
Faculty Mentor: Dr. Jun Sheng, Mechanical Engineering
Project Title: CNT-PDMS Flexible Sensors for Soft Fabric Robotic Actuators

Abstract: Soft robotics is reshaping medical technology by introducing safer, more adaptive systems capable of handling complex tasks. Unlike traditional rigid robots, soft robots are developed from materials that mimic the flexibility and resilience of biological tissues, allowing them to gently interact with the human body. Soft robots implemented for assistive technology and wearable rehabilitation devices demonstrate the need for more flexible and durable robotic systems. Soft robots cannot utilize the same rigid external sensors as their stiffer counterparts; they require a flexible and durable sensor that can follow the fluidity of the motion without being damaged. I aim to develop a flexible biosensor to monitor

strain through resistance tracking. This will be done by synthesizing a composite material composed of multi-walled carbon nanotubes (MWCNTs) and polydimethylsiloxane (PDMS). This composite will utilize the piezoresistive properties of the MWCNTs-PDMS composite to determine resistance values of a baseline, compressed, elongated, and bent configuration. The resistance readout will become a function of the recorded displacement, allowing for characterization to be used to predict movement. Once the composite is fully synthesized and the results are validated through comparison to expected results to confirm proper dispersion of MWCNTs into the PDMS, the material can be integrated into silicone tubes used as pneumatic chambers inside soft fabric robotic actuators. The integration of the flexible sensor will allow for deformation tracking through signal processing of soft robotic actuators, allowing for control of the actuator in a closed loop.

Presenter: William Dam, Chemistry
Faculty Mentor: Dr. Yujie Men, Environmental Engineering
Additional Contributor: David Alfaro, III; Environmental Toxicology
Project Title: Hybrid Microbial Electrochemical System for the Environmental Remediation of PFAS

Abstract: Per and polyfluoroalkyl substances (PFAS) are a class of persistent environmental contaminants that are highly resistant to natural degradation. They are also known as “forever chemicals”. PFAS can bioaccumulate and enter human food and water systems, and certain compounds, such as perfluorooctanoic acid (PFOA), have been classified as carcinogenic by the EPA. Current PFAS remediation strategies often rely on energy-intensive or chemically harsh treatments. These include high-temperature destruction processes or radical-based oxidation methods, which limit scalability and can lead to secondary environmental impacts. Although microbial bioremediation offers a more sustainable alternative, PFAS biodegradation is typically slow and often incomplete due to the strength of the carbon–fluorine bond. This project investigates a hybrid microbial–electrochemical framework for anaerobic PFAS defluorination, evaluating the degradation of multiple PFAS structures and demonstrating that the hybrid system achieved greater defluorination than either biological or electrochemical treatments alone. The system couples biocompatible electrochemical processes with bacterial metabolism; both mixed bacterial cultures and rapidly defluorinating isolates were used to promote the transformation of fluorinated contaminants in anaerobic conditions. This work may contribute to the development of PFAS remediation technologies and demonstrates the benefits of integrating multiple remediation processes.

Presenter: Jonah Damian, Biochemistry
Faculty Mentor: Dr. Iman Noshadi, Bioengineering
Additional Contributors: Aihik Banerjee, Kevin Dalsania, Jarnett Asuncion, and Arameh Masoumi
Project Title: 3D Digital Light Processing Bioprinting and In Situ Differentiation of hIPSCs for Engineering Cardiac Tissue

Abstract: The lack of physiologically relevant, reliable, scalable human cardiac tissue models remains a major barrier in cardiovascular disease research and drug development. Conventional 2D culture systems and animal models fail to accurately recapitulate the complex structure and function of the human myocardium, while current 3D strategies utilizing pre-differentiated cells face challenges in cell survival, integration, and tissue maturation. To address this critical gap, we developed FiBGel, a photocrosslinkable, choline bio-ionic liquid (BIL)-functionalized cold water fish gelatin methacryloyl

(GelMA), optimized for direct 3D bioprinting of undifferentiated human induced pluripotent stem cells (hiPSCs) and subsequent in situ cardiac differentiation. FiBGel offered tunable mechanical and electrochemical properties, high cytocompatibility, and printability on a 3D digital light processing (DLP) bioprinter. For the first time, we report 3D DLP bioprinting of hiPSCs within FiBGel bio-ink, resulting in functional 3D cardiac tissue constructs. In contrast to 2D pre-differentiated cardiac cell encapsulation, in situ 3D cardiac differentiation of encapsulated hiPSCs in FiBGel constructs exhibited superior cardiac biomarker expression, sustained synchronous contractility, and long-term viability up to 4 months. This platform represents a significant advancement in stem cell-based biofabrication strategies for generating functional human tissue models for pharmacological screening, personalized disease modeling, and regenerative therapies.

PRESENTER: RISHI DAVE, COMPUTER SCIENCE
FACULTY MENTOR: DR. PHILIP BRISK, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: FPGA ACCELERATION OF CONVOLUTION-BASED CLASSIFICATION ALGORITHMS FOR STREAMING TIME SERIES

Abstract: This paper presents a pair of FPGA accelerator architectures for two time series classification algorithms, MiniRocket, and MultiRocket, all of which employ convolutional kernels to generate features for downstream classifiers. Prior work has established that a combined MultiRocket+Hydra classifier is competitive with the state-of-the-art in this domain. The accelerators introduced in this paper process streaming time series that are sampled and transmitted over the network for real-time classification. Performing classification on a network-attached FPGA eliminates the latency required to copy data from a NIC to a CPU or GPU via host memory; on the other hand, the FPGAs may or may not retain an advantage if the time series is originally stored in host or onboard memory. A streaming convolution engine, and custom floating-point multiplier were developed to further accelerate classification. These results demonstrate how and when FPGAs may retain an advantage over more traditional computing architecture for processing streaming time series data in real-time, using the aforementioned convolution-based classifiers as representative examples of the processing that might be done.

PRESENTER: OSANNA DENG, COMPUTER SCIENCE
ADDITIONAL PRESENTER: RACHEL CHAN, COMPUTER SCIENCE
FACULTY MENTOR: DR. EVANGELOS PAPALEXAKIS, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: IN-CONTEXT-LEARNING FOR CITRUS HLB DISEASE DETECTION

Abstract: In-Context Learning (ICL) is the new learning paradigm that is exhibited by large pre-trained ("foundation") models, where we are able to show examples of (input, output) pairs to the model within the input prompt, and ask it to guess an output for a certain input, which seems to work very well *without* any additional training to the model. The advantages of this paradigm are (a) it does not require any fine-tuning (i.e., low compute), (b) it is based on very limited labeled data (i.e., data scarcity), and (c) it lends itself to an intuitive interface that a domain expert can use to tackle this problem, while also providing domain knowledge as part of the prompt. In this project, we investigate the effectiveness of applying in-context learning in pest disease detection for citrus trees, in comparison to “traditional” learning/fine-tuning paradigms. We compare the trade-offs between the number of available labeled data examples, compute necessary, and the resulting performance (F1 score/accuracy/etc.). Additionally, we explore the influence of editing the input selection or adding domain knowledge (e.g., description of the pest or its effects) on the performance of our ICL model. On a wider lens, we aim to determine when ICL

offers a practical alternative to resource-intensive training for challenging tasks like agricultural disease detection.

PRESENTER: PHIPHI DINH, BIOENGINEERING
FACULTY MENTOR: DR. CHUNG-HAO LEE, BIOENGINEERING
ADDITIONAL CONTRIBUTORS: TANNER CABANISS AND ASHLEY TAEPAKDEE
PROJECT TITLE: DEVELOPMENT OF AN IN-VITRO PARTICLE IMAGE VELOCIMETRY FLOW LOOP FOR STUDYING CEREBRAL ANEURYSM HEMODYNAMICS & FUNCTION

Abstract: Brain aneurysms occur when the walls of a blood vessel inside the brain weaken and form a focal dilation. The rupturing of brain aneurysms can cause catastrophic damage to a patient's neurovascular health and in many cases premature mortality. Current treatments for aneurysms include surgical clipping, minimally invasive endovascular procedure with detachable coils, and flow diverting stents. In vitro flow tests of cerebral vascular systems with patient-specific aneurysm geometries are crucial for evaluating the efficacy and performance of new aneurysm treatment devices. Particle image velocimetry (PIV) is an optical technique that measures the fluid velocity field by tracking the movement of small particles within the fluid.

A PIV flow loop system will be constructed to study aneurysm hemodynamics at a 100% size scale. Polydimethylsiloxane (PDMS) aneurysm phantoms will be made to mimic the brain aneurysm geometry. The working fluid of this system will be made of a mixture of water, glycerol, and fluorescent dyed particles. High power light emitting diodes (LEDs) will be aligned perpendicularly to the direction of flow to illuminate the suspended particles for the high-speed camera system to capture the particle movement through the phantom. The pulsatile pump and a flow meter will be used to monitor the flow of the working fluid to best replicate cerebral blood flow. The results of this research will be used to assist in testing the efficacy of various aneurysm treatments and in collection of high-fidelity flow-field data to validate brain aneurysm computational models.

PRESENTER: AMANI GAJJAR, BIOLOGY
FACULTY MENTOR: DR. BAHMAN ANVARI, BIOENGINEERING
PROJECT TITLE: OPTIMIZING MACROPHAGE EXOSOMES FOR PAYLOAD DELIVERY AND EXTENDED STORAGE USING TARDIGRADE-DERIVED PROTEINS

Abstract: Macrophages are innate immune cells responsible for engulfing foreign material and clearing damaged cells. They naturally migrate toward sites of inflammation, making them attractive candidates for targeted payload delivery. They also release exosomes, nanosized (30-150 nm) extracellular vesicles (EVs) of endosomal origin that retain key molecular features of their parent cell and protect selected cargo from premature degradation. Exosomes have emerged as versatile delivery vehicles across wound healing, inflammation, regeneration, and the blood-brain barrier. Indocyanine Green (ICG) is a near-infrared dye widely used in medical imaging and photothermal therapies but is limited by its half-life of ~3-5 minutes. Macrophages and their exosomes may enhance ICG circulation time and delivery. However, low exosome yield and ex vivo stability remain barriers to translational application of macrophage-derived exosomes. In this study, we established a reproducible macrophage exosome isolation protocol and confirmed particle size within the expected range using Dynamic Light Scattering, zeta potential analysis, and Scanning Electron Microscopy. Furthermore, to address the challenge of long-term exosome storage, we are investigating the incorporation of cytoplasmic abundant heat soluble

(CAHS) proteins known to stabilize cellular structures under extreme conditions. Preliminary UV-Vis spectroscopy data has demonstrated the presence of CAHS protein within exosomes following macrophage CAHS expression, suggesting successful incorporation. This study aims to optimize ICG loading into macrophage-derived exosomes while also addressing exosome stability and storage. By refining loading strategies and CAHS-mediated preservation, these experiments seek to enhance the longevity, functionality, and translational potential of exosome-based delivery systems for imaging and therapeutic applications.

PRESENTER: KARMA GAMALELDIN, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: MODELING CELL FATE RESPONSES TO DNA DAMAGE

Abstract: Cells constantly experience DNA damage from environmental stress, radiation, and normal metabolic processes. In response, they must choose between continuing to divide, temporarily stopping growth, or entering senescence, a permanent state of cell cycle arrest linked to aging and disease. While many of the molecular players involved in these decisions are known, it is difficult to observe how their interactions over time ultimately determine cell fate. This project uses computational modeling to better understand these dynamic processes. We developed a mathematical model that combines cell cycle regulation with DNA damage response pathways in a single system. The model simulates how cells respond to increasing levels of ionizing radiation, a well-studied source of DNA damage. Simulations show that low levels of damage allow cells to recover and continue dividing, while moderate damage leads to a temporary pause before growth resumes. At higher damage levels, the system transitions into a stable arrested state resembling cellular senescence. Additional analysis identified key regulatory interactions that strongly influence whether a cell recovers or becomes permanently arrested. By linking short-term damage signals to long-term outcomes, this model helps explain how gradual increases in stress can shift cells from healthy growth to permanent arrest. This work provides a framework for studying how radiation, aging, and disease-related stress affect cell cycle behavior and may support future efforts to better predict cellular responses to damage.

PRESENTER: SARISA HOANG, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. YAOFA LI, MECHANICAL ENGINEERING
ADDITIONAL CONTRIBUTORS: ALEX LEE AND LAWRENCE HONG
PROJECT TITLE: FABRICATION OF VASCULAR PHANTOMS FOR CHARACTERIZATION OF COMPROMISED HEMODYNAMICS WITH 3D PARTICLE IMAGE VELOCIMETRY

Abstract: Changes in the deformation of blood vessels is a crucial indicator in the field of cardiovascular health. Vein stiffness can serve as a marker of diseases such as hypertension, atherosclerosis, and aneurysms. However, directly measuring the deformation of blood vessels in vivo is difficult due to limited accessibility, safety concerns, and the complexity of biological systems. A simplified model can be built to replicate features of a blood vessel in a controlled environment. As blood vessels can essentially be considered flexible tubes that expand and contract as a result of blood flow, one approach to simulation is using a compliant tube to serve as the artificial blood vessel and running a liquid with the same fluid properties of blood through the tube using a pump to simulate the heart. In this way, the variables of flow rate and pressure can be controlled in order to understand the fluid-structure interactions that take place within a blood vessel. This research aims to experimentally recreate an experimental compliant-tube system under oscillatory flow conditions that mimic the constant fluctuating pressure of a

heartbeat. Building upon previous efforts aimed at earlier detection of abnormal vascular behavior associated with cardiovascular disease, this work will be invaluable to help us gain new insight into unexplored physics and achieve high-fidelity data to enable the development of new predictive models.

PRESENTER: TIFFANY IAN, BIOENGINEERING
ADDITIONAL PRESENTERS: TAHA KHAN, BIOENGINEERING AND YASMIN ELTWAFSHA, BIOENGINEERING
FACULTY MENTOR: DR. CHUNG-HAO LEE, BIOENGINEERING
PROJECT TITLE: ENABLING IN-VITRO TRICUSPID VALVE EVALUATION VIA THE RIGHT HEART SIMULATOR

Abstract: Hypoplastic Left Heart Syndrome (HLHS) is a deteriorative condition of the tricuspid valve (TV), which occurs in around 1 in 3,800 newborns and imposes a 30% mortality rate within the first two weeks of life. The TV is not as commonly studied as the other heart valves and lacks sufficient in-vitro models to study how the TV functions under physiologically relevant flow and pressure conditions. The Right Heart Simulator (RHS) is a physical testing system that emulates the fluid dynamics in the right-hand side of the heart, including multiple chambers: the (1) atrium, (2) ventricle, and (3) bladder pump. This project focuses on redesigning the ventricular chamber to enable mounting of live porcine tricuspid valves for determining the factors that influence TV regurgitation. A custom multimaterial mount for excised TVs, including chordae integration, will be developed to add functionality beyond our current artificial valve limitations. Additionally, a dual-camera photogrammetry system will be incorporated to visualize the strain in the artificial and the live TV specimens by observing the leaflet deformation and identifying locations of maximum strain that pressure and flow measurements alone cannot detect. The pressure and flow sensor will also be upgraded to higher-resolution models, enabling more accurate capture of subtle changes in the flow behavior. These enhancements will provide a complete integration of biological TVs into the RHS for comprehensive evaluation and characterization, especially for future investigations into TV pathology and regurgitation mechanisms in conditions like HLHS.

PRESENTER: LIAM JENKINS, BIOENGINEERING
FACULTY MENTOR: DR. XIAOPING HU, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: DR. JASON LANGLEY, UCR CENTER FOR ADVANCED NEUROIMAGING
PROJECT TITLE: EVALUATING AGE RELATED CHANGES IN CORTICAL SUSCEPTIBILITY

Abstract: Iron deposition and demyelination are commonly observed in the aging brain and neurodegenerative diseases. Magnetic resonance imaging (MRI) allows for characterization of iron deposition and myelination in vivo. Quantitative susceptibility mapping is an MRI technique that measures magnetic susceptibility, the degree a material is magnetized in response to an applied magnetic field, and quantitative susceptibility source separation allows for the separation of paramagnetic (i.e. positive susceptibility) and diamagnetic (i.e. negative susceptibility). components. Iron is paramagnetic and myelin is diamagnetic and the magnetic susceptibility of different tissues will vary based on the relative content of iron and myelin. Here, we examine the relationship between age and susceptibility in 54 healthy older adults (aged 60-87 years; interquartile range: 65-73, median: 68, mean: 69.3 ± 6.02 years; 24 males and 30 females) recruited from the community surrounding University of California, Riverside. All subjects provided written informed consent. Statistically significant correlations were seen between age and diamagnetic susceptibility in the frontal lobe ($r = 0.412$, $p<0.01$), temporal lobe ($r = 0.286$, $p<0.01$), occipital lobe ($r = 0.402$, $p<0.01$), and parietal lobe ($r = 0.348$, $p<0.01$). No significant relationship was observed between age and the paramagnetic susceptibility component in any cortical

region. The positive correlation between diamagnetic susceptibility and age may be due to grey matter volume loss. Older adults experience a loss of cortical grey matter and myelin may make up a larger percentage of brain tissue in older adults. This may lead to a relative increase in diamagnetic susceptibility.

PRESENTER: LAYLA KASSIR, BIOLOGY
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: IMPROVING CRYOPRESERVATION USING TARDIGRADE DISORDERED PROTEINS

Abstract: Thousands of patients undergo organ and tissue transplants each year, and their success depends critically on the viability of biological tissues. The preservation of biological tissues and cells is typically done through cryoprotection, or preservation at low temperatures. However, cryopreservation of cells is a sensitive process, as it relies on precise freezing and thawing methods, temperature levels for storage, and the use of cryoprotectants. Some common challenges in cryopreservation are osmotic damage and cytotoxicity due to cryoprotectants, resulting in cell injury and cell loss. A potential solution for improving cryopreservation exists in tardigrade disordered proteins (TDPs), which allow tardigrades to tolerate extreme environmental conditions such as desiccation, extreme temperatures, and osmotic shock. Given these distinctive qualities of TDPs, we hypothesize that incorporating TDPs in the cryoprotection of biological tissue will increase viability and ultimately improve cryopreservation. In this study, we aim to test the benefit of expressing TDPs in Madin-Darby Canine Kidney (MDCK) cells and to further apply this technique to Red Blood Cells (RBCs). Recombinant mitochondrial abundant heat-soluble (MAHS) and cytoplasmic abundant heat soluble (CAHS) proteins will be generated in E. coli and purified using metal affinity chromatography. MDCK and RBC cryopreservation will be performed with CAHS and MAHS, and post-thaw viability will be assessed using live/dead fluorescence assays.

PRESENTER: NASHWAAN KHAN, COMPUTER SCIENCE
FACULTY MENTOR: DR. PHILIP BRISK, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: A COMPILER FOR PROGRAMMING DIGITAL MICROFLUIDIC BOARDS

Abstract: Microfluidic platforms are the backbone of automation in biochemical research, spanning from drug discovery to genomics. By manipulating small quantities of liquid, microfluidic chips allow time-intensive laboratory protocols to be automated and efficiently executed. Digital Microfluidic Boards (DMFBs) are a type of microfluidic device that allows programmable control over a grid of electrodes, supporting liquid operations such as moving, mixing, splitting, and heating. DMFBs are a low-cost alternative to other microfluidic tools but presently require painstakingly implementing protocols ad-hoc electrode by electrode or reprogramming the processor with a dedicated protocol. This presents a scaling barrier for adoption of this technology by biochemists despite the promises of automation. This project introduces a general working pipeline that can receive graphs representing simple mixing protocols, and translating them into instructions for the OpenDrop platform, an open source DMFB. Our proposed pipeline interprets the protocol structure and determines when each operation should occur, where it should be performed on the grid, and how droplets should be routed to travel without interference using a scheduling, placement, and routing workflow like those used in chip design. Finally, it translates this intermediate representation into an OpenDrop compatible electrode activation protocol. This pipeline aims to make DMFB technology more accessible for researchers.

PRESENTER: ADITHI KONA, ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: MODELING HIPPO-YAP'S DUAL ROLE IN BONE GROWTH AND SENESCENCE UNDER MICROGRAVITY

Abstract: Spaceflight induced microgravity directly drove rapid bone loss and overall accelerated cellular aging. This posed a major challenge for astronaut health during extended duration missions. The Hippo-YAP signaling pathway was the primary signaling pathway to bone biology since it integrated mechanical cues to regulate the cell cycle. However, its dual role in promoting bone growth and triggering cellular senescence under microgravity was yet to be properly investigated. My project proposed to develop an ordinary differential equation base model that coupled Hippo-YAP signaling with mitochondrial reactive oxygen species (ROS) dynamics to predict how microgravity shifted the pathway from osteogenic activation toward senescence and bone degeneration. My new model incorporated mitochondrial ROS feedback and stimulated the effects of altered forces representative of microgravity on cellular outcomes. Simulations were conducted to quantify changes in nuclear YAP and mitochondrial ROS. This research advanced understanding of spaceflight associated osteoporosis and revealed new therapeutic targets to counteract bone loss and premature cellular aging during space travel by investigating the molecular determinants of the Hippo-YAP pathway under simulated microgravity.

PRESENTER: YANETH LARIOS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. KE DU, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTORS: JACOB WAITKUS, HENRY YUQING, KANG-HSIN WANG, AND YOSHIHIRO IZUMIYA
PROJECT TITLE: DEVELOPMENT OF 3D-PRINTED HOLLOW-CORE MICRONEEDLE PATCHES FOR TRANSDERMAL GENE THERAPY VIA AAV VECTOR DELIVERY

Abstract: This study investigates the development and optimization of Hollow-Core Microneedle (MN) patches as a minimally invasive platform for gene therapy. Specifically, penetration and payload delivery capabilities were evaluated using both high-density and low-density microneedle arrays on a 1cm patch. Due to their small size, MNs avoid hitting the nerve-rich dermis layer below the surface of the skin. Additionally, other MN variations such as solid-core, dissolvable, or hydrogel offer different advantages compared to hollow-core MNs. The MNs designed for this work provide accurate drug delivery for patients without relying on slow-release techniques. The design and development of the MN patches were accomplished using ultra-high-resolution stereolithography 3D printing techniques. This allowed us to print features as small as 20um to allow for optimal and localized penetration of MNs through the epidermis skin layers. To assess therapeutic potential, transduced KSHV-infected iSLK cells were applied in a xenograft mouse model to evaluate the delivery of AAV8-TR2-OriP-TK, a viral vector. Through surface modifications, plasma ashing treatments of the MNs allowed for reduced dead space within the hollow chamber of the MNs. This ensured a majority of the desired therapeutics were delivered to the mouse model. Further testing on newer MN designs was also explored to deliver a solution of betamethasone to inhibit inflammation in the ear muscle of a Psoriasis Mouse model. These results highlight the potential of customizable 3D-printed Hollow-Core Microneedles as a promising platform for an efficient and safer transdermal delivery of drug and gene therapeutics.

PRESENTER: JUNGWON LEE, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
ADDITIONAL CONTRIBUTOR: MÅNS ERIKSSON
PROJECT TITLE: DEVELOPMENT OF WEARABLE SOFT PNEUMATIC ACTUATORS DESIGNED FOR KNEE SUPPORT

Abstract: The ability to perform athletic activities is often limited for individuals with lower limb mobility issues due to the sustained physical demands required to maintain bent knee postures for extended periods of time. This research explores the development of a lightweight and wearable soft pneumatic actuator which aims to address this issue. The actuator design consists of an inflatable bladder encased within a fabric sleeve, with the sleeve opening secured by 3D-printed end caps. When inflated, the actuator resists bending to provide supportive assistance, while deflation allows for unrestricted movement. Positioned behind the knee, the actuator aims to deliver adaptive support that enables users to comfortably maintain physically demanding postures for longer durations. The performance of the actuator will be characterized using a custom test setup. This setup includes a force sensor that will accurately measure the force generated by the actuator at a range of different pressures and angles. Testing various sizes, shapes, and materials will allow us to choose ideal designs for certain desired characteristics. Further evaluation will be done by analyzing the body position changes of a user during a sustained squatting task in order to compare the exerted effort of a user with and without the actuator assistance. The ultimate goal of this research is to enhance accessibility and participation in physically demanding activities for individuals with lower limb mobility impairments.

PRESENTER: ANOUSHKA LIMAYE, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. JONATHAN REALMUTO, MECHANICAL ENGINEERING
PROJECT TITLE: CAN FORCE SENSORS BE USED TO DETECT CHANGES IN CHAMBER AIR PRESSURE?

Abstract: Soft actuators often use pressurized bladders to generate compliant forces and motion. These actuators are important for wearable robots because they can generate compliant forces against the body. The setup may consist of sealed silicon tubing attached to an air compressor unit, which dictates the air pressure within the bladder. However, soft bladder behavior is not predictable- i.e., the chamber air pressure does not automatically reflect the input pressure, and actuator output functions rely on accurate, real-time readings of the internal air pressure. Thus, a pressure transducer is required to sense true pressure. However, conventional transducers are often bulky and difficult to install within tubing; thus, they are mounted externally, which increases system size and complexity, adds failure points at fittings and cables, and can interfere with compact, wearable form factors. The aim of this work was to investigate integrating force-sensitive resistors (FSRs), flat piezoresistors whose electrical resistance changes with applied force, into the pneumatic soft actuators to estimate internal air pressure. FSRs can easily slide into soft tubing, and hence are a potential alternative to transducers for closed-loop soft actuator functionality. This project concludes that FSRs are able to roughly detect changes in chamber air pressure, and although the accuracy is unknown, FSRs can reliably detect core information such as whether the pressure increases, decreases, or remains constant as well as gauging the intensity of change. The process involved fabricating four bladders with FSRs installed uniquely. Resistance values were printed to a microcontroller using a voltage divider circuit.

PRESENTER: SIDD LOKRAY, NEUROSCIENCE
FACULTY MENTOR: DR. ERFAN NOZARI, MECHANICAL ENGINEERING
ADDITIONAL CONTRIBUTORS: SAM POST AND ANUBHUTI GOEL
PROJECT TITLE: DECODING VISUAL STIMULUS INFORMATION FROM RNN-PREDICTED V1 ACTIVITY IN CALCIUM IMAGING DATA

Abstract: Neural circuits in the primary visual cortex (V1) convert visual input into population activity patterns that encode features within the visual stimulus. However, the computational principles behinds these dynamics are not fully understood. The purpose of this study was to investigate whether biologically constrained recurrent neural networks (RNNs) can capture and replicate key dynamics of V1 neural populations in calcium imaging traces. We trained a continuous RNN to model calcium imaging data recorded from neurons in mouse V1 during exposure to gratings at baseline and four temporal intervals (200ms, 400ms, 600ms, and 800ms post-stimulus onset). Through simulation and decoding analysis, we examined how well RNN-predicted activity captured temporal stimulus information compared to the actual calcium traces. Our results showed that logistic regression classifiers achieved comparable decoding accuracy on RNN-predicted activity and actual calcium traces, demonstrating that biologically constrained RNNs can effectively model neural dynamics during visual processing. Understanding these computational principles are important for developing biologically realistic models of V1 and for understanding how visual neural circuits convert visual information into interpretable traces.

PRESENTER: KEVIN LORITSCH, COMPUTER SCIENCE
FACULTY MENTOR: DR. PAEA LEPENDU, COMPUTER SCIENCE AND ENGINEERING
ADDITIONAL CONTRIBUTOR: KELLY DOWNEY, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: WHAT ABOUT CHEATSHEETS ARE USEFUL?

Abstract: College instructors often allow students some form of cheatsheet during an exam, such as one page of notes and formulas. Many believe these reduce test anxiety and help students to do better on exams. Focusing on the latter, we found, in a study of two different types of computer science courses, that features we might have believed would help students, do not actually have any correlation with performance. Coupled with mixed results from the literature, we are still left with the agonizing question: what about cheatsheets are useful?

PRESENTER: CHRISTIAN MACALUSO, BIOENGINEERING
FACULTY MENTOR: DR. MASARU RAO, MECHANICAL ENGINEERING
ADDITIONAL CONTRIBUTOR: ERIC THUESON, MECHANICAL ENGINEERING
PROJECT TITLE: SONOGRAPHIC ANALYSIS OF THROMBOSIS WITHIN A PDMS SACCULAR ANEURYSM

Abstract: Cerebral aneurysms, characterized by weakening and saccular outpouching of a cerebral artery, pose significant risks of rupture. This can lead to life-threatening complications such as subarachnoid hemorrhage requiring immediate surgical intervention. For unruptured cerebral aneurysms, flow diverters have emerged as an innovative, minimally invasive treatment option effectively managing complex aneurysms by redirecting blood flow and promoting vessel healing. However, the use of flow diverters in the posterior circulation of the brain is not FDA-approved due to higher risks of complications such as thrombosis of perforating arteries and subsequent ischemia. In our research, we aim to develop a mechanism to detect blood coagulation formation within a polydimethylsiloxane (PDMS) saccular aneurysm model, fabricated to simulate in vivo conditions. Utilizing sonography-based imaging, we seek

to visualize and quantify blood coagulation dynamics while also measuring the time required for coagulation to occur.

PRESENTER: ADARSH MATTAPPALLY, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: PRINCE DAVID OKORO, BIOENGINEERING
PROJECT TITLE: BIOPHYSICAL CHARACTERIZATION OF AN IN SITU CROSSLINKED IONIC CONDUCTIVE HYDROGEL FOR NEURAL TISSUE ENGINEERING

Abstract: Neurodegenerative diseases continue to drive the need for advanced biomaterial strategies in neural tissue engineering, as many current scaffold systems remain limited in biomimicry and biocompatibility. We recently demonstrated the neurogenic potential of photocrosslinked bioionic liquid (BIL) hydrogels that better recapitulate the conductive and biophysical features of native tissue. To improve translational relevance, we developed an enzymatically crosslinked formulation composed of choline chloride (ChCl) modified fish gelatin crosslinked with transglutaminase (TGase), enabling gelation under physiological conditions without the need for light-based curing. Here, we characterized gelation, mechanical behavior, and degradation profiles of the engineered hydrogel. Hydrogels were formulated at varying polymer concentrations (5, 10, and 15% w/v) and TGase levels (2.5 and 10 U/mL), achieving rapid gelation under physiologically relevant conditions. We observed a clear dependence of gelation kinetics on enzyme concentration. Compression testing revealed time-dependent stiffening and an increase in compressive modulus with increasing polymer and enzyme concentration, with the highest moduli observed for 15% (w/v) polymer and 10 U/mL TGase. Notably, compressive moduli of 1 to 2 kPa were achieved, a range suitable for neural tissues. Degradation in phosphate-buffered saline (PBS) at 37°C showed a gradual loss with a clear dependence on both polymer and enzyme concentrations. In collagenase type II, degradation was accelerated, and this effect was more pronounced in BIL-free formulations. These results establish a tunable, injectable hydrogel platform with neural-relevant mechanics and controllable stability, supporting its potential as a clinically-relevant scaffold for neural repair.

PRESENTER: NICHOLAS MCCONNON-SHAHIN; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTORS: DR. JONATHAN MEUSER, CHEMICAL AND ENVIRONMENTAL ENGINEERING AND ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: GENOTYPIC VALIDATION OF BIOENGINEERED *ALOE VERA* BY CONFIRMATION OF TRANSFORMATION AND TARGETED DNA EDITS TO THE *AVPKS1* AND *AVPKS2* GENES

Abstract: *Aloe vera* (Aloe) is the most widely-used plant ingredient in the medical, cosmetic and supplement industries; however, the major Aloe anthraquinone aloin is classified as a Prop 65 carcinogen that must be reduced to below 10 ppm for commercial sale. Aloin-free non-toxic Aloe would require far less processing and the ability to retain nearly 200 other bioactives currently lost during charcoal filtration. Therefore, our goal is to disrupt the anthraquinone pathway genes Polyketide synthase 1 and 2 (*AvPKS1*, *AvPKS2*) to block aloin biosynthesis. Gene edits are being targeted with the endonuclease CRISPR-Cas9 and concomitantly expressed PKS1 and PKS2 gene-specific guide RNAs (gRNAs). The gene-editing plasmid CB3 used also contains the antibiotic hygromycin b resistance (Hyg_R) gene for plant selection, which can also be used as a marker for genetic transformation. The polymerase chain reaction (PCR) method of DNA amplification and gel electrophoresis has been used to test for the genomic integration of the Hyg_R gene and the success of targeted edits to *AvPKS1*/*AvPKS2* based on differences in

PCR amplicon size between native and edited alleles. Development of these methods is an essential step towards the goal of eliminating the biosynthesis of aloin, a demonstration of how biotechnology can be applied to a non-model crop to make valuable improvements to an important industrial ingredient like Aloe.

PRESENTER: SIKANDER NARANG, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
ADDITIONAL CONTRIBUTORS: PRINCE DAVID OKORO AND ADARSH MATTAPALLY
PROJECT TITLE: SYNTHESIS AND CHEMICAL CHARACTERIZATION OF IN SITU CROSSLINKABLE BIO-IONIC LIQUID HYDROGELS

Abstract: Bio-ionic-liquid (BIL) hydrogels have demonstrated strong potential for imparting tissue-relevant ionic conductivity while maintaining cytocompatibility. However, most current BIL systems rely on light-activated photopolymerization, which is poorly suited to deep, optically inaccessible, or light-sensitive tissues. To address this limitation, we implemented an in situ enzymatic crosslinking strategy that couples choline-chloride (ChCl)–modified fish gelatin with transglutaminase (TGase). TGase catalyzes ε- (γ-glutamyl)-lysine isopeptide bond formation under physiological conditions, enabling minimally invasive gelation without external irradiation. In this study, we synthesized ChCl-functionalized fish gelatin and confirmed cholinium incorporation by 1H NMR and FTIR, with 1H NMR verifying diagnostic cholinium resonances and FTIR supporting covalent modification of the gelatin backbone. We observed a clear dependence of functionalization on reaction temperature, with significantly higher incorporation at 50°C compared to room temperature. Reaction time also influenced functionalization, with greater incorporation at 24 h relative to 6 h. Finally, we evaluated enzymatic gelation to confirm retention of TGase-reactive sites and observed a solution-to-gel transition within ~10 min at 37°C. Collectively, these results support an injectable, conductive hydrogel platform that crosslinks entirely through enzymatic chemistry, offering a safer, light-independent route for applications in electroactive tissues.

PRESENTER: ATHARVA NEVASEKAR, COMPUTER SCIENCE
FACULTY MENTOR: DR. ZHAOWEI TAN, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: ENHANCING 5G ARCHITECTURE COMPREHENSION WITH LARGE LANGUAGE MODELS AND MULTIMODAL RETRIEVAL-AUGMENTED GENERATION

Abstract: With new telecommunication and computer networking technologies (O-RAN, MIMO, 5G NR, etc.) specifications are very complex with hundreds of thousands of pages of documentation. Expanding expertise in this field helps industry to better design secure, reliable, performant 5G and future G infrastructure for billions of people. I propose a Large Language Model (LLM) based learning tool to communicate extracted information to users and incorporate a Retrieval Augmented Generation (RAG) pipeline to extract data from 5G specifications. The goal is to enhance multimodal RAG capabilities and optimize AI as a powerful information retrieval and learning tool by testing diverse RAG methods.

PRESENTER: JASMINE NGUYEN, BIOENGINEERING
FACULTY MENTOR: DR. JIN NAM, BIOENGINEERING
PROJECT TITLE: MAGNETIC ALIGNMENT OF SILK FIBROIN COMPOSITE HYDROGEL FOR THREE-DIMENSIONAL NEURAL TISSUE MODELING

Abstract: The objective is to develop a three-dimensional in vitro nerve model using a silk-fibron hydrogel with embedded magnetic nanoparticles to reproduce the structural features of nerve tissue. The design helps provide a controlled microenvironment that enhances the nerve cell growth and alignment by the modulated physical cues. Silk fibron is selected as the hydrogel matrix due to its biocompatibility and tunable mechanical properties. Magnetic nanoparticles in a form of rod shape are embedded within and crosslinked with the silk fibroin hydrogel, creating a nanoparticle-hydrogel composite. The composite hydrogel is mixed with neural stem cells, creating a three-dimensional cell-matrix construct. An external magnetic field is utilized to induce the alignment of magnetic nanoparticles within the hydrogel matrix. This then creates structural cues that guide the axonal extension and the uniaxial orientation of the cells. The alignment is critical for mimicking an organized environment of the spinal cord that the axons rely on for physical guidance. This model provides an in vitro nerve model that allows for the study of nerve pathology and regeneration under controlled conditions.

PRESENTER: RAMI NOURSI, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. MICHAEL ZACHARIAH, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTORS: ERIK HAGEN, LEI YANG, YUAN QUAN, SAMMED BHALERAO, MAHBUB COWDERY, AND YUXIN ZHOU
PROJECT TITLE: USING MESOPARTICLES WITH EXOTHERMIC BINDERS TO EJECT NANO ALUMINUM FROM HTPB

Abstract: Hydroxyl-terminated polybutadiene (HTPB) is the most widely used solid fuel and polymer binder in hybrid and solid rocket systems. To enhance its energy density, aluminum powder is commonly incorporated, typically in micron-scale form (µAl). Although µAl/HTPB composites have been studied extensively for over a decade, recent research has demonstrated the potential advantages of incorporating nano-scale aluminum (nAl) into HTPB. Compared to µAl, nAl offers lower ignition temperatures, higher reactivity, and shorter burn times due to its increased surface area. However, this same high surface area creates strong interfacial interactions with HTPB, making ejection difficult. During combustion, nAl particles tend to sinter on the fuel surface, forming agglomerates that inhibit particle ejection and ultimately cause flame extinction. To address this limitation, micron-scale mesoparticles (MPs) composed of nAl and a polymer binder were synthesized to facilitate sustained ejection. In this study, MPs were fabricated using nitrocellulose (NC), polyacrylonitrile (PAN), polyvinylidene fluoride (PVDF), or polypropylene carbonate (PPC) as a binder. The MPs were evaluated for their ability to promote nAl ejection and sustain regression in MP/HTPB composites. MPs containing NC or PAN successfully ejected nAl and enabled consistent fuel regression, whereas PVDF and PPC-based MPs did not. The enhanced performance of NC and PAN formulations is attributed to their exothermic decomposition, which generates localized heat at the HTPB-MP interface. This leads to increased HTPB pyrolysis, producing gaseous species, which promotes nAl ejection.

PRESENTER: CHARLETTE O'CONNOR, DATA SCIENCE
FACULTY MENTOR: DR. ZHAOWEI TAN, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: MITIGATING DATA POISONING ATTACKS BY MALICIOUS XAPPS IN THE 5G O-RAN CONTEXT

Abstract: Radio Access Network (RAN), widely known as base stations, is a critical component in cellular networks to provide wireless data services. 5G introduces a new approach to RAN, as Open RAN (O-RAN), allowing the traditional hardware base stations of RAN to be virtualized as Cloud supported software. O-RAN is disaggregated into multiple components, each a part of RAN functionality. Additionally, it introduces the RAN Intelligence Controller (RIC) as a new software component that allows the creation and deployment of xApps. These AI-powered components collect and process large amounts of data in order to train their configurations which are used to optimize some specific utilities.

We studied a new cybersecurity concern regarding malicious 3rd party xApps that would abuse authorized privileges to perform data poisoning attacks on other deployed xApps. This would cause the xApps to make inaccurate decisions and degrade intended optimization, potentially denying service to users. In conducting a case study using a Traffic Steering xApp set-up, we discovered that the attacker could spoof messages to the xApp and initiate false handover. To evaluate how they execute these attacks, we set up O-RAN test beds and used various Colosseum O-RAN dataset in order to simulate and analyze these attacks. We are using the combination of anomaly detection algorithms such as the Isolated Forests algorithm which will identify any attacks, and Vertical Federated Learning which will strengthen the integrity of the xApp ecosystem.

PRESENTER: NATHAN OH, MECHANICAL ENGINEERING
FACULTY MENTORS: DR. SUNDARARAJAN VENKATADRIAGARAM, MECHANICAL ENGINEERING
PROJECT TITLE: EXPERIMENTAL VALIDATION OF APOGEE TRAJECTION AND BASE DRAG CONTRIBUTIONS FOR A DEPLOYABLE PAYLOAD IN A LOW-COST SOLID ROCKET SYSTEM

Abstract: Low-cost rocketry provides accessible platforms for aerospace education, experimental validation, and small-scale trajectory modeling. Accurate prediction of rocket flight is critical for safety and performance; however, most conventional aerodynamic models assume a constant drag coefficient, despite limited empirical characterization of base drag contributions. This simplification can introduce significant apogee prediction error. This study investigates the influence of base drag and altitude-dependent fluid property variation on aerodynamic modeling accuracy in low-cost rocket systems. Flight telemetry is collected using an onboard Arduino-based data acquisition system measuring barometric altitude, temperature, and acceleration. These measurements are used to estimate air density variation and Reynolds number throughout ascent. Inverse dynamic modeling is applied to isolate drag forces and quantify deviations from constant-coefficient assumptions. Multiple flight trials are conducted to ensure repeatability, and statistical comparisons are performed to evaluate model consistency. Experimental comparisons between trapezoidal and elliptical fin configurations assess geometric effects on base drag behavior. Apogee prediction error is quantified relative to theoretical predictions, and an adjusted drag coefficient model is developed to improve trajectory accuracy. This work demonstrates the sensitivity of aerodynamic prediction to density variation and fin geometry, providing an empirical framework for enhancing low-cost rocket modeling.

PRESENTER: ALISON ORDENTLICH, DATA SCIENCE
FACULTY MENTOR: DR. TINGTING XIANG, BIOENGINEERING
PROJECT TITLE: SYMBIOSIS STABILITY IN SYMBIODINIACEAE FROM BLEACHED AND BLEACHING-RESISTANT CORALS

Abstract: Coral-algal symbiosis is the mutually beneficial relationship between corals and dinoflagellates in the family Symbiodiniaceae. This partnership is essential to coral reef health, with algal symbionts providing up to 100% of the coral's energy through nutrient exchange. However, this relationship is highly sensitive to environmental stress, with elevated temperatures disrupting symbiosis and leading to coral bleaching. Without host recovery through algal repopulation, corals die, causing major losses of biodiversity and ecosystem resources. The increasing frequency of global bleaching events highlights the urgent need for strategies to safeguard coral reefs.

Our research investigates how algal symbionts from bleaching-susceptible and bleaching-resistant corals differ in their thermal stress responses and in their effects on host-symbiont stability. We isolate algal symbionts from bleached and non-bleached coral hosts and characterize them at genetic and molecular levels to link species identity with phenotypic thermal tolerance. To directly assess their functional impact, these isolated algae are introduced into *Exaiptasia diaphana*, a cnidarian model system for coral–algal symbiosis, where we evaluate symbiosis establishment and thermal responses under controlled stress conditions.
Preliminary data suggests an increased symbiont presence in *Exaiptasia diaphana* under elevated thermal stress for algae isolated from bleaching-resistant corals compared to those from bleached counterparts. This research addresses a gap in understanding how natural variation among algal populations contributes to thermal tolerance and symbiosis stability. Defining these functional traits will establish a predictive framework for identifying symbiont lineages capable of enhancing coral resilience in a warming ocean.

[1] Van Oppen et al. Springer. 233 (2018); [2] Xiang et al. J. Phycol. 49 (2013); [3] Jinkerson et al. Curr. Biol. 32 (2022); [4] Xiang et al. Nature. 108 (2020).

PRESENTER: GERARD ALLEN PAREDES, BIOENGINEERING
FACULTY MENTOR: DR. TINGTING XIANG, BIOENGINEERING
PROJECT TITLE: METABOLIC RESPONSES TO LOSS OF SYMBIONT PHOTOSYNTHESIS IN CNIDARIAN-SYMBIODINIACEAE RELATIONSHIP

Abstract: Coral–algal symbiosis is the mutualistic association between cnidarian hosts and photosynthetic dinoflagellates of the family Symbiodiniaceae. This partnership is vulnerable to environmental disturbances that disrupt photosynthesis and induce coral bleaching, a stress response marked by symbiont loss and often followed by coral death. Restoration success is limited by coral bleaching susceptibility, highlighting the need for innovative genetic approaches; however, no optimized gene-editing systems currently exist for Symbiodiniaceae or cnidarian hosts. To fill this gap, our lab developed a UV-mutagenesis protocol for *Brevolium minutum* (SSB01), a symbiont of the model sea anemone Aiptasia, enabling rapid generation of mutants. This method produced *less brown 1 (lbr1)* and *orange 1 (ora1)*, two non-photoautotrophic SSB01 mutants that require supplemental nutrients for growth. We have shown that without symbiont photosynthesis, the cnidarian-algal relationship becomes unfavorable, and symbionts are unable to proliferate within hosts. What remains unknown are the key metabolites transferred to the host through symbiont photosynthesis and the metabolic response of the host to lack of photosynthetic products. In this project, I inoculated Aiptasia with *lbr1* and *ora1* and

performed comparative metabolomic analyses to identify host metabolic pathways altered by the lack of symbiont photosynthesis and nutrient exchange. Preliminary data show enrichment of amino acids in the metabolic profiles of mutant-infected animals compared to wild-type-infected animals, suggesting increased delivery of nitrogen to symbionts by the host to encourage growth and photosynthesis. As global oceanic temperatures continue to rise, understanding the basis of the cnidarian-algal symbiosis may help address the decline of coral populations worldwide.

PRESENTER: JOOAHN PARK, COMPUTER SCIENCE
FACULTY MENTOR: DR. ZHAOWEI TAN, COMPUTER SCIENCE AND ENGINEERING
ADDITIONAL CONTRIBUTORS: JULIEANNE NGUYEN AND ZHUTIAN LIU
PROJECT TITLE: DRONE-ASSISTED LORAWAN SYSTEM FOR REMOTE AGRICULTURAL SENSING

Abstract: Modern agriculture is increasingly turning to smart technologies to help farmers improve crop yields and conserve resources. Key challenges include collecting data in remote areas and the high cost of precision agriculture. This project aims to build a drone-assisted system that gathers soil sensor data using LoRaWAN, a low-power network protocol that uses LoRa radio signals for long-range wireless communication. The system incorporates standalone LoRa-enabled soil sensors and a custom Raspberry Pi 4B datalogger that collects and transmits data from multiple wired sensors. These soil readings are sent to a mobile gateway mounted on a drone, which strengthens sensor connectivity by reducing signal degradation from long distances and blocked line of sight. Unlike standard systems that require internet access, the gateway operates offline by running a local network server on a Raspberry Pi 3B using Docker containers. As the drone flies, it collects sensor data via MQTT in real time and logs it locally for later analysis, eliminating the need for manual retrieval from individual sensors. End-to-end communication was confirmed through real time data transfer from sensors to the gateway, confirming that the mobile gateway could receive and process simultaneous transmissions without cellular or Wi-Fi infrastructure. These results demonstrate that LoRaWAN provides a practical and flexible system for agricultural monitoring in large or remote regions. Future work will focus on developing an intuitive interface to visualize data and generate crop management recommendations.

PRESENTER: ESHAN PATEL, BIOCHEMISTRY
FACULTY MENTORS: DR. JONATHAN MEUSER, CHEMICAL AND ENVIRONMENTAL ENGINEERING AND ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: DETERMINATION OF VANILLIN SYNTHASE (VPVAN) GENETIC TRANSFORMATION IN *VANILLA PLANIFOLIA*

Abstract: Vanilla is a highly-valued ingredient, but *Vanilla planifolia* agriculture threatens tropical ecosystems, is low-yielding, and is often grown unethically. Genetic engineering for enhanced vanillin biosynthesis could be both a sustainable and ethical agricultural solution, as well as positive control for non-GMO screening approaches. We aim to overexpress a native Vanillin synthase gene (VpVAN) to increase vanillin yields both *in planta* and in plant cell suspension culture. Putatively biolistically transformed plants were selected based on kanamycin antibiotic resistance. Genomic plasmid integration was tested using polymerase chain reaction to detect the Kan_R gene in the putative transformant. Amplification of the expected fragment confirmed transformation in the putative vanilla mutant. Currently, work is being done to quantify transformant versus wild-type vanillin production using high-performance liquid chromatography (HPLC). These results confirm successful genetic transformation of *V. planifolia*, establishing a framework for reverse engineering and strain selection methods to increase

vanillin yield. This work demonstrates the first steps in how synthetic biology may be leveraged to achieve a more sustainable and ethical strategy for vanilla production through metabolic engineering.

PRESENTER: AXEL PEREZ, COMPUTER ENGINEERING
ADDITIONAL PRESENTER: KIM NGUYEN, COMPUTER SCIENCE
FACULTY MENTOR: DR. PHILIP BRISK, COMPUTER SCIENCE AND ENGINEERING
ADDITIONAL CONTRIBUTORS: VAHAGN TOVMASIAN, GIOVANNI DE LA LUZ, AND DR. WILLIAM GROVER
PROJECT TITLE: DNA MELTING TEMPERATURE PREDICTION VIA MACHINE LEARNING

Abstract: The melting temperature T_m of a DNA sequence is the temperature at which half of double-stranded DNA denatures into single-stranded DNA, a parameter used in primer design for PCR and other nucleic acid based reactions. The standard for quickly predicting T_m, the nearest neighbor (NN) model, despite its general accuracy, can give very inaccurate predictions (+/- 10 deg C) in certain cases such as multiple mismatches in base pairs the individual DNA strands, varying ion salt concentrations of the solutions, and melting which does not occur in a two-state manner. Extended nearest neighbor models or improving existing parameters may provide more accuracy, but require rapidly increasing amounts of data from wet-lab experiments for marginal return. In this paper, we present the approach of using supervised machine learning with XGBoost, a gradient boosted tree-based ensemble model, alongside an encoding using ProtVec, a continuous distributed representation of biological sequences, to predict the melting temperatures of oligonucleotides. We explored multiple encoding strategies to identify the most effective representation, followed by hyperparameter optimization to refine predictive accuracy. The model was trained on datasets that included both perfectly complementary and mismatched DNA strands, to improve predictive accuracy across a variety of structures. We present results which demonstrate that this approach can yield a reduction of mean absolute error over existing models, while discussing the significance and impact of encoding and connections between nearest neighbors and ProtVec, along with the application of said model as an open source, self-improving, tool for researchers.

PRESENTER: NINA PHATAK, BIOENGINEERING
FACULTY MENTOR: DR. GIULIA PALERMO, BIOENGINEERING
PROJECT TITLE: CONFORMATIONAL DYNAMICS OF S15 PROTEIN IN CRISPR-ASSOCIATED TRANSPOSONS REVEALED THROUGH GEOMETRIC DEEP LEARNING

Abstract: CRISPR-associated transposons (CASTs) are powerful gene-editing systems, capable of inserting large DNA payloads without creating harmful double-strand breaks. Recent cryo-EM structures revealed that bacterial ribosomal protein S15 is unexpectedly essential to the Cas12k-RNA-DNA complex, where it binds between the Cas12k REC2 domain and the RNA-DNA hybrid, enhancing transposition activity two- to three-fold through contacts with tracrRNA. However, human ribosomal protein S13 cannot functionally substitute for bacterial S15, limiting human therapeutic applications. Static experimental structures provide only snapshots and cannot reveal how S15 moves, limiting our ability to engineer human-compatible variants.

We apply molecular dynamics (MD) simulations combined with geom2vec, a geometric deep learning approach, to characterize S15 conformational dynamics. Geom2vec uses pre-trained graph neural

networks to learn universal geometric features from 3D atomic coordinates, decoupling feature extraction from downstream analysis. We analyze multi-microsecond long simulations under different conditions (with/without S15 and TniQ cofactor) using the SubFormer-GVP architecture to capture long-range interactions across the S15-Cas12k-RNA interface. Learned representations are processed through VAMPNet to identify slow collective variables (CVs) that describe how S15 changes shape over time.

Initial analysis focuses on identifying 2-4 dominant slow CVs and using SubFormer attention maps to reveal which S15 residues beyond the known contact residues (K3, R11, H42) regulate conformational dynamics. Cross-condition comparison will determine whether TniQ removal alters S15's conformational landscape or sampling behavior. Understanding S15's dynamic molecular basis will inform engineering strategies for human-compatible CAST systems and establish a transferable deep learning framework for understanding conformational dynamics in large biomolecular assemblies.

PRESENTER: KEYANNA-MILENIA PINZON, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: SARA NAFAR, BIOENGINEERING
PROJECT TITLE: TARDIGRADE-DERIVED PROTEINS PROTECT MITOCHONDRIA FROM OXIDATIVE STRESS IMPLICATED IN NEURODEGENERATION

Abstract: Parkinson's disease is a progressive neurodegenerative disorder strongly associated with mitochondrial dysfunction and oxidative stress, both of which accelerate cellular senescence. To explore therapeutic strategies, we investigated whether tardigrade-derived proteins could enhance resistance to mitochondrial stress in mammalian cells.

Tardigrades are microscopic animals known for their ability to survive extreme conditions, including desiccation. Senescence is an entryway to cell death (apoptosis) and a driving factor to many neurodegenerative diseases. This resilience is incompletely understood but has been attributed in part to genes encoding intrinsically disordered proteins such as Mitochondrial-Abundant Heat Soluble (MAHS), Mitochondrial-Late Embryonic Abundant (RvLEAM), and damage suppressor (Dsup) proteins. In limited studies, transgene expression of these proteins has been shown to protect human cells, however, this is understudied in mitochondrial stress. An established model of mitochondrial stress is treatment with mitoparaquat (MitoPQ), which generates oxidative stress specifically in the mitochondria.

Human U87 glioblastoma cells were transduced using a lentiviral system to express MAHS-AcGFP, RvLEAM-AcGFP, and Dsup-AcGFP with AcGFP as the control group. Cells were exposed to 25 μM MitoPQ for six days to induce mitochondrial superoxide production and simulate a Parkinsonian phenotype. Senescence induction by MitoPQ was validated by an increase in a senescence-associated marker GLB1 (lysosomal β-galactosidase) transcript levels, measured by quantitative PCR relative to the untreated group. Cell metabolic activity was evaluated through MTT assays to quantify mitochondrial protection by the tardigrade-derived proteins. Compared to control, cells expressing RvLEAM, Dsup, and MAHS had 14.52%, 7.97%, and 2.01% (respectively) higher metabolic activity via MTT.

PRESENTER: AUDREY REINHARD, COMPUTER ENGINEERING
ADDITIONAL PRESENTERS: CHARLETTE O'CONNER, DATA SCIENCE AND MARVLEY RODRIGUEZ-CALVA, COMPUTER SCIENCE
FACULTY MENTOR: DR. BRENDON WHEELER, UCR LIBRARY
ADDITIONAL CONTRIBUTORS: MELANIE GOMEZ AND ACHALA PANDIT
PROJECT TITLE: REAL-TIME TOTEM RECOGNITION ON EDGE DEVICES

Abstract: This research explores the development of an efficient edge computing computer vision system designed for real-time recognition of totems used as powerups in a Mario Kart style RC car race. Implementing computer vision at the "edge" allows for lower latency and reduced bandwidth usage, but it presents significant challenges regarding hardware constraints.

Initially, a standard Convolutional Neural Network (CNN) was developed. While the model demonstrated high accuracy during the verification and testing phases on a workstation, its performance degraded significantly after conversion to a TensorFlow Lite (TFLite) format for deployment. To address these accuracy losses, the project transitioned to a YOLO (You Only Look Once) architecture. After manual data annotation and training, the YOLO model provided superior detection capabilities in live environments.

However, deployment on the edge device revealed an unexpected hardware conflict: the high computational load required by the model created interference that disrupted the device's Bluetooth signal. To maintain reliable communication and system stability, the research shifted toward model compression and architecture shrinking. By reducing the model's footprint, we aim to balance high-precision object detection with the power and signal constraints of edge hardware. This ongoing work highlights the need for holistic system design in edge AI, where software performance must be balanced against hardware limitations. Future steps include fine-tuning the pruned YOLO model to recover accuracy lost during the shrinking process.

PRESENTER: SHANE REVEL, MATERIALS SCIENCE AND ENGINEERING
FACULTY MENTOR: DR. TAMAR MENTZEL, MECHANICAL ENGINEERING
PROJECT TITLE: OXIDATION-INDUCED TELLURIUM PRECIPITATES AND ITS IMPACT ON RAMAN MODE ASSIGNMENT IN ZRTE3

Abstract: Van der Waals (vdW) materials exhibit strong in-plane bonding and weak out-of-plane interactions, enabling mechanical exfoliation and high surface sensitivity. ZrTe3, a quasi-one-dimensional (1D) vdW transition metal trichalcogenide, has garnered attention for its charge density waves, and filamentary superconductivity. Raman spectroscopy serves as a powerful probe of lattice vibrations and symmetry changes to explore ZrTe3. However, there are conflicting understandings of the Raman mode reported in the literature, as has been found for other air-sensitive Te- and Se- based materials. This project resolves the intrinsic Raman modes in ZrTe3. We find oxidation- and laser irradiation-induced tellurium precipitates form in the surface of ZrTe3. Owing to the large Raman scattering cross section of Te precipitates, their modes dominate the Raman spectrum despite comprising a small fraction of the material. ZrTe3 was systematically studied under controlled oxidation and laser irradiation to track the evolution of the Raman modes as Te precipitates form. Atomic force microscopy (AFM) was used to determine flake thickness and laser-induced surface modification depth. Focused ion beam scanning electron microscopy (FIB-SEM) was used to prepare cross sections for high-angle annular dark-field scanning transmission electron microscopy (HAADF-STEM) to directly visualize precipitates within the

oxide layer. By correlating spectroscopic, structural, and depth-dependent analyses, this work aimed to distinguish intrinsic lattice vibrations from surface-induced tellurium modes and establish a framework for accurate Raman mode assignment in chalcogenide vdW materials.

PRESENTER: DAMIEN SOLARES RUIZ, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. FUDONG LIU, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTOR: DR. TAN LI, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: PALLADIUM-BASED CATALYSTS FOR METHANE OXIDATION AT LOW TEMPERATURES

Abstract: Natural gas and petroleum systems account for 28% of methane emissions in the United States, with methane being emitted during the production, processing, and distribution of both systems. In recent years, the U.S. has become the leading producer of natural gas, with liquefied natural gas (LNG) emissions growing rapidly. Palladium (Pd)-based catalytic materials offer promising potential for methane removal through complete oxidation at low temperatures due to the ability of palladium to cycle between Pd^0 and Pd^{2+} oxidation states. Here, several Pd-based catalysts ($1.5Pd/Al_2O_3$, $1.5Pd/2.5SiO_2/Al_2O_3$, $1.5Pd/5SiO_2/Al_2O_3$, $1.5Pd/7.5SiO_2/Al_2O_3$, and $1.5Pd/10SiO_2/Al_2O_3$) were synthesized by incipient wetness impregnation (IWI) and calcined at 550°C for 2 hours. The synthesized catalysts were then characterized using both X-ray diffraction (XRD) and transmission electron microscopy (TEM) before the catalytic performance tests were performed. Then, a fixed-bed tubular reactor was used to evaluate the conversion of methane for each catalyst over a 250°C-500°C temperature range. Additionally, the catalysts were aged at 700°C for 10 hours to evaluate the effect on methane conversion under realistic conditions. The $1.5Pd/2.5SiO_2/Al_2O_3$ catalyst exhibited the highest catalytic activity for the fresh catalysts, with a T_{50} of 380°C. However, after aging the catalyst, $1.5Pd/7.5SiO_2/Al_2O_3$ displayed higher catalytic activity with a T_{50} of 412°C. Future work aims to evaluate the effect of sulfur dioxide on $Pd/SiO_2/Al_2O_3$ catalysts.

PRESENTER: AARUSHI SAHU, NEUROSCIENCE
FACULTY MENTOR: DR. YUJIE MEN, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTOR: YIWEN ZHU, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: BIOTRANSFORMATION OF PFAS PRECURSORS IN ACTIVATED SLUDGE AND DETECTION OF PERSISTENT TRANSFORMATION PRODUCTS

Abstract: Activated sludge systems are widely used in wastewater treatment, yet their capacity to biotransform per- and polyfluoroalkyl substance (PFAS) precursors and generate persistent transformation products remains insufficiently characterized. In this study, we evaluated the biotransformation behavior of five PFAS precursors in activated sludge over a 21-day incubation: FOSA (CAS: 754-91-6), AmPr_FHxSA (CAS: 50598-28-2), AmPr_FHxSA_PrA (CAS: 141607-32-1), AmPr_FOSA (CAS: 13417-01-1), and AmPr_FOSA_PrA (CAS: 1432486-92-4). Whole samples were collected at multiple time points, extracted, and directly injected for analysis using a Q Exactive Orbitrap high-resolution mass spectrometer to track parent compounds and screen for transformation products. Evidence of transformation was observed for FOSA, AmPr_FOSA, and AmPr_FHxSA, with multiple transformation products detected, indicating that activated sludge microbial communities can mediate precursor conversion under these conditions. In contrast, the quaternary amine precursors AmPr_FHxSA_PrA and AmPr_FOSA_PrA showed no detectable transformation over 21 days, suggesting high stability and potential persistence through biological treatment. To our knowledge, this is the first report demonstrating biotransformation and transformation product detection for these PFAS precursors in an activated sludge

system. These findings highlight precursor-specific fate and underscore the importance of monitoring both parent PFAS precursors and transformation products when evaluating PFAS behavior in wastewater treatment.

PRESENTER: SHIVETA SAINI, BIOENGINEERING
FACULTY MENTOR: DR. XIAOPING HU, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: VALA MASJEDIZADEH
PROJECT TITLE: MICROPARTICLE-BASED DELIVERY INCREASES BRAIN CREATINE LEVELS IN MICE

Abstract: Creatine supplementation in mice enhances brain energy metabolism through increased ATP production. This study compares creatine concentrations obtained from commercially available creatine monohydrate and microparticle-based delivery systems. The mice were treated with phosphate-buffered saline (PBS), commercially available creatine monohydrate (13 mg/mL), microparticle creatine at 13 mg/mL, or microparticle creatine at 32.5 mg/mL. These treatments were administered intranasally to partially bypass the blood-brain barrier and provide direct transport to the brain. Using a colorimetric creatine assay kit, the olfactory bulb, cerebellum, and hippocampus were analyzed. The standard curve of absorbance values helped determine the creatine concentration in each respective brain region. The final creatine concentrations were adjusted for dilution, and tissue water content (0.8 mL/g) was taken into account. Brain creatine levels were lowest in the PBS-treated mice and gradually increased in both the commercially available creatine monohydrate and the microparticle creatine at 13 mg/mL. The microparticle-based delivery at 32.5 mg/mL resulted in the highest creatine concentrations. This enhancement in creatine concentration was observed across all three brain regions that were analyzed. There were regional differences in creatine elevation, with the hippocampus having a meaningful impact. The hippocampus is responsible for memory formation and spatial navigation, suggesting that creatine availability may have an impact on cognitive processes. The olfactory bulb also showed increased creatine, but this can be attributed to its proximity to the blood-brain barrier. These findings suggest that microparticle-based creatine delivery could improve brain energy metabolism in mice.

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

Abstract: The rapid expansion of artificial intelligence (AI) has led to its integration across fields such as healthcare. At its core, AI uses mathematical algorithms to produce an output from inputs chosen by the user. Traditional AI approaches include symbolic AI which 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. For these reasons, it is risky to incorporate neural or symbolic AI methods to healthcare where both accuracy and interpretability is crucial. To address these concerns, this research introduces neuro-symbolic AI, a revolutionary AI learning paradigm that combines both symbolic and neural approaches to solve complex problems and be interpretable. The effectiveness of neuro-symbolic AI is demonstrated through the context of retinal prosthesis, also known as the bionic eye. Similar to cochlear implants, the bionic eye is a device that converts visual input to electrical signals. These signals stimulate remaining retinal cells to produce vision. By combining advanced data processing with interpretable reasoning, neuro-symbolic AI can enhance the visual input and improve the bionic eye perception. Thus,

this research evaluates neuro-symbolic AI and its application to retinal prosthesis by creating and testing a neuro-symbolic program to improve bionic vision.

PRESENTER: AMELIA SCHOCH, COMPUTER ENGINEERING
FACULTY MENTOR: DR. PHILIP BRISK, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: APPLICATION OF TERNARY CAM IN MEMCACHED

Abstract: The dominant form of computer memory today is RAM, which requires an address in order to access data. A different form of memory is CAM (Content Addressable Memory) which requires a piece of the data to access the rest. We are using FeFET-based TCAM (Ternary CAM), which is an emerging technology that provides area and power benefits over a CMOS equivalent, and can store one of three values per cell: 0, 1, and X (aka 'Don't Care'), instead of two values (0 or 1). TCAM can search its entire contents in a single cycle, allowing it to excel at specific tasks, such as dictionary lookup, which are used by a broad range of applications from compilers to network management. Our research introduces a new distributed Key-Value storage application called Memcached that can be accelerated by TCAM. In addition, instead of using 'Don't Care' as a wildcard, we have an approach to utilize the 'X' as a distinct symbol that allows for data compression, which will help compensate for TCAM's limited width. Evaluation is carried out by extending the industry-standard architecture simulators Gem5 and Eva-CAM, where we compare the performance of running memcached on a standard SRAM Cache, against one enhanced with our hybrid SRAM-TCAM cache. This study is part of a larger work, to understand the impact TCAM has on the memory hierarchy and performance of general purpose computers.

PRESENTER: NORMAN SEDER, BIOENGINEERING
FACULTY MENTOR: DR. IAN WHEELDON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTORS: CHASE LENERT MONDOU, STEPHANIE CARRERA, WESLEY GEORGE, SEAN CUTLER, AND TIMOTHY A. WHITEHEAD
PROJECT TITLE: A REPROGRAMMABLE PYR1 SPLIT NANOLUC PLATFORM FOR LATERAL FLOW DETECTION OF DIVERSE SMALL MOLECULES

Abstract: Detecting structurally diverse small molecules remains a constraint due to the limited number of biosensing platforms that enable binding pocket reprogramming without disrupting signal transduction. The plant hormone receptor PYR1 natively recruits the phosphatase HAB1 in the presence of abscisic acid (ABA), providing a ligand-dependent protein-protein interaction that can be tied to various reporter outputs. Reprogramming the PYR1 scaffold enables novel recognition of non-native small molecules while preserving the PYR1-HAB1 interaction architecture. Here, we translate this interaction system to membrane-based slot blot and lateral flow assay (LFA) formats using split NanoLuc complementation as a luminescent reporter. PYR1 mutants responsive to per- and polyfluoroalkyl substances (PFAS), synthetic nitazene opioids, and mycotoxins such as zearalenone retained ligand-dependent split NanoLuc reconstitution in membrane-based slot blot and LFA formats with minimal redesign of the downstream reporting architecture. Furthermore, titration of nanomolar to micromolar concentrations of these small molecules resulted in dose-responsive luminescent output for both slot blot and lateral flow formats, with detection limits as low as 250 ppb for PFOS, indicating quantitative responsiveness in the modular architecture. To enable assay validation, we implemented a constitutively active PYR1 mutant (PYR1CA4) to act as a built-in control due to its unique ligand independence while maintaining the protein-protein interaction with HAB1. Ultimately, these results define PYR1 as a modular scaffold

element for membrane detection of structurally diverse molecules, providing a plug-and-play chassis as an alternative to antibody and aptamer based lateral flow assays.

PRESENTER: HIRANYA SELVAKUMAR, BIOENGINEERING
ADDITIONAL PRESENTER: SARAH FAN, BIOENGINEERING
FACULTY MENTORS: DR. JIAMIN ZHANG, CHEMICAL AND ENVIRONMENTAL ENGINEERING AND ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: INTEGRATING RESEARCH INTO UNDERGRADUATE LABORATORY COURSES

Abstract: This research project aims to investigate the physiological effects of high-altitude (HA) exposure on platelet function and thrombosis. Platelets, also known as thrombocytes, are bone-marrow-derived cells essential for initiating the blood clotting cascade. The study addresses critical questions regarding how hypoxia at high altitudes alters these clotting mechanisms, potentially increasing the risk of thrombotic events. We hypothesized that gene expression for platelet activation and aggregation increases at high altitude. To test this hypothesis, we measured gene and protein expression in peripheral blood, as well as platelet function from blood samples collected from healthy participants at sea level and after 1-3 days at high altitude (3800 m elevation). We identified several genes related to platelet activation that were differentially expressed at high altitude, including several members of the Diacylglycerol kinase (DGK) family, which play a role in transitioning platelets from a quiescent to an activated state. To further evaluate changes in platelet function at high altitude, we will culture platelets in the presence of blood plasma collected from participants at sea level and high altitude to determine if secreted factors in plasma enhance platelet aggregation, measured via Light Transmission Aggregometry (LTA). This work will provide novel insights into the mechanisms by which hypoxemia may contribute to thrombotic events in clinical pathologies including sepsis and COVID-19.

PRESENTER: ARUSHI SHAH, BIOENGINEERING
FACULTY MENTOR: DR. BAHMAN ANVARI, BIOENGINEERING
PROJECT TITLE: MECHANISTIC ANALYSIS OF THE ENHANCED OPTICAL PROPERTIES OF INDOCYANINE GREEN (ICG) UPON INTERACTION WITH GD-BOPTA

Abstract: Indocyanine green (ICG) is an FDA-approved near-infrared dye used for diagnostic imaging and fluorescence-guided surgery. Combining Gadobenate Dimeglumine (Gd-BOPTA), a magnetic resonance imaging (MRI) contrast agent, with ICG is a useful strategy for multimodal imaging. Our preliminary studies revealed that the fluorescence emission of ICG was enhanced upon interaction with high concentrations of Gd-BOPTA. However, the mechanisms underlying how Gd-BOPTA alters the optical properties of ICG remain unclear. In this study, using absorbance and fluorescence spectroscopy, we investigate three potential mechanisms by which Gd-BOPTA could influence the optical properties of ICG: microenvironment rigidity, polarity, and ICG aggregation. By comparing ICG absorbance and fluorescence spectra under various experimental conditions, we aim to understand the mechanisms by which Gd-BOPTA enhances the optical properties of ICG. We believe that our mechanistic investigation of the interactions between ICG and Gd-BOPTA will pave the way for advanced multimodal theranostics.

PRESENTER: TRINITY SHAKER, BIOLOGY
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: PRINCE DAVID OKORO, BIOENGINEERING
PROJECT TITLE: OPTIMIZING SCAFFOLD FABRICATION TO PROBE ARCHITECTURE-DRIVEN NEURONAL BEHAVIOR

Abstract: Innovations in neural tissue engineering increasingly highlight scaffold microarchitecture as a key driver of stem cell behavior, even in the absence of added biochemical cues. Bicontinuous interfacially jammed emulsion gel (BIJEL) constructs offer a highly tunable, interconnected microporous network that can capture aspects of native tissue structural complexity. Building on our prior work showing BIJEL fibers robustly support adhesion, proliferation, and functional differentiation of iPSC-derived human neural stem cells (i-HNSCs), we sought to translate this bioactivity to millimeter-scale constructs by streamlining fabrication and preserving architectural fidelity. Here, we optimized the polymerization strategy during bioprinter-aided fabrication by varying 405 nm light exposure patterns (none, intermittent, or continuous) and adjusting printing voltage to improve construct reproducibility. Distinct changes in both macrostructure and microscale organization emerged across conditions. Intermittent light exposure consistently produced more refined architectures, suggesting improved shape retention while limiting over-curing and feature loss. Scanning electron microscopy images enabled visualization and scoring of key structural metrics, including micropore morphology, fiber organization, strut size, and polymer bleed-out. Preliminary cytocompatibility analysis indicated high i-HNSC viability, supported by low caspase-3 signal and strong PrestoBlue readouts. This work establishes practical fabrication rules that preserve biomimetic microstructural motifs at the millimeter scale, enabling reproducible constructs for studying neural stem cell behavior and advancing BIJEL scaffolds toward translational neural applications.

PRESENTER: MAKRUM SHANTI, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. HIDEAKI TSUTSUI, MECHANICAL ENGINEERING
PROJECT TITLE: EFFECT OF GRAVITY ON WICKING IN MICROGROOVES IN PAPER CHANNELS

Abstract: Rapid and efficient fluid transport through paper-based materials is essential for improving portable diagnostic devices. This study examines how the angle of filter paper (15°, 45°, and 90° from the horizontal) influences the wicking behavior of deionized water through laser-engraved microgrooves. Microgrooves were fabricated using a 30 watt CO_2 laser at 7% power and 60% speed, producing uniform grooves approximately 0.4 mm wide. These laser-generated grooves provided controlled pathways for fluid transport, enabling direct comparison across angle conditions. All experiments were conducted inside a humidity chamber maintained at 70% relative humidity to ensure consistent environmental conditions and minimize variability due to ambient moisture.

Wicking rate, groove-dependent flow variations, and interactions between the advancing fluid front and the engraved channels were measured to assess how gravity affects capillary-driven flow. Preliminary results indicate that wicking speed increases with decreasing angle, suggesting that gravitational forces reduce fluid transport speed along the microgrooves. These findings offer early insight into how paper orientation can be strategically manipulated to optimize flow performance in paper-based microfluidic systems.

This work builds upon established paper-based diagnostic strips and aims to improve their speed and efficiency, similar to rapid test formats such as COVID-19 and pregnancy tests. By integrating controlled

laser-fabricated structures with angle-dependent flow analysis, this study contributes to the development of more reliable, efficient, and tunable fluid-handling components for low-cost, portable diagnostic devices.

PRESENTER: SHUBHRA SINGHAL, BIOENGINEERING
FACULTY MENTOR: DR. CHUNG-HAO LEE, BIOENGINEERING
ADDITIONAL CONTRIBUTORS: MAEDEH MAKKI, BIOENGINEERING; ZACHARY A. MOLANDER, BIOENGINEERING; AND ASHLEY TAEPAKDEE, BIOENGINEERING
PROJECT TITLE: INVESTIGATION OF THE TIME DEPENDENT MECHANICAL PROPERTIES DUE TO ELASTIN DEGRADATIONS IN PORCINE MITRAL VALVE ANTERIOR LEAFLETS (MVAL)

Abstract: Mitral valve degeneration is a common age-related condition that reduces leaflet flexibility and structural integrity, impairing cardiac function. The valve regulates blood flow from the left atrium to the left ventricle, and its dysfunction can cause regurgitation, where incomplete closure allows backward flow into the atrium. A major contributor is the gradual breakdown of elastin, an extracellular matrix (ECM) protein that enables leaflet stretch and recoil. As elastin deteriorates, loading shifts to stiffer collagen fibers, altering leaflet motion and contributing to disorders such as mitral valve prolapse. Although prior studies have examined tissue behavior after near-complete elastin removal, aging involves gradual ECM loss, and the mechanical effects of progressive elastin degradation remain poorly understood. This project addresses this gap by quantifying mechanical changes in porcine anterior mitral leaflets following controlled, stepwise elastin degradation. The study includes (i) baseline biaxial tension and stress-relaxation testing, (ii) timed enzymatic treatment to selectively degrade elastin, and (iii) repeated biaxial testing after each degradation stage. By linking mechanical responses to the time course of elastin loss, this work clarifies how aging-like ECM remodeling alters valve function and may inform improved surgical repair strategies and computational models.

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

Abstract: Normal wound healing typically progresses through four stages: coagulation, inflammation, proliferation, and maturation, resulting in functional tissue regeneration. However, chronic wounds halt at the inflammatory stage, resulting in nonfunctional tissue. Stress-induced cellular senescence has been implicated in chronic wounds. Recent work has shown that expression of tardigrade transgenes can mitigate cellular stress, but the impact of this on wound healing is untested. To address this, we wished to test an *in vitro* quantitative wound healing model to compare healthy and senescent Adipose-derived Stem Cells (ASCs) modified with tardigrade transgenes, specifically Mitochondrial Abundant Heat Soluble (MAHS) protein.

Unmodified and AcGFP expressing ASCs were used as genetic controls for MAHS expression. Cellular senescence was induced using 5 mM thymidine for 48 hr. Consistent wound models were created using polydimethylsiloxane (PDMS) (Slygard 184, Dow Corning) cylinders. ASC migration into the circular wound area was tracked using confocal microscopy, and closure rates were quantified using custom MATLAB script.

Senescent ASCs closed the wound more slowly. Preliminary qualitative analysis indicates that MAHS-expressing cells have the potential to heal the wound at a faster rate compared to GFP and parental ASCs. This basic research is a foundational step toward utilizing these tardigrade proteins for human health and clinical impact. Improving ASC efficiency can lead to reduced costs of wound healing therapies, shorten patient recovery times, and expand access to regenerative cures. Future work will include assessment of the mechanism of MAHS in the context of wound healing.

PRESENTER: AGNA SONEJI, BIOENGINEERING
FACULTY MENTOR: DR. IMAN NOSHADI, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: PRINCE DAVID OKORO, BIOENGINEERING
PROJECT TITLE: ELECTROCHEMICAL CHARACTERIZATION OF AN ENZYMATICALLY CROSSLINKED IONIC CONDUCTIVE HYDROGEL FOR REGENERATIVE APPLICATIONS

Abstract: Hydrogels with intrinsic ionic conductivity and biocompatibility are important for regenerating electroactive tissues, such as cardiac and neural tissues, as they better approximate the ionic charge transport of native microenvironments. We recently developed an ionically conductive material by incorporating choline chloride into fish gelatin and crosslinking it with transglutaminase (TGase). Enzymatic crosslinking with TGase offers a minimally invasive, physiologically compatible alternative to light-based curing and is well suited to translational settings. Here, we characterize and optimize the ionic conductivity and capacitive behavior of TGase crosslinked BioGels using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV). We identify formulation parameters that enhance conductivity while preserving key biophysical properties needed for robust biological performance. EIS revealed reduced impedance and increased conductivity with increasing polymer concentration (5, 10, and 15% w/v), with the highest ionic conductivity observed at 15% (w/v). At a fixed polymer concentration of 10% (w/v), we observed higher conductive behavior at a lower TGase concentration (2.5 U/mL) compared with 10 U/mL, consistent with crosslink density influencing ion mobility. CV also showed electrochemical behavior that depended on both polymer and enzyme concentration. Furthermore, we observed time-dependent evolution in electrochemical behavior, with stabilization toward equilibrium by approximately 48 h post-fabrication. Overall, these results establish practical design rules for tuning TGase crosslinked ionically conductive hydrogels and support their use as injectable scaffolds for tissue regeneration.

PRESENTER: IME STEVENSON, BIOENGINEERING
FACULTY MENTOR: DR. HUINAN LIU, BIOENGINEERING
ADDITIONAL CONTRIBUTORS: JINRUI TAN AND PATRICIA HOLT-TORRES
PROJECT TITLE: EVALUATION OF ANTIBACTERIAL NANOCOMPOSITE HYDROGELS FOR IMPLANT COATING APPLICATIONS

Abstract: Over half of the two million reported healthcare-associated infections (HAIs) result from indwelling medical devices, costing 5 to 10 billion dollars a year to treat and causing clinical complications. Thus, there is a need for an antibacterial biomaterial to serve as a coating for implant surfaces. Magnesium oxide(nMgO) and magnesium hydroxide nanoparticles (n$Mg(OH)_2$) are promising biomaterials due to their antibacterial effects and low toxicity. However, using them as a standalone coating for implants can lead to the rapid release of the nanoparticles. To enhance stability and control the release of the nanoparticles, they can be incorporated into hydrogels. These hydrogels have previously been shown to have potential for managing infections and combating antibiotic resistance. Here, we tested and optimized nanocomposite hydrogels containing either nMgO and $nMg(OH)_2$ for their antibacterial properties and adhesion to clinically used implant materials. Our results indicate that the antibacterial nanocomposite hydrogels show promising potential as an implant coating. The findings from our research will support the development of innovative antibacterial biomaterials for implant coatings, helping to reduce HAIs and their associated consequences.

PRESENTER: XANDER THOMPSON, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. AMANDA RUPIPER, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: THE LIFE OF PHARMACEUTICALS THROUGH THE BODY, TREATMENT, AND THE ENVIRONMENT

Abstract: There are many pollutants in our water, pharmaceuticals being one of the main contributors to the pollution. This literature review quantifies some of the pharmaceuticals (Acetaminophen, Naproxen, and Diclofenac) that are introduced into our water, tracks their excretions through the body, their degradation by wastewater treatment, and determines if they persist in the environment. This was done by looking at various research papers and compiling information related to excretion rates, degradation rates, and more to develop into Sankey diagrams tracking the fate of these pharmaceuticals. This research found that of the three drugs investigated, only Naproxen persisted in the environment after a year.

PRESENTER: ALTON SU, COMPUTER SCIENCE
FACULTY MENTOR: DR. PHILIP BRISK, COMPUTER SCIENCE AND ENGINEERING
PROJECT TITLE: THE AUTOMATED LIQUID HANDLING TOOL

Abstract: The Automated Liquid Handling Tool (Software) is built to assist the Personal Automated Liquid Handler system. The Personal Automated Liquid Handler is built for the purpose of a cost-effective automated liquid handler system by transforming a cheaper 3D printer into a customizable and accurate liquid handler. It allows researchers to build and modify the system for specific experimental needs. However, in order to utilize the personal automated liquid handler, researchers would need to know how to program in G-code to control specific motors.

To address this limitation, the Automated Liquid Handling tool would bridge the gap between the two ends by creating an easy to use and intuitive interface. Users are able to design and run protocols visually with a no-coding experience needed. Researchers are also able to view the G-codes of the protocols they ordered to review or modify if needed. This lowers the entry barrier for automated research and broadens access to laboratory automation by removing the technical programming barrier for users who aren't engineers.

PRESENTER: BENJAMIN TOBAR, MATERIALS SCIENCE AND ENGINEERING
FACULTY MENTOR: DR. YUANHANG ZHU, MECHANICAL ENGINEERING
PROJECT TITLE: MITIGATING AEROELASTIC OSCILLATIONS AND INTERACTIONS WITH PASSIVE FLAPS ON AIR AND HYDROFOILS

Abstract: Aeroelastic oscillations resulting from fluid-structure interactions can induce detrimental vibrations in airfoil and hydrofoil systems, contributing to aerodynamic performance loss, structural fatigue, and premature failure in applications such as wind turbines and aircraft lifting surfaces. This

study investigates the effectiveness of passive flap attachments as an oscillation-mitigation and flow-stabilization strategy. Experimental testing is conducted using a controlled water-tank towing apparatus, in which instrumented airfoil models with varying passive flap configurations are evaluated at prescribed flow velocities. Laser-based particle flow visualization is employed to characterize wake development, vortex-shedding behavior, and flow-separation dynamics, while integrated force measurements quantify lift variations, drag, and oscillatory loading. By correlating flap geometry and compliance with measured vibration amplitudes and wake structures, this work aims to determine the extent to which passive flaps suppress aeroelastic instabilities. The results are expected to demonstrate that passive flow-control devices offer a structurally simple, low-cost solution for enhancing stability and extending service life in fluid-loaded structures. These findings support the broader development of passive control technologies for improved aerodynamic and hydrodynamic performance in aerospace and renewable energy systems.

PRESENTER: SAMPREETHA TUMKUR, CHEMICAL ENGINEERING
FACULTY MENTOR: DR. ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
ADDITIONAL CONTRIBUTOR: DANG LE
PROJECT TITLE: HETEROTROPHIC ALGAL GROWTH VIA CO_2 TO ACETATE ELECTROLYSIS

Abstract: Algae produce high value bio-products such as fuels, nutraceutical lipids, and carotenoids. However, many current algal bioproduction systems rely on photosynthesis which converts 1-4.0% of incident solar energy into biomass. An alternative approach is to use electrolysis to fix CO_2 into acetate, ultimately producing an acetate and KOH electrolyte rich stream. KOH is innately present in the product stream and has been observed to be cytotoxic. Previous work demonstrated that despite the presence of KOH, this acetate rich stream can be used as the sole carbon and energy source for the green algae *Chlamydomonas reinhardtii*, ultimately resulting in a system that operates with higher incident solar energy to biomass efficiency than conventional biological photosynthesis. Our work expands upon this, by examining other algae beyond *C. reinhardtii* and evaluating their potential to use electrochemically derived acetate to produce high value chemicals.

An acetate and KOH rich feed stock was used to heterotrophically (reliant on exogenous carbon and energy) grow 3 different algae species: *C. reinhardtii, Crypthecodinium cohnii*, and various strains of *Auxenochlorella*. Mass yields of electrochemically produced acetate to bioproducts were measured to evaluate the acetate utilization efficiency and KOH tolerance of these algae, and how they can be applied in industrial contexts to produce high value fuels, food, and dyes. This work expands the understanding of how emerging CO_2 electrolysis technologies can drive algal bioproduction at high energy, land-use, and economic efficiencies.

PRESENTER: DECKER VAN DAELE, MATERIALS SCIENCE AND ENGINEERING
FACULTY MENTOR: DR. RICHARD WILSON, MECHANICAL ENGINEERING
PROJECT TITLE: LASER SCANNING MICROSCOPY AND MAGNETIC HYSTERESIS

Abstract: Magnetic domain structure has important applications in spintronics, magnetic storage, and semiconductors. High resolution spatially resolved measuring of magnetic properties is critical to understanding local magne. No solution in our lab existed to measure spatially resolved hysteresis. I designed a laser scanning microscope capable of measuring magnetic hysteresis through the magneto-optic Kerr effect (MOKE). The microscope integrates photo-elastic modulation (PEM) with polarization optics and lock-in amplification to measure both magnetic hysteresis and to image magnetic domains.

Magnetic hysteresis utilizes a dual-pole magnet to measure the coercivity fields of the sample. High resolution optical maps of sample surfaces were gathered. Hysteresis loops demonstrating coercivity of samples were also obtained. This project provides a crucial step in generating domain maps of magnetic samples in the future and will support understanding domain structure in thin films.

PRESENTER: MARICELA VASQUEZ, PLANT BIOLOGY
FACULTY MENTOR: DR. ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: *ALOE VERA* CELL CULTURE RESPONSE TO ACETIC ACID MEDIA

Abstract: To keep up with the increasing human population, large scale food production has many environmental impacts. One prominent impact of agriculture is that it contributes to 10% of the total U.S. greenhouse gas emissions (Joiner, 2023). There are many scientific advances that aim to make agriculture less environmentally costly, such as growing plants in cell culture. Plant cell cultures are typically grown with glucose as their main carbon and energy source, however, there are alternate carbon sources such as acetate that have been utilized for their cultivation (Hann, 2023). Here I evaluate acetate as an alternative to sucrose for the cultivation of *Aloe vera* cell cultures. I determined how differently acclimated *Aloe vera* cell cultures respond to being grown in media with glucose and 4 mM acetic acid as carbon sources. The *Aloe vera* cells are able to endure growing in media with 4 mM acetic acid. One *Aloe vera* strain was acclimated to 4 mM acetate over a year, and this strain grew faster than the unacclimated strain, but its cell volume was unchanged when grown on media with acetate and without acetate. The unacclimated *Aloe vera* strain grew slower with acetate, suggesting that acclimation does increase acetate tolerance. This research advances the use of acetate as a carbon and energy source for plant cell agriculture which could help increase the food supply and availability of plant-based products more sustainably

PRESENTER: HANNAH VELAZQUEZ, ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. DON COLLINS, ENVIRONMENTAL ENGINEERING
PROJECT TITLE: TIRE TEMPERATURE PROFILES RELATION TO SECONDARY ORGANIC AEROSOL FORMATION

Abstract: Secondary organic aerosols (SOAs) are major components of air pollutants produced from off-gassing car tires. By collecting accurate temperature ranges of tires on and off the road, SOA formation from tires can be better understood. This study collected and analyzed tire temperature data to refine estimates of SOA production under real-world conditions. By narrowing our temperature ranges, we better understood SOA formation from car tires, leading to a better understanding of how to mitigate harmful air pollutants.

PRESENTER: STEVEN VU, BIOENGINEERING
ADDITIONAL PRESENTER: AADYA PENCHALA, BIOENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
PROJECT TITLE: SOFT ROBOTIC CATHETERS ENABLED BY MINIATURIZED BENDING AND TORSIONAL HYDRAULIC SOFT ACTUATORS

Abstract: Conventional endovascular catheters are limited in tip steerability and depend on base manipulation, due to being built from semi-rigid polymers. This hinders navigation through blood vessels and can comprise the patient's safety. This work presents a soft robotic catheter that combines a passive

flexible shaft with a dexterous mesoscale tip, composed of two hydraulic actuators, one for bending and one for torsion. The actuators are fabricated from hyperelastic silicone with fiber and fabric reinforcement. Independent control of the two sections is enabled via concentric fluid supply tubes, and the segments can be reconfigured to better assist specific task performance. Motion characterization shows up to 90◦ bending at 0.25 mL injected water volume and 360◦ axial rotation at 0.30 mL injected water volume, with block tests measuring 53.8 mN bending tip force and 1.3 mN·m torque of the torsion segment. Multi-Degree-of-Freedom (Multi-DOF) articulation was demonstrated for navigation in an aortic phantom, highlighting the dexterity and safe motion capability of the soft robotic catheter.

PRESENTER: MATTHEW VU, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. JUN SHENG, MECHANICAL ENGINEERING
PROJECT TITLE: ROBOTIC NEEDLE STEERING BY CONCENTRIC TUBE AND WIRE

Abstract: This presentation will showcase a new steerable needle device for minimally invasive surgeries (MIS), used specifically for soft tissue mediums. The design utilizes a concentric assembly of a tube and a wire, both with asymmetric beveled tips. The interaction between the needle tips and the tissue medium cause a perpendicular force, pushing the needle assembly in a desired direction. By controlling the rotational position of both components, the needle's trajectory can be controlled without the need for continuous base manipulation. This in turn minimizes tissue damage compared to other designs. A comparison is then made between the needles design parameters and the bending capability through analytic modeling. Experiments on gelatin tissue mediums validate the predictions, showing that the displacement of the tip and general bending capability are heavily reliant on the position of the needles. The needles are made out of nitinol and have a maximum displacement of 16.75 mm at an insertion depth of 70 mm. The system and its results show promise for MIS applications.

PRESENTER: CONNER WALLACE, MECHANICAL ENGINEERING
ADDITIONAL PRESENTER: SHIV KHATRI, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. MINGYU CAI, MECHANICAL ENGINEERING
PROJECT TITLE: THREE FINGER GRIPPER FOR TELEOPERATION

Abstract: Teleoperation systems allow for easier training of robotic arms, so that they can perform tasks like manufacturing autonomously. Many low cost teleoperation systems use cheap two finger grippers, which limits what can be grasped and what tasks can be done. The purpose of this project is to design an affordable three finger (under $200) gripper to increase the number of tasks that can be accomplished with teleoperation systems. To prevent down time on the teleoperation system and allow for hierarchical model training, a handheld platform, like the Universal Manipulator Interface from the Stanford University Robotics & Embodied Artificial Intelligence Lab is made. Once the handheld platform has been proven to perform, the three finger gripper is then attached to the teleoperation system. The effectiveness of this new gripper is evaluated by the ability to accomplish new tasks and ease of operation compared to the current two finger gripper. The proposed tasks to test the new gripper is holding an object with mass concentrated at one end of the object (like a hammer) and a pick and place task, which is compared to the current two finger gripper. Currently designing the handheld platform is ongoing. The implication of this project is the ability for teleoperation systems to cheaply increase the amount of tasks they can accomplish.

PRESENTER: SYMPHONY WALTER-EZE, ELECTRICAL AND COMPUTER ENGINEERING
FACULTY MENTOR: DR. PHILIP BRISK, ELECTRICAL AND COMPUTER ENGINEERING
ADDITIONAL CONTRIBUTOR: VAHAGN TOVMASIAN
PROJECT TITLE: REPROGRAMMING OPENDROP FOR EXTENSIBILITY

Abstract: Microfluidics is the design and implementation of tools to manipulate small amounts of fluid, primarily with the intention of automating chemistry or biology. It has found widespread use in many areas such from medical diagnostics to biological research.

Traditional microfluidics consists of using molds/engravings to create "chips" with a permanent set of microchannels. By contrast, digital microfluidic boards (DMFBs) are programmable systems which can activate electrodes to manipulate droplets of liquid. This versatility and programmability comes at an expertise-cost. OpenDrop is an open-source DMFB platform aimed at being accessible to researchers and hobbyists. Despite this, its control code is inaccessible and not written with extensibility in mind. Our research remedies this problem by rewriting the code of OpenDrop to have programmability in mind.

In our work, we have analyzed the original OpenDrop microcontroller code to identify optimization opportunities, and applied systematic programming techniques based on finite-state machines to rewrite the control code for readability, efficiency, and extensibility. Additionally, we added monitoring mechanisms to the OpenDrop so information on the board can be directly relayed to the user.

PRESENTER: BRYCE YEH, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA MORGAN, BIOENGINEERING
PROJECT TITLE: EVALUATING TREHALOSE AS A RESCUE STRATEGY FOR CAHS-EXPRESSING EPITHELIAL CELLS UNDER MEMBRANE INDUCED STRESS

Abstract: Madin-Darby Canine Kidney (MDCK) cells are a mammalian cell line used to study membrane integrity and cellular stress responses. Increasing cellular tolerance to environmental stressors through the expression of protective proteins has been gaining recent interest. In this study, MDCK cells were transgenically modified to express the cytoplasmic abundant heat soluble (CAHS) protein, a tardigrade protein associated with desiccation tolerance. Previous findings suggested that CAHS expression alone did not improve and, in some cases, reduced viability under dimethyl sulfoxide (DMSO) induced stress. Since trehalose has been shown to function synergistically with CAHS in tardigrades, we investigated whether trehalose treatment could increase the viability of CAHS expressing MDCK cells exposed to DMSO. Cells were plated in 48-well plates at a density of 10,000 cells per well and allowed to adhere overnight. Four experimental groups were evaluated: MDCK GFP, MDCK GFP + 50 mM trehalose, MDCK CAHS, and MDCK CAHS + 50 mM trehalose. Each group was exposed to 0%, 1%, 3%, or 5% DMSO for 72 hours. Cells were then fixed, stained with DAPI and phalloidin, and imaged using confocal microscopy with a 6×6 tile scan and 24-slice z-stack. Cell survival was quantified using custom MATLAB image analysis scripts. All experiments were conducted in triplicate, and statistical significance was determined using ANOVA followed by Tukey's Honestly Significant Difference test. This study will determine whether trehalose can rescue stress tolerance in CAHS expressing MDCK under membrane induced stress.

PRESENTER: HANNAH YUAN, MICROBIOLOGY
FACULTY MENTOR: DR. AMIT ROY-CHOWDHURY, ELECTRICAL AND COMPUTER ENGINEERING
PROJECT TITLE: SHIFT: EXPLOITING SYNTHETIC ADULT DATASETS FOR INFANT POSE ESTIMATION

Abstract: Cerebral palsy is a neurological disorder characterized by abnormal, spontaneous limb movements in infants. Early detection is crucial for timely treatment, but such assessments are challenging and rigorous, requiring extensive training to objectively identify abnormal movement patterns. Pose estimation models enable automated, markerless joint tracking, which can be used to detect and quantify movements patterns. However, most models are built using adult subjects, and those for infants require labeled training data, which is very laborious to generate and difficult to access. To address these challenges, we built an adaptive method called SHIFT: Exploiting SyntHetic Adult Datasets for InFanT Pose Estimation. SHIFT incorporates innovative techniques like the mean teacher framework, an infant manifold pose prior, and a novel visibility consistency module to effectively adapt a pre-trained 2D adult pose estimation model to infants. We performed extensive experiments on multiple pose estimation benchmarks, including unsupervised domain adaptation and supervised methods. We demonstrate that SHIFT outperforms unsupervised domain adaptation methods by an increase of 5% (51% vs 56%, respectively) and supervised methods by an increase of 16% (68% vs 84%, respectively) in prediction accuracy. Building on this foundation, we conduct additional ablation studies to assess the optimal weighting of the manifold pose prior and keypoint segmentation modules, ensuring that anatomical constraints enhance rather than distort predictions during the adaptation process. We now propose SHIFT as an infant pose estimation method independent of labeled target domain data, which we hope will enable efficient assessment of disorders like cerebral palsy using computer vision.

PRESENTER: NASHITA ZAYN, BIOENGINEERING
FACULTY MENTOR: DR. HUINAN LIU, BIOENGINEERING
ADDITIONAL CONTRIBUTOR: ALLISON SANDER
PROJECT TITLE: QUANTITATIVE REGULATORY RISK ASSESSMENT FRAMEWORK FOR NANOCOMPOSITE SCAFFOLDS

Abstract: Biodegradable nanocomposite scaffolds are central to regenerative medicine because they provide temporary structural support that safely resorbs within the body. Scaffold performance is highly dependent on nanoparticle dispersion: clustered nanoparticles can accelerate degradation, weaken mechanical integrity, and increase particle shedding, whereas uniform dispersion promotes structural consistency and improved safety. Despite their growing clinical relevance, current FDA 510(k) device pathways lack quantitative criteria for evaluating dispersion variability. Although ASTM and ISO standards identify 20-30% mechanical performance deviations as clinically significant, comparable quantitative thresholds have not been established for scaffold degradation. In the absence of a universal numeric cutoff defining unacceptable degradation, evaluation remains case-by-case and risk-based within existing FDA pathways.

This study establishes a Quantitative Regulatory Risk Assessment Framework that connects measurable scaffold performance deviations to potential FDA review considerations. Polycaprolactone (PCL) scaffolds incorporating semi-crystalline hydroxyapatite nanoparticles were fabricated under uniform and intentionally clustered dispersion conditions and exposed to physiologically relevant conditions. Dimensional change, mass loss, and morphology measurements were collected to assess degradation behavior across conditions. These data were synthesized into a Regulatory Flag Matrix that categorizes performance deviations based on ASTM/ISO significance thresholds and FDA risk-based evaluation

principles.

Preliminary findings indicate that degradation behavior influenced by nanoparticle dispersion may prompt regulatory consideration. By integrating experimental findings with structured risk interpretation, this work supports safer innovation in regenerative medicine and contributes a practical framework for evaluating nanocomposite scaffolds with more standardization, consistency, and transparency.

PRESENTER: WENQIAN ZHANG, COMPUTER ENGINEERING
FACULTY MENTOR: DR. JIACHEN LI, ELECTRICAL AND COMPUTER ENGINEERING
PROJECT TITLE: CONTEXT-GATED MULTIMODAL FUSION FOR FELINE INTENT RECOGNITION

Abstract: Interpreting the latent intent of non-verbal agents in unstructured home environments remains difficult because single cues (only audio or only motion) are often ambiguous. We propose a context-gated Bayesian multimodal fusion framework that infers feline intent over time by integrating (1) visual context (objects/locations), (2) pose dynamics, and (3) audio spectral cues. Visual context is extracted with a pretrained object detector (YOLOv8) to detect semantically meaningful items such as bowl, door, litter box, and human presence, and to compute proximity features. Pose keypoints are estimated per frame and aggregated within sliding windows (T=5 s, stride=1 s) using a lightweight temporal encoder to capture coarse behaviors (e.g., resting vs. pacing). Audio is converted to log-mel spectrograms and encoded with a pretrained Audio Spectrogram Transformer (AST) to estimate vocalization arousal/type. Fusion follows an explicit Bayesian logic: environmental context provides an intent prior, which is then updated by calibrated pose and audio evidence to produce a time-series intent probability. For evaluation, we will collect ~50 short clips of a single subject (Felis catus, "Yuanbao") and assign labels using outcome-based criteria (e.g., food solicitation confirmed by eating soon after the clip; exploration/exit confirmed by sustained door-directed behavior). We will compare against audio-only, pose-only, and early-fusion MLP baselines, reporting macro-F1 and confusion matrices, with a dedicated ambiguous subset (near door/bowl/human) to test false-positive reduction. Expected deliverables include an offline analysis pipeline with visual overlays and an interpretable intent probability timeline.

PRESENTER: SARAH ZOHARY, ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. GEORGIOS KARAVALAKIS, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: MODELING URBAN BRAKE-WEAR PARTICULATE EMISSIONS

Abstract: Vehicular traffic is a primary source of urban air pollution, yet as tailpipe regulations tighten, non-exhaust emissions emerge as a dominant threat to air quality and respiratory health. While Europe has implemented standards for brake-wear particulate matter (PM), the U.S. does not currently regulate non-exhaust emissions such as brake and tire wear or resuspended road dust. This study aims to quantify the dispersion of brake-wear particulates generated during real-world vehicle testing over a test route simulating urban driving conditions. Through a dispersion modeling approach, we employ R-Line for precise near-roadway dispersion and AERMOD to simulate broader atmospheric transport. In this study, emission factors for PM2.5, PM10, and real-time particle number are collected through driving trials in Riverside and processed through the R-Line dispersion models to map concentration gradients. The particulates generated from mechanical abrasion are expected to show significant spatial variability, peak concentrations localized near high-frequency braking zones such as intersections and downhill roads. It is anticipated that these non-exhaust particles, which often contain heavy metals, will pose a localized risk to air health that disproportionately affects high-density housing situated adjacent to the route. Variables

such as braking frequency and atmospheric conditions have been measured in part to this study to calculate the extent of the impact. Future research will involve correlating these dispersion maps with local socioeconomic data to advocate for targeted environmental justice interventions in the Inland Empire.

College of Humanities and Social Sciences

PRESENTER: CASSANDRA ADRIATICO, PSYCHOLOGY
ADDITIONAL PRESENTERS: LEILANI MENDOZA, PSYCHOLOGY; SAMEENA BRAR, PSYCHOLOGY; AND JULIA MARTIN, NEUROSCIENCE
FACULTY MENTOR: DR. IAN BALLARD, PSYCHOLOGY
PROJECT TITLE: SWITCHING GEARS: HOW UNDERGRADUATE LEARNERS NAVIGATE SOCIAL MEDIA AND ONLINE LECTURES

Abstract: Digital multitasking could pose an asset or challenge to goal-oriented learning by altering how learners consistently engage with instructional material. However, it is unknown how switching between educational content and social media, a form of digital multitasking, could affect performance stability. This study examined whether switching behavior over time affects task performance, aiming to (i) replicate time-on-video effects for mean switches and coefficient of variation across blocks, and (ii) determine if switching variability affects quiz performance. Undergraduate students ($N = 98$) completed a 32-minute self-directed session, navigating freely between a 15-minute lecture and TikTok, followed by a comprehension quiz. Switches were operationalized as transitions between lecture and social media, quantified via behavioral logs, and segmented across six 150-second blocks. Repeated measures ANOVAs revealed significant differences across blocks in mean switches, $F(5, 485) = 7.64$, $p < 0.001$, and coefficient of variation of switches, $F(5, 415) = 495.30$, $p < 0.001$. However, within-subject effects for mean switches across blocks by quiz score (%) were non-significant ($p = 0.209$). Raincloud plots visualizing quiz percent score distributions across segments demonstrated visible overlap, suggesting minimal differentiation in performance across switch groupings. Counter to our hypothesis, switching behavior did not affect quiz performance, which may reflect the assessment's narrow spread of scores and limited differentiation among high performers. While these findings show that multitasking may not influence consistency in short-term performance, they demonstrate the adaptive nature of multitasking behavior in how engagement with educational information changes throughout a given session.

PRESENTER: SAMANTHA AGUSTIN, PSYCHOLOGY
FACULTY MENTOR: DR. JACK CÁRAVES, GENDER AND SEXUALITY STUDIES
PROJECT TITLE: THE ROLE OF INTERSECTIONALITY ON QUEER FILIPINAS' LIVED EXPERIENCES

Abstract: Intersectionality emphasizes how the intersections of one's social identities are shaped by overlapping systems of oppression, producing distinct experiences in everyday life, particularly for marginalized individuals. Although previous research examined how systems of power shape the experiences of queer Filipino men, such as their struggle with cultural religion and sexuality expression, there is an existing gap in the literature that looks specifically at how these systems operate in the lives of queer Filipina women and queer nonbinary Filipinas. Their experiences, although sharing similar social identities, are drastically different because of the intersecting identities of being queer, being Filipina, and being a woman or nonbinary. The present study investigates the lived experiences of queer Filipinas living in the US, exploring how the interlocking systems of power shaped by their race, gender, and sexuality shape their identities and daily lives. Through in-depth structured interviews, the research examines three aspects of their experiences–their relationships (platonic, familial, romantic), their identity development, and their mental health. The results suggest how one expresses their gender and sexual identity as well as how they navigate mental health is based on their Filipino background due to many Filipino households having religious roots (specifically Catholicism) that result in conservative

worldviews. From cultural gender norms and conservative religious views, queer Filipinas are subject to many different forms of prejudice and discrimination due to how their identities interact. My study uses an intersectional framework to uplift queer Filipinas' lived experiences in hopes of bringing awareness to their unique experiences.

PRESENTER: LEONARDO ALTAFINI, POLITICAL SCIENCE
FACULTY MENTOR: DR. MIGUEL CARRERAS, POLITICAL SCIENCE
PROJECT TITLE: FAITH AND THE BALLOT: THE POLITICAL IMPACT OF EVANGELICALISM IN BRAZIL

Abstract: Over the past half-century, Brazil has undergone a consequential religious transformation. Once a country almost entirely Catholic, evangelical traditions—including Protestants and Pentecostals—have begun to gain traction, making up nearly 30% of the Brazilian population in 2022, while Catholicism has seen a steep decline to just over 50%. Evangelicals have historically been fragmented in electoral politics. Throughout the 21st century, evangelical populations have supported both left- and right-leaning candidates. The 2018 and 2022 presidential elections revealed an unusual consolidation of evangelical support behind Jair Bolsonaro. What mechanisms help explain this realignment?

This project argues that evangelical voting cohesion cannot be attributed solely to demographic growth. Instead, it reflects the interaction of three key factors: strategic clerical framing on moral issues; institutional competition between groups within and outside Christianity; and Brazil's open-list proportional representation (OLPR) electoral system, which facilitates personalized, identity-driven campaigns. As religious leaders increasingly framed political participation as a defense of moral principles, candidates like Bolsonaro were able to cultivate symbolic alignment between evangelical identity and political loyalty.

Using electoral data from the presidential elections of 2002 to 2022, alongside current literature on religion and political behavior, my project analyzes shifts in evangelical voter cohesion across elections. By creating a clearer picture of Brazil's religious and political transformation, the project will help clarify the mechanisms that make political campaigns successful given the nature of different political institutions.

PRESENTER: APAMA AMERI, PSYCHOLOGY
FACULTY MENTOR: DR. REBEKAH RICHERT, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: ASHLEY MARIN, PSYCHOLOGY
PROJECT TITLE: WHAT DO YOU PRAY FOR? AGE EFFECTS ON CHILDREN'S SELF-REPORTED PRAYER CONTENT

Abstract: Many U.S. children from diverse religious and socioeconomic backgrounds are socialized by caregivers to engage in prayer; however, the specific content of children's prayers remains largely unexplored. Using a mixed-methods design, this study investigated children's self-reported prayer content. Religiously and ethnically diverse children ($N = 36$; 61.1% Female) between the ages of 3.31 and 5.89 years old ($M = 4.55$, $SD = 0.72$) were asked about what they pray for. Thematic analysis revealed that 44.4% of children reported praying to or for an agent without specifying a request or reason, 16.67% prayed for others with a stated request or reason, and 33.33% described self-focused petitions with a request or reason. Qualitative analyses further demonstrated two significant findings. Children who reported praying for others with a stated request or reason ($M = 5.37$, $SD = 0.38$) were older than both

counterpeers who reported praying to or for an agent without specifying a request or reason ($M = 4.37$, $SD = 0.77$) and counterpeers reporting self-focused petitions with a request or reason ($M = 4.35$, $SD = 0.71$), $t(19) = 3.00$, $p = 0.007$, 95% *CI* [0.31, 1.70]; $t(11) = 2.87$, $p = 0.015$, 95% *CI* [0.25, 1.94]. Analyses demonstrated large age effects (Cohen's $d = 0.69$ and 0.64, respectively). Collectively, results suggest that older children are more intentional and prosocial in their prayers, assigning reasons and focusing on others, potentially reflecting developing socio-cognitive skills and socialization experiences.

Presenter: Diya Anantharaman, Linguistics
Faculty Mentor: Dr. Emily Graham, Linguistics
Project Title: The Minimalist Pragmatics and Syntax of Generative AI Video Advertising

Abstract: With the rise in ubiquity of generative AI (GenAI) models, online advertising has concurrently evolved to anticipate the needs of the everyday consumer and market GenAI in ways that present it as relevant and of interest to them. Much of GenAI's allure lies in the novelty of its purported capabilities, with leading services such as Google's Gemini and OpenAI's ChatGPT having only been launched within the past five years [1, 2]. The tactics used in the persuasive rhetoric of video advertising have compounded with the widespread popularity and convenience of GenAI, creating a marketing methodology that neatly fits with the current trend of positive responses to minimalist branding communication and aesthetics across generations, specifically millennials, Gen Z, and Gen X [3]. While research shows that language use and gesturing in advertising certainly play a role in eliciting unconscious emotional responses [4], there exists a gap in linguistic analyses of advertising for GenAI technologies in particular. Therefore, further research is necessary due to the complex ethics, cultural relevance, and novelty of these services. This study will take a corpus-adjacent approach to analyzing the rhetorical and linguistic properties of video advertisements for seven major GenAI models, focusing on syntactic, pragmatic, and semantic aspects. Specifically, I will evaluate text and speech used in GenAI advertisements to identify common syntactic patterns as well as pragmatic appeals to pathos in order to understand the minimalistic rhetorical strategies used to manufacture familiarity and emotional responses with customers.

Presenter: Jessica Avila, Sociology
Faculty Mentor: Danielle White, CUREL
Project Title: From Theory to Practice: Sociological Insights From a Congressional Internship

Abstract: Through my internship in the U.S. House of Representatives in the fall of 2025, this poster explores how sociological theories of social movements operate within a Congressional office. I used the frameworks of political opportunity structures, resource mobilization, and institutional intermediaries to study daily legislative activity while working in Lateefah Simon's (CA-12) office. During my daily activities, which included tracking legislation, attending briefings, and answering constituent calls, I saw firsthand how well-organized advocacy groups effectively strategize by using coalitions, data, and messaging to sway policymakers. Furthermore, I saw how vital legislative staff members are as "middle actors," because they help bridge the access gap between the public and the government. These interactions demonstrated that institutional position, organization, and access decide whose perspectives are given greater prominence; just complaining is insufficient to bring about political change. This internship made my dedication to equity-centered public service and policy work clear by tying sociological theory to lived institutional practice.

PRESENTER: LAUREN BALLARD; THEATRE, FILM AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. CHRISTOPHE KATRIB; THEATRE, FILM AND DIGITAL PRODUCTION
PROJECT TITLE: THE WEIGHT OF TOMORROW

Abstract: This film project examines the lived experiences of Black students as they navigate the intersecting pressures of academics, work, and pursuing their own passions. Through a realistic and emotionally grounded narrative, the film highlights the physical, mental, and emotional toll of balancing everyday life with social expectations while confronting financial hardship and personal insecurity. The story unfolds through a fast-paced series of scenes, each focusing on our main Black student whose experiences reflect shared yet distinct challenges. This structure emphasizes both individuality and collective struggle.

The main themes include educational barriers, economic instability, identity formation, and mental health. These themes are visually represented through moments such as working late-night shifts before early morning classes, and taking time to encourage their passion. By focusing on small but meaningful details, the film builds conflict and emotional depth while reflecting everyday realities.

The project also addresses the importance of authentic representation, erasing harmful stereotypes often portrayed in mainstream media. By centering emotionally honest storytelling, the film presents Black students as complex individuals rather than simplified narratives. The goal of this project is to raise awareness and encourage meaningful conversations about the systemic challenges that continue to impact Black students in their pursuit of education, self-discovery, and economic stability. Through these portrayals, the film aims to affirm resilience, highlight perseverance, and contribute to broader discussions surrounding representation in educational spaces.

PRESENTER: KADE BARONE, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: UNDERSTANDING HISTORY THROUGH POLITICAL CAMPAIGNING

Abstract: During Fall 2025, I participated in the UCDC program, spending the quarter living and interning in Washington, DC. I worked at Crossroads Campaign Solutions, a campaign consulting firm that manages political races nationwide. My responsibilities included voter research and outreach assistance, as well as supporting partner organizations in achieving their electoral objectives. This work involved researching demographic data, such as minority population numbers in certain congressional districts and candidate profiles to inform targeted voter outreach strategies.

Through the concurrent UCDC academic course, I examined how political campaigns shaped and are shaped by historical forces, and how electoral outcomes constitute significant historical events. This combined experiential and academic approach deepened my understanding of campaign mechanics, the influence of external forces on electoral politics and the role of campaigns in determining historical trajectories.

PRESENTER: RILEY BARRIOS, NEUROSCIENCE
FACULTY MENTOR: DR. ILANA BENNETT, PSYCHOLOGY
PROJECT TITLE: DOES LOCUS COERULEUS STRUCTURE RELATE TO ASSOCIATIVE MEMORY-RELATED ACTIVITY IN OLDER ADULTS?

Abstract: No abstract submitted

PRESENTER: ELIZABETH BENITEZ, PSYCHOLOGY
ADDITIONAL PRESENTER: RACHEL IBRAHIM, PSYCHOLOGY
FACULTY MENTOR: DR. ELIZABETH DAVIS, PSYCHOLOGY
PROJECT TITLE: THE DIFFERENCES IN ADAPTIVE AND MALADAPTIVE EMOTION REGULATION (ER) STRATEGY USE BETWEEN MONOLINGUAL AND MULTILINGUAL INDIVIDUALS

Abstract: Language plays an important role in how people regulate their emotions. Previous studies have found relationships between bilingualism and anxiety symptoms through ER (Camacho et al., 2018); however, fewer studies have investigated the direct relationship between the use of language(s) and race in relation to the use of adaptive and maladaptive ER strategies. The current study explores whether there are differences in adaptive and maladaptive ER strategy use based on whether an individual is monolingual or multilingual. In addition, we explore what differences in adaptive/maladaptive ER strategy use exist between different racial groups among adults. Parents completed the Language and Social Background Questionnaire (LSBQ; Anderson, J. A. E et al., 2018) to indicate whether they speak any languages beyond English, and the Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski, Kraaij, & Spinhoven, 2001) to self-report their strategy use. The strategies reported were then coded into categories of adaptive and maladaptive ER use, and demographic information was also collected. We expect multilingual individuals to use greater adaptive emotion regulation strategies compared to monolingual individuals. We also expect monolingual individuals to report greater maladaptive strategy use compared to multilingual individuals. This is because of prior evidence that bilingual individuals may use their native language to up-regulate and their second language to down-regulate themselves (Williams et al. 2019). Results may implicate the adaptiveness of speaking more than one language in ER strategy use. Racial identity may also help us understand the role of the broader cultural context in ER strategy use.

PRESENTER: SAKSHI BHARGAVA, NEUROSCIENCE
ADDITIONAL PRESENTERS: DEBDEEP BANDYOPADHYAY, PSYCHOLOGY AND EMMA COHEN, PSYCHOLOGY
FACULTY MENTOR: DR. DEEPA RAMAMURTHY, PSYCHOLOGY
PROJECT TITLE: QUANTIFYING SPONTANEOUS MOTOR BEHAVIORS DURING A DELAY-PERIOD TASK IN MICE

Abstract: In sensory detection tasks, mice report stimulus detection by licking a spout to receive a water reward. Because licking and reward delivery are associated with movement and changes in behavioral state, neural activity recorded during behavior can reflect overlapping sensory, motor, and reward-related processes. Without temporal separation, motor-related signals can be misattributed to sensory or cognitive processing. Using a delay period between the stimulus and response window creates a clear lick-free window in which stimulus-evoked activity can be measured before motor output, allowing changes in

neural activity to be evaluated within a sensory epoch that precedes action and reward.

In previous studies, this delay-period task structure made it possible to demonstrate that changes in pyramidal neuron activity in the somatosensory cortex reflected attentional modulation of the sensory response rather than the effects of licking behavior or rewards. In contrast, Vasoactive Intestinal Peptide (VIP) interneurons were activated by general sensory input, movement, and arousal and did not show selective attention signals.

In this project, we use DeepLabCut-based pose tracking to test whether the delay-period task reshapes motor behavior beyond licking behavior itself. By quantifying spontaneous whisker and body movements during the enforced delay window across training, we characterize reductions in motor activity relative to tasks without delay periods and assess the extent to which remaining movements reflect motor preparation. Characterizing spontaneous motion during the delay period further clarifies how effectively sensory processing is isolated from motor preparation beyond licking behavior, strengthening interpretation of delay-period neural activity in studies of sensory and cognitive processes.

Presenter: Akhila Biju, Political Science
Faculty Mentor: Danielle White, CUREL
Project Title: Experiential Learning in Global Affairs

Abstract: My internship with the Osgood Center for International Studies brought me many opportunities to engage in the design and functions of Model United Nations conferences, supporting 3 different schools in Texas, Houston, and DC. Building upon my prior experience in Model UN during middle school and high school, I expanded my skills in conducting research in international studies and diplomacy. I focused on creating background guides, writing research papers, and interviewing professionals whose expertise related to the topics covered in the conferences in order to thoroughly prepare students for debate. Through this research, not only was I able to get our students to engage in real-world global issues, but I was able to also learn and expand my own knowledge and skills on these different topics such as child malnutrition, gun safety, and different humanitarian crises. My creative goal for this project is to show the importance of experiential learning and how it can produce skills that are different from a normal lecture-based class. By combining research with creative design, I have learned that Model UN is a performative and scholarly space. This presentation will show how experiential simulations like Model UN can serve as a creative bridge for students to get a mock diplomatic training and to apply international engagement.

Presenter: Caleb Borquez, History
Faculty Mentor: Dr. Benjamin Sullivan, History
Project Title: Euhemerization in the *Heimskringla*: Snorri's Tool to Build the Bridge of Continuity Between Myth and Monarchy

Abstract: My work examines the political-historical aspects of the *Heimskringla* attributed to the multifaceted Icelandic poet, historian, and politician Snorri Sturluson (1179–1241). The *Heimskringl*a is a collection of sagas about early Swedish and Norwegian kings. Key to Snorri's political-historical agenda here was the technique of euhemerization: the rationalizing process, already ancient by Snorri's time, in which mythological figures and tales were held to be historical persons and events that had been changed and exaggerated over time. Faced with a rapidly Christianizing Scandinavia and a stark Scandinavian

political landscape, Snorri recognized that the old myths could be useful. Snorri euhemerized pre-Christian Norse deities in the *Heimskringla* in order to establish connections between several of them and King Óláfr II of Norway, or more commonly known as Saint Olaf (995-1030). In doing so, Snorri aimed to generate and foreground continuities between the old, pre-Christian form of kingship and more recent Christian forms. Snorri framed the shifting character of contemporary Scandinavian political authority as the continuation of a system that derived much of its authority from divine legitimacy.

PRESENTER: QUAN BUI, HISTORY
FACULTY MENTOR: DR. DAVID BIGGS, HISTORY
PROJECT TITLE: REWRITING VIETNAM'S POLITICAL HERITAGE IN THE EARLY TWENTIETH CENTURY

Abstract: Studies on Vietnamese historiography at the turn of the 20th century have illuminated for us the ways that Vietnamese intellectuals synthesized European concepts of race and Social Darwinism with local understandings to conceive the concepts of the Vietnamese race, Vietnam as a nation, and the designation of national heroes (Kelley, 2015; Duong, 2020; Tai, 2024). Yet in those same books, these 20th century Vietnamese intellectuals also critically questioned the political systems around them and looked towards the past to socially critique their present colonial conditions. The critical juncture of Vietnamese political history for these writers was the Diên Hồng Conference of 1284 CE whose significance they greatly elaborated on. To understand how these early 20th century authors reconceptualized the Diên Hồng Conference, we must examine their experiences with and contributions to civilizational discourse in a world disrupted by French colonialism. Through a close textual analysis of the rhetoric and neologisms employed within several history books authored by these thinkers throughout the early 20th century, this study traces a genealogy of thought of how these reformist scholars and intellectuals in Vietnam reimagined the Diên Hồng Conference in order to reassert the legitimacy of Vietnamese political thought. This paper explores the ways in which Vietnam's future was imagined alongside its past. What significance did these intellectuals attribute to the Diên Hồng Conference? How did these authors rethink Vietnam's condition of being colonized? And in what ways did they imagine the Diên Hồng Conference to manifest itself across space and time?

PRESENTER: GABRIEL CANO, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: POLITICAL CHAMELEON: HENRY STANBERY REALIGNMENT FROM UNIONIST TO SEGREGATIONIST

Abstract: Henry Stanbery's resignation as Attorney General signaled his ideological departure from pro-unionist Republican to defending former Confederates and members of the Ku Klux Klan following the wave of white supremist terror during Reconstruction in the South. Highlighting Stanbery's political realignment exposes the fractures in the Union's core, bringing into question the strength of the political foundation of the Union as the issue of racial equality would alter long-standing political alliances.

PRESENTER: PARIS (TRANG) CAO, ECONOMICS
FACULTY MENTOR: DR. BOHAN YE, ECONOMICS
PROJECT TITLE: OPTIMAL HOUSING LISTINGS IN AI AGE: ANALYZING THE IMPACT OF DIGITAL PRESENTATION ON BUYER BEHAVIOR

Abstract: This study examines how the presentation and marketing of residential real estate listings on digital platforms such as Zillow and Redfin influence buyer engagement and market outcomes. As housing searches increasingly occur online, listing design has become a key determinant of visibility, perceived value, and transaction efficiency. Drawing on microeconomic theory, the study employs econometric analysis of listing-level data to evaluate the effects of AI-generated versus human-written descriptions, targeted marketing keywords (e.g., "luxury," "renovated," "spacious"), and the quantity and quality of listing photos. Buyer engagement is measured using click-through rates, inquiries, and perceived property value. The analysis also quantifies the cost - benefit trade-offs of listing enhancements, including high-resolution imagery, virtual tours, and AI-assisted descriptions, by linking these investments to time on market and final sale prices. Results indicate that persuasive descriptions, keyword optimization, and high-quality visual content significantly increase buyer engagement and are associated with faster sales and higher prices. AI-generated descriptions perform similarly to human-written descriptions in engagement outcomes, though differences in buyer confidence and conversion rates emerge across market segments. Listing enhancements generally yield positive returns, with diminishing marginal benefits at higher investment levels. The findings demonstrate how digital listing strategies shape buyer behavior and market efficiency, offering practical guidance for sellers seeking to optimize online real estate marketing in order to stand out in today's saturated housing markets.

PRESENTER: STEPHANIE CHANG, MECHANICAL ENGINEERING
FACULTY MENTOR: SUSAN STRAIGHT, CREATIVE WRITING
PROJECT TITLE: *HUA HUA*

Abstract: *Hua Hua* is an autobiographical fiction graphic novel featuring seventeen stories across twenty-one pages. Across these stories, the graphic novel focuses on the key memories of Mei, a young Taiwanese-American woman, as it follows her chronologically from early childhood to young adulthood. It focuses on her challenges growing up as an outcast at home and in school, and her constantly evolving sense of self. Throughout, she questions and evaluates her relationship with her culture, family, friends, and former acquaintances. Depending on the audience, Mei learns which aspects of herself she should hide away and others she can safely express. Her early childhood focuses on the struggles of growing up as the only Taiwanese student in her predominantly white elementary school. It explores her earliest encounters with self-loathing from the constant teasing and badgering of racial and cultural differences. Meanwhile, her teenage years focus on self-discovery, retrospection, and acknowledging generational trauma and destructive behavior stemming from her relationships. Mei's story culminates in the acceptance of the experiences, positive and negative, that made her the sum of who she is. With these stories, the graphic novel aims to balance the comedy and troubles that come with growing up in an environment that ostracizes those who are unwilling to conform. It conveys that bitter experiences in the moment can be looked back on as through the lens of a story with a lesson or punchline.

PRESENTER: TIFFANY CHEN, PSYCHOLOGY
FACULTY MENTOR: DR. THOMAS SY, PSYCHOLOGY
PROJECT TITLE: PERCEPTIONS OF LEADERSHIP AND FOLLOWERSHIP DURING THE AFTERMATH OF FAILED WORKPLACE PROJECTS

Abstract: Escalation of commitment is a common phenomenon in which decision makers continue to invest resources and time into a failing course of action (Stray et al. 2012). This phenomenon can occur for many different reasons. For example, programs that have proven to be unsuccessful may still continue due to factors such as limitations of performance indicators, implementation, and leadership (Barrett et al. 2023). Although past research has explored the emotions that accompany failure in organizational settings, there is not much looking into the influence of an individual's perceptions of leadership and followership. We aim to investigate how positive versus negative implicit leadership theories (ILTs) and implicit followership theories (IFTs) influence individuals' narrative experiences of escalation of commitment in regard to workplace projects. ILTs are preconceived notions about the traits and behaviors of leaders, while IFTs are preconceived notions about the traits and behaviors of followers.

We hypothesize that positive ILTs and IFTs will lead to more positive emotions during the aftermath of failure due to escalation of commitment (and vice versa). Participants will answer a series of open-ended questions regarding their previous experiences with escalation of commitment in similar settings; specifically, we would like to explore their perceptions of leadership and followership. Through thematic analysis, we will identify patterns among the participants' narrative experiences of escalation of commitment. This study will allow us to better understand the complex emotions individuals may feel towards leaders and followers as a result of their implicit biases during the aftermath of failed projects.

PRESENTER: KINA D'ANGELO, COMPARATIVE LITERATURE AND LANGUAGES
FACULTY MENTORS: DR. ILYA BROOKWELL, MEDIA AND CULTURAL STUDIES AND DR. KENNETH SHIMA, COMPARATIVE LITERATURE AND LANGUAGES
PROJECT TITLE: SYSTEMS OF CONTROL: IMPERIAL POWER IN *METAL GEAR SOLID* AND OTHER WAR GAMES

Abstract: This project analyzes how war-themed video games function as disciplinary systems that structure player engagement with surveillance, performance evaluation, and procedural violence. Drawing on Michel Foucault, Ian Bogost, Judith Butler, and Stuart Hall, I argue that games like *Metal Gear Solid V* and *Knights of Al-Aqsa Mosque* operate as "gameic panopticons"—digital architectures that encode militarism, obedience, and violence through constant observation and behavioral control. While mainstream shooters like *Call of Duty* naturalize institutional violence through seamless mechanics and nationalist narratives, *Metal Gear Solid V* disrupts militarized play by foregrounding trauma, complicity, and manufactured identity. Mission 43's forced executions and the revelation of Venom Snake as surgically conditioned proxy expose how military institutions produce subjects instead of heroes. *Knights* inverts the colonial gaze by positioning players as resistance fighters under occupation, reframing armed resistance as politically justified counterpower. However, both games risk reproducing the affective logic they critique by rewarding killing through progression systems and score mechanics. Through ludic analysis grounded in my experience as a former Marine, I examine how military logics are replicated in digital environments (from HUD interfaces and detection systems to ranking mechanics) structuring gameplay conditions where surveillance appears as tactical advantage and violence is procedurally rewarded as optimal response. Following Stuart Hall's encoding/decoding model, I demonstrate how games encode specific relationships to violence, masculinity, and institutional power, while players

decode these mechanics differently based on their critical awareness and subject positions. Critical play emerges when players adopt oppositional readings that expose the machinery of control.

PRESENTER: ISABELLA DAY, CLASSICAL STUDIES
FACULTY MENTOR: DR. DENVER GRANINGER, HISTORY
PROJECT TITLE: MYTHIC PARADIGMS AND FEMALE AGENCY IN GREEK TRAGEDY

Abstract: Scholarship on Greek tragedy and the emphasis on female morality often explores how the actions of tragic women are disruptive to the idea of what it meant to be a virtuous woman in Greek society. However, many arguments overlook the tension between self-perception and external projections that not only reflect how characters perceive her, but also perpetuate the characterization of these women as disruptive. Froma Zeitlin's 1996 book, *Playing the Other*, highlights how myth can be used to understand these ideas in tragedy and I build on this to examine how mythic invocations are employed to frame tragic women and their actions. To grasp what these women are aspiring for, and why they are villainized, we may look to external myths that are evoked within the lines of these plays, either invoked by the women themselves or imposed on them by others. Cases I explore include Antigone and the comparison to Niobe of Thebes and Medea to Ino and Scylla. By analyzing these tragedies, fragments of surviving tragedies, and external myths, we can understand how invocations shape how tragic heroines view themselves, how other characters in the play perceive them, and how we, as audience members, interpret them. This paper explores how the agency of a woman in tragedy is altered based on who is invoking the external myth. The employment of comparison between a tragic heroine and a woman from an external myth reinforces a cycle of suffering and punishment for women even if their motivations are morally defensible.

PRESENTER: JOAQUIN DE AMORRORTU, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: ROLE OF NGOS IN INTERNATIONAL DEVELOPMENT THROUGH A STUDENT'S LENS

Abstract: This presentation examines the role of NGOs on international development and humanitarian relief, drawing on two complementary experiences: coursework in International Development and a professional internship with The Salvation Army. Engaging with key scholars from the course, I will apply their frameworks to observations I made during my time working at The Salvation Army, where I worked closely with members of The Salvation Army's World Service Office on global programming and organizational operations. My poster pairs theoretical perspectives on international development with concrete examples from The Salvation Army initiatives, specifically the methods of recruitment and its international operations. A central component of the presentation highlights a project I completed during my placement: an orientation module built on the Articulate platform, designed to introduce newcomers to the organization's international mission, recruitment practices, and global reach.

Taken together, the presentation argues that immersive, practice-based learning deepens engagement with international development theory, and that NGOs like The Salvation Army offer meaningful sites for understanding how global relief work is organized, staffed, and sustained. It also reflects on what this experience contributed to my own professional formation and career trajectory.

PRESENTER: CECILE DIROLL, PUBLIC POLICY
FACULTY MENTOR: DR. RONALD LOVERIDGE, POLITICAL SCIENCE
PROJECT TITLE: WAREHOUSES, PUBLIC HEALTH, AND COMMUNITY PROTECTIONS: A POLICY ANALYSIS OF AB 98

Abstract: With nearly one billion square feet of warehouses, the Inland Empire (IE) has become the nation's e-commerce industry epicenter, handling 40 percent of the country's goods. While the logistics industry has grown significantly in recent decades and is the region's largest employer, its expansion has contributed to poor air quality, community displacement, and workers' rights issues. This project examines California Assembly Bill 98 (AB 98), a law intended to "raise the standards for warehouse development" and improve local communities' "quality of life." Drawing on interviews with various state and local stakeholders, including elected officials, city managers, county officials, state lobbying groups, business associations, and environmental and labor advocacy organizations, this study identifies strengths and weaknesses of the bill and its early implementation. The research also includes a comparative analysis of IE general plans and municipal codes against AB 98's main requirements to evaluate how previous local policies align with the law and the amount of variability between jurisdictions. The findings reveal five major themes across all stakeholders: the appropriateness of AB 98's statewide standard, limited collaboration during the legislative process, unintended consequences, implementation challenges, and impacts on the IE's economy. The analysis further supports the need for AB 98's minimum standards, given substantial variation and generally weaker local regulations in IE jurisdictions. Overall, this research contributes to early policy discussions on how state legislation can address the growing impacts of the logistics industry while balancing economic development, environmental sustainability, community protections, and labor rights in the IE.

PRESENTER: COLIN DONAHUE, ECONOMICS
FACULTY MENTORS: DR. ELLEN REESE, SOCIOLOGY; DR. MIRIAM VENTURINI, ECONOMICS; AND DR. RAYMOND RUSSELL, SOCIOLOGY
PROJECT TITLE: AN ANALYSIS OF WORKER COOPERATIVES AND THEIR POTENTIAL IN CALIFORNIA

Abstract: This paper examines worker cooperatives in California. A worker cooperative is a business model where the workers within the business also collectively own and operate it. Lacking a traditional business owner, worker-owners usually practice a form of workplace democracy, whereby workers elect management or hold votes via direct democracy to make business decisions. Prior research on worker cooperatives focuses mainly on examples found outside of the United States or in previous decades. This paper compares worker-owners' experiences to those found in traditional businesses in terms of individual structures, day-to-day operations, economic performance, workers' beliefs and perspectives, and interactions with other groups. My research is based on in-depth interviews with worker-owners and experts on worker cooperatives in California. My findings reveal that workers interviewed greatly prefer worker-owned cooperatives over traditional businesses because they allow a greater sense of ownership and control over their labor and day-to-day operations. Interviewees report that they appreciate the agency and power they are given within cooperatives, claiming that this helps to also make them more efficient at work. Interviewees also report that, in comparison to previous employment experiences, they feel a greater sense of respect and dignity in the workplace in worker cooperatives. Worker-owners also emphasize that they experience a greater connection with their communities and the wider labor movement within cooperatives compared to more traditional businesses. I conclude that worker-owners interviewed for this study prefer the worker cooperative model over more traditional business models because they show great potential for both personal and economic empowerment.

PRESENTER: THOMAS DU, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: "A LIFE STRUGGLE FOR FREEDOM": STUDENT ACTIVISM, PROGRESSIVE MOVEMENTS, AND THE LEGACY OF NEW LEFT DISCOURSE AT UC RIVERSIDE, 1966-1969

Abstract: Traditional narratives of the New Left in the 1960s and 1970s have emphasized iconic events—among them the 1964 Free Speech Movement at UC Berkeley, the 1968 East Los Angeles School Walkouts, the 1969 People's Park Protests, and the 1970 Kent State shooting. While understandable, this focus on dramatic demonstrations has obscured the breadth of New Left activism and overlooked grassroots organizing in less visible locations. This paper examines student activism between 1966 and 1969 on the UC Riverside university campus, tracing three interconnected political developments—student-led support for the United Farm Workers in the Delano Grape Strike, initiatives for equal opportunity in UCR admissions and K-12 curriculum reform in the Riverside Unified School District (RUSD), and housing desegregation efforts in communities near campus—as well as student opinions on, responses to, and discourse surrounding these causes. Drawing on records from UCR student organizations, including the United Mexican-American Students (UMAS), the Committee for Open Housing, and Students-For-Tunney, as well as campus event summaries, student correspondence, political flyers and publications, and the UCR Highlander newspaper, this study offers an exurban perspective that complicates and augments urban-centered narratives of the New Left and university student activism in the 1960s. By recovering the quotidian activities of largely unnamed student and community organizers, this project demonstrates how local activism contributed to national movements for desegregation, civil rights, and social justice, revealing a more expansive geography of New Left politics than previously recognized.

PRESENTER: ANISHKA DURVASULA, POLITICAL SCIENCE
FACULTY MENTOR: DR. YASEMIN IREPOGLU CARRERAS, POLITICAL SCIENCE
PROJECT TITLE: IN LINES OF CODE, THE POSSIBILITY OF PEACE

Abstract: During my UCDC program, I served as a Digital Strategy and PeaceTech Fellow at the New Story Leadership Organization. In this role, I worked at the intersection of artificial intelligence, peacebuilding, and restorative justice. Our team sought to identify and address systemic barriers to negotiating peace in the Israeli–Palestinian conflict by integrating AI-driven analysis with practical, community-based engagement strategies.

I collaborated with CulturePulse.ai to design and pilot AI-powered survey frameworks capable of capturing nuanced stakeholder perspectives across polarized communities. These tools used narrative and sentiment analysis to map patterns of polarization, assess readiness for dialogue, and inform predictive simulations for mediation strategies. I also conducted research on PeaceTech companies such as Akord AI and Nextlevel Mediation to assess how their technologies could be adapted for campus-based restorative services.

To operationalize these insights, I led strategic outreach for the "Campus Phoenix initiative." This included stakeholder mapping of university groups connected to the Israeli–Palestinian conflict, managing a comprehensive coordination tracker, and spearheading media outreach to podcasts such as *PeaceCast* and *Rethinking Palestine* to amplify constructive dialogue. I integrated restorative justice frameworks by incorporating *Honeycomb Justice* as a primary partner.

This experience developed my appreciation for the emerging field of Peace Technology. I gained insights on strategically leveraging AI tools to enhance human facilitation and to develop a framework for integrating the tools within restorative practices and institutional contexts. I found that when grounded in dialogue, reconciliation, and systems-level engagement, PeaceTech can meaningfully support sustainable conflict transformation and long-term relationship building.

PRESENTER: MATA ELANGOVAN, MEDIA AND CULTURAL STUDIES
FACULTY MENTOR: DR. JUDITH RODENBECK, MEDIA AND CULTURAL STUDIES
PROJECT TITLE: DESIGNED, USED, DISCARDED: JUST ANOTHER DAY IN THE REPRODUCTIVE MARKETPLACE

Abstract: Dystopian literature has long imagined futures in which reproduction is tightly controlled by political systems. Aldous Huxley's *Brave New World*, Kazuo Ishiguro's *Never Let Me Go*, and Margaret Atwood's *The Handmaid's Tale* each depict regimes of reproductive management that resonate with contemporary debates surrounding artificial reproductive technologies (ART) and commercial surrogacy. This paper explores how these novels collectively construct reproduction as a site of bioeconomic value, offering critical frameworks for understanding present-day ethical concerns.

In *Brave New World*, reproduction is rendered artificial, eliminating traditional family structures, transforming human life into a product engineered for social stability. *Never Let Me Go* presents a subtler system in which cloned individuals are raised solely to provide organs, reducing human existence to biological utility and disposable human capital. *The Handmaid's Tale* foregrounds reproductive coercion under a theocratic regime, where fertile women are forced into surrogate roles for elite families, highlighting the gendered control of bodies and the erosion of autonomy.

Drawing on theoretical frameworks from scholars such as Tithi Bhattacharya and Michel Foucault, these fictional worlds can be connected to contemporary reproductive practices. Bhattacharya's social reproduction theory positions reproductive labor as indispensable work that sustains social life across generations, while Foucault's concept of human capital casts biological traits as assets to be cultivated and optimized. Through this lens, I will argue dystopian narratives appear less as distant speculation and more as critical reflections of present realities, highlighting persistent struggles over bodily autonomy and the biopolitical governance of reproduction.

PRESENTER: JANE ESSAVI, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. XOCHITL CHAVEZ, MUSIC
PROJECT TITLE: THE ROLE OF FOLKLORE AND STORYTELLING IN TEACHING MORAL VALUES ACROSS CULTURES

Abstract: This research examines the transmission of moral values through storytelling across diverse cultural traditions, focusing specifically on folk tales, parables, and oral narratives from Middle Eastern, African, European, and Indigenous American societies. Through a comparative analysis of recurring themes in these narratives, the study investigates how historical circumstances and cultural needs shaped the emphasis on particular virtues like family reverence, communal responsibility, and environmental stewardship. Using a combination of narrative analysis and anthropological frameworks, the research traces how these traditional moral teachings have evolved to address contemporary challenges while maintaining their cultural significance. The project analyzes modern adaptations of traditional narratives

to demonstrate how storytelling continues to influence individual identity formation and social cohesion in an increasingly globalized world. By examining both the persistence and transformation of moral teachings through storytelling, this research contributes to our understanding of cross-cultural dialogue and ethical development in multicultural societies.

PRESENTER: EMILY FANG, PSYCHOLOGY
FACULTY MENTOR: DR. MISAKI NATSUAKI, PSYCHOLOGY
PROJECT TITLE: ADVERSE FAMILIAL EXPERIENCES AND INTERNALIZING BEHAVIORS: THE MEDIATING ROLE OF PARENT EMOTIONAL SOCIALIZATION

Abstract: Adolescence is a significant developmental transition and is characterized by increased sensitivity to socioemotional responses (Silvers, 2022). Familial adversity has been found to disrupt parenting practices and lead to increased emotional difficulties in adolescents (Masarik, 2017). Further, it is well understood that parenting behaviors have an impact on the emergence of adolescent psychopathology (Chainey & Burke, 2021). Parental emotional socialization, the process by which parents teach their children about understanding and regulating emotions, could be one mechanism linking familial adversity to adolescent internalizing behaviors (Shaffer et al., 2011). Furthermore, there is scarce literature that focuses solely on the impact of adversity stemming from the familial context. The current study aims to examine how parents' reactions to their adolescents' experiences of emotions may act as a mediator connecting adverse familial experiences and adolescent symptoms of withdrawal. A sample of adolescents (N = 220; 49.5% Female) and their parents drawn from the Adolescent Emotional Study (AES; Klimes-Dougan et al., 2001) self-reported on study constructs. Mediation analyses revealed that the experience of familial-related adversity predicted mothers' tendency to react to their adolescents' sadness with neglectful responses ($b = 0.044$, $SE = 0.012$, $p = .0001$), which in turn predicted increased adolescent symptoms of withdrawal ($b = 0.639$, $SE = 0.217$, $p = 0.004$). These findings contribute to our understanding of parents' roles in adolescent emotional development.

PRESENTER: ALESSANDRA FLORES, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. CHRISTOPHE KATRIB; THEATRE, FILM AND DIGITAL PRODUCTION
PROJECT TITLE: WOMEN IN BOXING: THE LIFE OF A FEMALE BOXER

Abstract: Boxing has reshaped me into a different person than I was before, shaping my resilience, confidence, and inner-strength. The lessons I have learned in the ring have also been applicable to my personal life. This unique sport has not only allowed me to discover a different part of myself, but has also helped me build and maintain many wonderful friendships and relationships with other fellow fighters. While it is undeniable that boxing requires physical toughness, this sport requires one to delve deeply within themselves, requiring the ability to create and fortify a mental toughness. Through the use of personal anecdotes and self-documentation via smartphone, audio clips and archived footage, I aim to share with others how boxing can serve as a great personal resource of self-improvement and empowerment. My documentary will display my personal accounts of training, revealing my struggles as well as my achievements. The footage captured in this documentation will be filmed almost entirely on my own. I plan on briefly introducing my film and the process of making it, followed by a screening of the 10-minute film, followed by a brief Q&A with the attendees.

PRESENTER: SOPHIA FU, POLITICAL SCIENCE
FACULTY MENTOR: DR. PETER MORT, POLITICAL SCIENCE
PROJECT TITLE: FROM WALL TO WINDOW: THE SUPREME COURT AND THE EROSION OF THE CHURCH-STATE WALL OF SEPARATION

Abstract: The First Amendment and the Establishment and Free Exercise Clauses derived from it are the basis for what Thomas Jefferson coined as the "wall of separation." As of 2020 however, the appointments to the Supreme Court made during the first Trump administration marked the creation of an unprecedented 6-3 conservative, catholic, "super" majority. This research project aims to examine not only the impacts of the current religious majority on the Supreme Court, but to argue that there has been a substantial erosion in the separation of church and state in recent decades. This study investigates how judicial decisions have increasingly accommodated religious influence within public institutions, particularly in areas such as education, reproductive rights, LGBTQ+ protections, and public funding of religious organizations. This project argues that this erosion is the product of gradual and calculated movements towards satisfying religious interests, and analyzes the shortcomings and rulings of the Supreme Court that have emboldened the mobilization of conservative religious movements and religious nationalism. This research examines Supreme Court decisions on both the merit and emergency docket, that impact the separation of church and state.

PRESENTER: CASSANDRA GARCIA, PSYCHOLOGY
ADDITIONAL PRESENTERS: CAMILLE CRUZ, EDUCATION AND NATALIE MORENO, EDUCATION
FACULTY MENTOR: DR. BERNARDETTE PINETTA, PSYCHOLOGY
PROJECT TITLE: SCHOOL CULTURAL SOCIALIZATION AND SCHOOL OUTCOMES: EXPLORING ERI CONTENT AS A PATHWAY FOR THE SUCCESS OF STUDENTS OF COLOR

Abstract: Adolescence is a vital time for youth's need for social validation. However, limited research has examined how students perceive their teachers' consideration for their ethnic-racial group (e.g., teacher ethnic-regard) may impact their sense of belonging and engagement (Rivas-Drake, 2011). Cultural socialization messages (i.e., opportunities for youth to learn about their cultural background and develop a positive identity) may not only affirm students' ethnic-racial identities, but also their perceptions of teachers' regard for their ethnic-racial community (Byrd & Ahn, 2020; Wang et al., 2019). To better understand these associations, the present study seeks to answer the following research questions: RQ1) Does school cultural socialization affect school outcomes (i.e., academic engagement, sense of belonging) for high school students of color?; and RQ2) How does ERI content (i.e., private regard, teacher ethnic regard) serve as an underlying pathway between teacher ethnic-racial socialization and students' school outcomes? The data from this study comes from a larger longitudinal mixed-methods study; 420 students of color were selected from our 453 datasets. We will run simple mediation models on SPSS V. 30. We hypothesize that more frequent cultural socialization leads to greater school engagement and sense of belonging. We further hypothesized that teacher public regard will serve as a mechanism between student cultural socialization and school outcomes. This study will deepen our understanding of how teacher ethnic regard functions as a critical pathway between cultural socialization, and shaping students' academic engagement and sense of belonging in schools.

PRESENTER: MAXINE GARCIA, PSYCHOLOGY
FACULTY MENTOR: DR. AERIKA LOYD, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: LENISHA WILLIAMS, PSYCHOLOGY
PROJECT TITLE: THE RELATIONSHIP BETWEEN SCHOOL ETHNIC-RACIAL SOCIALIZATION, IDENTITY, AND MENTAL HEALTH OUTCOMES FOR ASIAN-AMERICAN COLLEGE STUDENTS

Abstract: Recent scholarship has considered schools as a primary transmitter of ethnic-racial socialization (the process in which individuals learn and form attitudes about their race or ethnic heritage) for youth transitioning from childhood to adolescence (Saleem & Byrd, 2021). School ethnic-racial socialization and its positive impact on mental health have thus been evaluated as a factor contributing to ethnic-racial identity development (Byrd et al., 2021). However, existing literature has focused predominantly on Latinx and African American students, with little to no research focusing on Asian American students. Thus, we aim to investigate the association between school ethnic-racial socialization, ethnic-racial identity, and mental health outcomes (e.g., depression and anxiety) among Asian American college students. Participants included 305 Asian American college students (M_{age}= 19.2, age range = 18-41 years), including 177 women, 120 men, 4 non-binary, and 3 identifying as "other." Participants attended a large public university in the southwest region of the United States and completed the 2023 College Student Identity Project online survey. Preliminary analyses revealed some notable correlations. School ethnic-racial socialization was positively associated with ethnic-racial identity overall ($r = 0.27$, $p < 0.01$) and ethnic-racial identity centrality ($r = 0.14$, $p < 0.05$), but demonstrated a weak negative correlation with anxiety ($r = -0.12$, $p < 0.05$) and a negative association with depression ($r = -0.19$, $p < 0.01$). These emerging findings may inform interventions to support healthy identity development for Asian American students, providing a culturally competent resource to the university population.

PRESENTER: JOANA GHOSH, NEUROSCIENCE
FACULTY MENTOR: DR. RACHEL WU, PSYCHOLOGY
PROJECT TITLE: SKILL TYPE, MOTIVATION, AND ENGAGEMENT IMPACT ONLINE TECHNICAL SKILL LEARNING IN YOUNGER AND OLDER WORKERS

Abstract: Employees often need to learn different types of skills (e.g., new hands-on operational procedures versus new software) to adapt to changes in work settings. When employees have to learn new skills to adapt to their work responsibilities, they may only be provided with minimal training, perhaps a short online tutorial, often resulting in self-directed learning. Thus, motivational aspects (e.g., intrinsic motivation, utility value, growth mindset, self-regulation, perceived effort, and engagement) naturally play an important role in adult learning. It is unclear how skill type and aspects of motivation predict learning performance in younger and older workers. Younger and older workers in the present study learned two new skill types: 1) a manual skill (how to cap an EEG participant) and 2) a conceptual skill (how to adapt code to graph in R). For older workers, skill type predicted learning outcomes, with better performance on the EEG capping task compared to the R programming task. We also found marginal effects for higher income (above $75k) predicting better learning outcomes for older workers. For younger workers, higher growth mindset, perceived effort, and higher engagement predicted better learning outcomes regardless of skill type. Our results highlight motivational aspects and skill types that may support or hinder novel skill learning performance for younger and older workers in the workforce.

Presenter: Laya Ghosn, Psychology
Faculty Mentor: Dr. David Rosenbaum, Psychology
Additional Contributor: Simran Bhatia
Project Title: Effects of a Memory Load on Visual-Search Performance: Do People Give Themselves Extra Time Between Trials to Rehearse, Or Do They Hurry To Finish?

Abstract: People assess the difficulty of tasks on a daily basis, yet little work has been done on the way they make these assessments. The present research addressed this gap. UCR students completed visual search tasks in multiple trials. In contrast to earlier studies which imposed fixed delays between trials, our participants initiated each trial on their own, providing us with a novel measure of self-pacing. The visual search trials were done after participants studied a word list. After the visual search trials were completed, participants saw a new list of words and reported the number they believed stayed the same (an anticipated test of memory). Two competing hypotheses were tested. According to the first, the rehearsal hypothesis, participants would generate longer inter-trial times between successive visual-search trials with a memory load than without as they mentally review the word list. According to the other hypothesis, the get-it-over-with-quickly hypothesis, participants would generate shorter inter-trial times between successive visual-search trials with a memory load than without; shortening the inter-trial times would help them get to the test phase as quickly as possible. The results to be reported shed light on the mental processes underlying the scheduling of everyday tasks.

Presenter: Ariana Gonzales, Psychology
Faculty Mentor: Dr. Olivia Atherton, Psychology
Project Title: Sensory Processing Sensitivity and Romantic Relationship Quality

Abstract: We naturally form meaningful connections with those around us daily. Individuals tend to establish interpersonal connections with others because it helps them to meet the universal need to belong (Baumeister & Leary, 1995). Although an extensive body of research has examined predictors of romantic relationship quality, little-to-no work has examined how sensory processing sensitivity (SPS), a personality trait characterized by higher awareness and processing depth of sensory and social stimuli (Aron & Aron, 1997), is associated with romantic relationship quality. Prior research has investigated SPS in romantic relationships without distinguishing between satisfaction and quality (Zorlular & Uzer, 2023). Consequently, it is not clear whether SPS is beneficial for all types of romantic relationship outcomes. Even less research has focused on these associations among racial/ethnic minoritized people. We fill these gaps in the literature by leveraging existing data from a longitudinal study of Mexican-origin individuals (California Families Project) to: Aim 1) construct a measure of SPS from relevant personality/individual difference measures, and Aim 2) investigate how SPS in adolescence is related to romantic relationship quality in young adulthood. We hypothesize that individuals with higher levels of SPS will have better romantic relationship quality (e.g., higher warmth, lower hostility). This current study will allow researchers to better understand how high levels of SPS and relationship quality relate to each other, thereby setting the foundation for future research to test potential interventions to promote or maintain relationship quality among high SPS individuals.

PRESENTER: DESPUES GREEN, PHILOSOPHY
FACULTY MENTOR: DR. BRIAN HAAS, PHILOSOPHY
PROJECT TITLE: BREATHING LIFE BACK INTO ACADEMIC PHILOSOPHY

Abstract: In this paper I will use historical anecdotes to critique the current state of academic philosophy. I argue that philosophy has a pure form, and I examine the effects of certain pedagogies of philosophy which may or may not represent this pure form that philosophy has. The relevance of these pedagogies is that they are practiced in what are called major institutions, and thus bear a large responsibility for how they are trusted to represent their subjects.

In order to compare a state of academic philosophy that is not consistent with its pure form and a state that is, I will use the words attributed to Pythagoras and Heraclides, that he (whichever one) distinguished himself as on a "pursuit into the inquiry of the nature of existence" as opposed to merely being a "wise (man)."

I will examine how academic philosophy has adopted certain pedagogical structures of philosophy that cultivate wise men, and the effects of those pedagogies, both immediate and long-term.

Then, I will respond to certain objections that may arise such as those associated with sovereignty and free will, which say that people should be able to "do or teach philosophy however they want!" I intend to defend the principles of my interpretation of the meaning of philosophy, with the potential for the manifestation of philosophy—that which gives it palpability.

By the end of this, readers will have a sturdy baseline for practicing philosophy from the perspective of one who aspires toward philosophy in pure form.

PRESENTER: HONG HA, POLITICAL SCIENCE
FACULTY MENTOR: DR. NOEL PEREYRA-JOHNSTON, POLITICAL SCIENCE
PROJECT TITLE: HUMAN CAPITAL, GOVERNANCE, AND FOREIGN DIRECT INVESTMENT: RETHINKING THE "RACE TO THE BOTTOM" IN LOW- TO MIDDLE-INCOME COUNTRIES

Abstract: This study examines how human capital and institutional quality influence foreign direct investment (FDI) across 106 countries using panel data regression analysis. Drawing on World Bank, UNCTAD, and INSCR datasets, the analysis evaluates three dependent variables, gross FDI inflows, net FDI inflows, and FDI stock, over time. Key explanatory variables include average years of schooling, property rights, rule of law, institutionalized democracy, and executive constraints, alongside macroeconomic controls such as trade openness, GDP per capita, inflation, population, and natural resource rents.

Results indicate that human capital is a consistently strong and statistically significant predictor of FDI across all measures. A one-year increase in average schooling is associated with substantial increases in both gross and net FDI, with the largest effects observed in low- and lower-middle-income countries. Institutional quality also matters, particularly property rights and the rule of law, which demonstrate strong positive relationships with FDI, especially in developing economies. In contrast, democracy and executive constraints show mixed or statistically insignificant effects across income groups.

Macroeconomic factors such as trade openness and natural resource rents positively influence FDI in certain contexts, while inflation generally discourages investment in middle-income economies. Overall, the findings suggest that investments in education and legal institutions are central to attracting and retaining foreign capital, particularly in lower-income countries seeking sustainable economic development.

PRESENTER: JESSICA HABIB, BIOLOGY
ADDITIONAL PRESENTER: LYDIA FANOOS, BIOLOGY
FACULTY MENTOR: DR. ELIZABETH DAVIS, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: RICKY HANEDA, PSYCHOLOGY
PROJECT TITLE: EXPLORING CULTURE IN INTERPERSONAL EMOTION REGULATION: ASSOCIATIONS BETWEEN FAMILISM AND INTERPERSONAL EMOTION REGULATION TENDENCIES

Abstract: Emotion regulation (ER) does not occur solely within an individual (i.e. intrapersonally), but is also shaped through interactions with others (i.e. interpersonally). Although interpersonal ER has received less attention historically, recent work acknowledges that social interactions are ubiquitous (e.g. family and peers) and influence the development of ER. One relevant cultural value for interpersonal ER processes is familism which is defined as family interconnectedness, obligation, and support. Familism is prominent in populations of color, including Latinx communities. Given that Latinx individuals comprise roughly over half of the Inland Empire (IE) of Southern California (Inland Empire Regional Snapshot Region 9, 2025), it is important to understand how familism may influence tendencies to engage in interpersonal ER strategies within this community. Using a sample of 54 parents from the IE area, we examined whether the cultural value of familism, using The Familism Scale (Sabogal et al., 1987), is associated with tendencies to participate in interpersonal ER using the Interpersonal Emotion Regulation Questionnaire (IERQ; Hofmann et al., 2016). Subscales will be correlated to investigate if certain categories of familism, such as support from family, is associated with greater tendencies to engage in social modeling, an aspect of interpersonal ER. We expect a moderate positive association between familism and interpersonal ER tendencies. We also expect that support from family within familism may be positively associated with social modeling tendencies within interpersonal ER. These findings can highlight how cultural values influence tendencies to use ER strategies.

PRESENTER: LEILA HAIDAR, BIOLOGY
FACULTY MENTOR: DR. CARLA MAZZIO, ENGLISH
PROJECT TITLE: EQUITY IN THE LABORATORY: DISABILITY ACCESS FOR UNDERGRADUATE SCIENCE COURSES

Abstract: While many higher education institutions highlight equity in science education, "equity is rarely conceptualized with adequate attention to access," (Reinholz and Ridgway, 2021). Even with more physically accessible features for science laboratories, including adjustable fume hoods and workbenches, broader challenges related to systemic ableist barriers remain unresolved. As "disability services are multidisciplinary, and comprehensive support requires the involvement of numerous stakeholders," (Acar et al., 2025) it is critical to examine student awareness of available resources and the preparedness of faculty and teaching assistants (TAs) to support disabled students effectively. This study aimed to identify and analyze barriers to lab accessibility at the University of California, Riverside (UCR) through surveys with permanently and temporarily disabled students who have been or are currently enrolled in the BIOL05L Series, BIOL020 Dynamic Genome Laboratory, CHEM01L Series, CHEM08L Series, BCH015, and/or PHYS02L Series. Results from a survey of TAs for the aforementioned courses

regarding level of training and awareness of accessibility protocols and accommodation practices were also analyzed. The findings aimed to identify strengths and gaps of current protocols, alongside attention to larger structural and institutional forms of supporting disabled students at UCR. In the process, I worked with various Critical Disability Studies insights that offered helpful ways to imagine improved means of approaching disability as a concept and supporting disabled students in the goal to advocate for a more robust accessibility policy and cultural shifts that address institutional ableism and supports the full participation of disabled students in science laboratory classes.

PRESENTER: ALYSSA HALE, PHILOSOPHY
FACULTY MENTOR: DR. JOSHUA WOOD, POLITICAL SCIENCE
PROJECT TITLE: RETURN TO THE INTERNAL - REFLECTION ON REASON

Abstract: This paper examines the shared thought on the separation of soul and body in classical philosophers Socrates, Epictetus, and Marcus Aruelius with a contemporary framework. While the distinction between mind and body is no new idea in classical philosophy, this paper will take a more specific approach on the experience of living in the internal world and navigating the external. Using both ideas and thoughts from these thinkers and my own personal experiences and thoughts. This paper traces a conceptual progression in this idea between these thinkers.
Starting with Socrates who identifies the 'soul' as the rational element of ourselves. Making a clear distinction of the importance of the soul to the externalities of life. To Epictetus who teaches how to accept living with the knowledge of this separation while stressing the need to still engage with the external world within limits. Then to Aurelius who set principles for how to conduct oneself in the external world while being separated from it particularly in Meditations the clearest example of the progression I can give aside from my own. Finally, the paper will add an original idea while using all the thinkers before me to relay how to revert philosophy to a guide for the internal rather than a rule book on how one should act. This paper uses philosophical analysis and conceptual understanding to revisit a century old question of how to live with the separation, distinction, and experiences of the internal and external world.

PRESENTER: MEGAN HO, PSYCHOLOGY
FACULTY MENTOR: DR. SONJA LYUBOMIRSKY, PSYCHOLOGY
PROJECT TITLE: SOCIAL CURIOSITY: THE COGNITIVE DRIVER OF SOCIAL CONNECTIONS

Abstract: Friendship is widely understood as a beneficial evolutionary mechanism that enables humans to ensure survival through cooperation. Optimal foraging theory, a biological theory detailing animal foraging strategies, explains how humans decide between meeting new people (social exploration) and retreating to familiar relationships (Tsang et al., 2024). While biological and behavioral explanations for cultivating close relationships have been thoroughly examined, sociocognitive processes focused on "how" have hardly been examined. To explore this question, we conducted an intervention aimed at improving well-being through curiosity. Participants were tasked with either performing a novel activity every day for a week or recording their usual schedule. They reported pretest, daily, and posttest affect as well as descriptions of the daily activities they engaged in. Participants' journal entries were coded for socially curious behaviors and relationship strength to investigate how frequently participants were curious towards, with, and inspired by weak and strong ties. We propose that curiosity serves as a cognitive driver in both exploring new relationships and in deepening understanding of close friends and family. Additionally, people in relatively close relationships will exhibit less social curiosity than those in

less familiar relationships. Furthermore, we anticipate that people will report higher levels of subjective well-being and relatedness if social curiosity is present in either type of relationship.

PRESENTER: PHILSON HO, BUSINESS ECONOMICS
FACULTY MENTOR: DR. VERONICA SOVERO, ECONOMICS
PROJECT TITLE: AN EMPIRICAL ANALYSIS OF MINIMUM WAGE POLICIES: INTEGRATING MEDIA PERSPECTIVES, ECONOMIC THEORY, AND DATA MINING USING R AND SQL

Abstract: Minimum wage policy plays a significant role in shaping the economic wellbeing of American workers. However, political actors and media outlets often frame minimum wage debates in divergent ways, potentially influencing public understanding of its economic effects. This capstone project examines how politicians and news media across the political spectrum interpret and present minimum wage policy, focusing on Gavin Newsom's 2024 $20 minimum wage policy in California.
Using R and SQL for data mining and content analysis, the study collects and analyzes articles, public statements, and economic reports from ideologically diverse news sources. The analysis finds that news sources across the political spectrum frequently emphasize selective economic outcomes or ideological framing of minimum wage increases, while empirical economic evidence generally shows more nuanced and mixed effects on employment and worker welfare than portrayed in public discourse. One of our key findings included using R to perform sentiment analysis to create a chart displaying the distribution of positive and negative sentiment over all the news articles analyzed. We found that most news articles and sources were narrowly more negative towards the minimum wage policy, with most articles and news sources crossing the 50% threshold in favor of a negative view.

PRESENTER: ANAHITA HOOSHYARI FAR, SOCIOLOGY
FACULTY MENTOR: DR. JADE SASSER, GENDER AND SEXUALITY STUDIES
PROJECT TITLE: AIR POLLUTION, ECO-ANXIETY, AND MENTAL HEALTH IMPACTS AMONG UNIVERSITY STUDENTS IN THE INLAND EMPIRE

Abstract: With the increase in warehousing in the Inland Empire and the region's demographics mostly composed of working-class Latino, Black, Indigenous, Asian, and Southwest Asian North African (SWANA) families, there have been instances of racial health disparities with these groups combating various cancers and respiratory health issues as a result of air pollution, heat waves, and wildfires. There is growing evidence of studies demonstrating a link between air pollution exposure (for example, exposure to PM10) and mental health outcomes such as suicidal ideation, depression, and schizophrenia relapses. This capstone project will analyze whether students of color within the University of California, Riverside, and Riverside Community College District (RCCD) have experienced eco-anxiety and/or negative mental health outcomes due to air pollution & climate impacts in the Riverside region. To carry out this project, we will collect survey data from students at UCR and RCCD who have been affected by air pollution/climate impacts in Riverside, and then compare the students of color's levels of eco-anxiety to white students' levels of eco-anxiety. We consider whether students with a background in environmental studies experience more perceived climate and pollution impacts, and if so, whether their levels of reported eco-anxiety are higher, and whether and how this impacts their mental wellbeing. The significance of this project is to test whether or not communities of color, such as Black, Indigenous, Latin, Asian, and SWANA students in low socioeconomic and more polluted areas experience higher levels of eco-anxiety than white students.

PRESENTER: ISABELLE HUANG, BIOLOGY
FACULTY MENTOR: BRADLEY BUTTERWORTH, MUSIC
PROJECT TITLE: EXPLORING MUSIC COMPOSITION AS A FORM OF MEDICINE

Abstract: Modern medicine has advanced through discoveries of biological mechanisms and the development of new treatments; however, the emphasis on scientific knowledge and clinical technology has consequently diminished the emotional connection within physician-patient relationships. Alongside these advancements, research studies in music therapy suggest specific melodies and rhythmic structures may enhance patient recovery and improve overall well-being. While additional research is needed, music has been shown to help patients better manage disease symptoms and treatment side effects, such as stress and pain. This project consists of an original composition that explores how musical characteristics associated with positive patient outcomes can be integrated with personal stories. Research methods include reviewing relevant literature to identify patterns of musical characteristics that influence patient healing. Selected piano scores are analyzed for chord progressions, tempo, and musical key to provide a foundation for the structure of this composition. Lastly, the creative phase of this project involves experimenting with different music motifs to combine these musical elements with my personal experiences and translating them into a single piece. Through practice and refinement, these motifs are developed into a finalized, recorded musical composition. The resulting composition aims not only to provide insight into how music therapy can contribute to compassionate medical practice, but also to create meaningful work that reflects the integration of two distinct disciplines: music and medicine.

PRESENTER: MELANIE HUANG, PSYCHOLOGY
ADDITIONAL PRESENTER: KYLIE RAUKKO, PSYCHOLOGY
FACULTY MENTORS: DR. THOMAS SY, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: MERAB GOMEZ
PROJECT TITLE: EXPLORING THE IMPACT OF HUMAN AND USABILITY FACTORS ON GOAL PROGRESS IN AN APP INTERVENTION

Abstract: Given that technology is deeply integrated into everyday life, research on user experience (UX) is essential for testing its effectiveness in helping users achieve their goals. This study investigates how user engagement, with a goal setting mobile gaming application (MINDTAPP), can predict goal progress while considering individual differences such as perceived usefulness as well as app-related factors like ease of use. User engagement explains not only a user's persistence with a system, but also the quality of which they interact with that system. Previous research suggests that engagement can function as a mediator between user experience and behavioral outcomes in which early engagement can predict long term goal achievement (Valentine et al., 2025). Additionally, the Technology Acceptance Model (TAM) posits that perceived usefulness and perceived ease of use determine user's adaptation to the technology (Davis, 1989). Building on this, the present study tests a moderated mediation model to examine whether user's beliefs that the app supports goal achievement predicts goal progress through app engagement over time, and how ratings of the app's usability moderates this effect. We hypothesize that perceived usefulness increases user engagement, which in turn predicts goal progress, and that the strength of this indirect relationship varies depending on perceived ease of use. These findings provide insight into how individual differences combined with user experience can impact app effectiveness. As society becomes more technology-driven, understanding how goal-based apps promote self-improvement is critical due to their widespread use in organizational and educational contexts.

PRESENTER: WEIJUN HUANG, PHILOSOPHY
FACULTY MENTOR: DR. ALEXANDRA NEWTON, PHILOSOPHY
PROJECT TITLE: RETHINKING HUME'S MORAL THEORY: NEITHER REALIST NOR RELATIVIST

Abstract: This essay argues that David Hume's moral philosophy escapes the familiar opposition between moral realism and relativism by grounding moral judgment in sentiment, sympathy, and socially shared conventions. While Hume's "general survey" provides stability in moral judgment, a consistent application of his principles reveals deeper contingency in the heart of moral life. Immediate moral responses show that sympathy is not merely psychological but reflects an ontological structure of human experience. Through a historical analysis, I argue that the "general survey" is never fully impartial": it is historically and socially bounded, shaped by practices that build on exclusion. By examining cases of murder, cultural variations, and historical institutions, I argue that a more radical and consistent Humean view embraces the conclusion that morality is inescapably human, contingent, and bounded—hence opening space for critical reflection on existing moral systems.

PRESENTER: AINARA IBARRONDO LLOMBART, PHILOSOPHY
FACULTY MENTOR: DR. ERIC SCHWITZGEBEL, PHILOSOPHY
PROJECT TITLE: A MODAL ACCOUNT OF ADDICTION AND SELF-CONTROL

Abstract: The question this work is concerned with is how the threat to procedural autonomy posed by addiction ought to be understood. The account presented here is intended to show how the notion of self-control might be cashed out in such a way that it sheds explanatory light on the nature of addiction. First, I explore the theoretical and empirical problems with three models of addiction: The Willpower Model, the Disease Model, and the Liberal Account. I argue that these models fail because they rely on motivational exertion and total loss of voluntary agency to explain addiction, However, for their explanatory failures, I argue they are right to recognize that the addict's capacity for autonomy is impaired in some relevant way. Additionally, I argue that the Liberal Account fails to characterize the distinctive salience and character of addictive desires and doesn't give us a guideline for doing so. Following this, I briefly defend the view that self-control is a notion central to addiction, and introduce the language of agentive modals to cash it out centrally in terms of practical availability. I then integrate Neil Levy's belief-oscillation theory of addiction to draw out a view that explains when and how we are entitled to saying that the addict is failing to execute self-control by showing which actions are practically available to the addict at a given time.

PRESENTER: RABYANA IQBAL, PSYCHOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
PROJECT TITLE: HOW LOCOMOTOR BEHAVIOR SHAPES INFANTS' EXPLORATION

Abstract: Infants explore the world around them through their locomotor behavior, and as infants age, they become able to locomote more independently when walking skill improves. Independent locomotion results in reduced times spent near their caregivers (Chen et al., 2022). A limitation of past work is that investigations were all conducted in laboratory settings, containing poor ecological validity (Hoch et al., 2019). Rogoff and colleagues (2018) emphasize the importance of studies that mirror the population of interest's natural environment, producing results that are more applicable to real life. Our cross-sectional study aims to improve ecological validity by investigating infants' locomotor behavior in their primary location: their home. Additionally, we will be investigating any potential exploratory differences between infants aged 12, 18, and 24 months. Our participants (*n* = 75 infant/mother dyads) were recruited nationally from the Play & Learning Across a Year Project's database, and they were recorded for an hour after the mother was advised to continue on with what she and her infant would typically do during that time of day. We will run a correlation analysis to explore the association between the infant's age and the percent of walking bouts that were spent locomoting away from their mothers. We hypothesize a positive correlation between infants' age and percent of bouts spent locomoting away. This study improves the ecological validity of past work and would suggest that with age, infants spend more time exploring independently

PRESENTER: BRIAN JEON, NEUROSCIENCE
FACULTY MENTOR: DR. KHALEEL ABDULRAZAK, PSYCHOLOGY
PROJECT TITLE: THE EFFECTS OF FMRP RE-EXPRESSION ON INNATE BEHAVIORS IN FRAGILE X SYNDROME MICE

Abstract: Fragile X Syndrome (FXS) is a prominent neurodevelopmental disorder which can cause autism-like symptoms such as anxiety, hyperactivity, and learning deficits. It is of significant interest as FXS mouse models show similar phenotypes to human FXS patients and it is caused by a genetic mutation preventing the production of Fragile X Messenger Ribonucleoprotein (FMRP) which plays a key role in controlling excitatory neuron activity in the frontal lobe. Due to its genetic origin it may be possible to treat FXS through gene therapy. Previous studies in similar neurodevelopmental disorders suggest that gene therapy treatments in rodents can rescue learning related issues, however, the results of gene therapy on affected innate behaviors has been inconclusive. To test this, we will reintroduce FMRP to FXS mice and compare their performance to control WT and FXS mice. We will run an Open Field Test to observe anxiety and hyperactivity levels and observe changes in nesting, a key innate behavior. Additionally, due to the brain becoming less susceptible to change as it develops, it is unknown whether this treatment will be effective for patients whose brains have matured. Thus, a specific timeframe (critical window) may exist where reintroduction of FMRP must take place to be effective. To test this, we will compare the effectiveness of the treatment in two age groups (p14 and p60). The results of this study can suggest if FMRP reintroduction can treat corresponding innate behaviors in human FXS patients and determine whether a critical window for this treatment exists.

PRESENTER: AUBREY JERUE; THEATER, FILM AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. FREYA SCHIWY, MEDIA AND CULTURAL STUDIES
PROJECT TITLE: REPRESENTING THE GREEN ECONOMY: CINEMATIC APPROACHES TO LITHIUM EXTRACTION

Abstract: Popular media portrays lithium extraction as part of the great solution to climate change and a step towards a green economy largely based on electric energy. *Before the Flood*, for example, presents climate change as an urgent existential crisis and celebrates electric vehicles, wind energy, and lithium-based batteries as a method to continue unfettered consumption. The ways we relate to cinema shapes our perspectives on the world around us. Utilizing various film techniques to instill urgency in the audience, *Before the Flood* fails to recognize the consequences of extractivism. In this paper I examine different approaches to understanding lithium extraction. *In the Name of Lithium*, for example, presents an alternative narrative to modern relationships with nature straying away from a continuation of modernity, which utilizes land as a means to accumulate capital. My analysis of this documentary builds on Kyle Whyte's critique of crisis-oriented thinking, Mary Ann Doane's *The Emergence of Cinematic Time*, and

Slow Cinema edited by Tiago de Luca. I use these texts to examine how orientations focusing on the goal of development and human-centrism only continue the destruction of the planet. Removing modern temporalities and human-exceptionalism in the representations of extractivism creates an opportunity to shift towards kinship with the environment rather than a relationship of finitude.

PRESENTER: CARISSA JOHNSON, PSYCHOLOGY
FACULTY MENTOR: DR. WEIWEI ZHANG, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: JESSICA GOLDING, PSYCHOLOGY
PROJECT TITLE: MEMORIES UNDER STRESS: THE ROLE OF REAPPRAISAL AND SUPPRESSION IN MENTAL HEALTH AND EMOTIONAL RECALL

Abstract: Prior research suggests that lifetime adversity predicts depression, anxiety, and cognitive difficulties such as weakened visual working memory. Emotion regulation strategies (cognitive reappraisal and expressive suppression) may influence both emotional and cognitive processes, particularly how emotional stimuli are processed and remembered. This study examined how lifetime adversity and emotional regulation strategies relate to mental health outcomes and visual working memory (VWM) for emotional information.

A sample of 120 undergraduates completed a VWM task recalling positive, neutral, and negative words from the Affective Norms for English Words (ANEW) database. Individual differences were assessed using the Stress and Adversity Inventory (STRAIN) and Emotion Regulation Questionnaire (ERQ). Exploratory analyses included the Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder scale (GAD-7).

A multiple linear regression with lifetime adversity, cognitive reappraisal and emotional suppression significantly predicted mental health. Such that, lifetime adversity ($p < 0.001$, $p < 0.001$) and suppression ($p < 0.001$, $p < 0.002$) predicted worse depression and anxiety, while reappraisal ($p = 0.045$, $p = 0.027$) predicted better. However, contrary to hypotheses, adversity and emotion regulation strategies did not significantly predict overall memory performance or valence-specific recall.

Overall, adversity did not impair short-term emotional memory, and performance remained largely stable across individuals. While these findings lacked significance in a direct relationship between adversity and valenced recall, its poor impacts on mental health draw concern for emotion and also cognition. Future work will use different emotional tasks to investigate different levels of memory, as well as executive function to validate or challenge the current null results.

PRESENTER: KYLIE JORDAN, POLITICAL SCIENCE
FACULTY MENTOR: DR. NICHOLAS NAPOLIO, POLITICAL SCIENCE
PROJECT TITLE: SUSCEPTIBILITY TO EXTREMISM AND CONSPIRACY BELIEF IN COLLEGE STUDENTS

Abstract: Following the 2016 Presidential Election, there has been an infamous rhetoric in the United States that posits Americans are adopting increasingly extremist political beliefs, resulting in rampant polarization and increased susceptibility to believing in conspiracy. The use of extreme language from politicians, along with using social media platforms as a primary way to consume news have been long since speculated as causes of these phenomena. The nature of receiving information in the age of social media is unprecedented, as people are vulnerable to misinformation and opinions that are often disguised as facts, often referred to as "fake news". Despite extensive and relatively recent research on these topics, research has yet to be dedicated to examining students in, arguably, their most valuable years of discovery and learning. The goal of this research is to collect data via surveys from college students to gain insight into whether or not this popular rhetoric is reflected in the beliefs of college-level students, and subsequently conclude what causes determine their political beliefs. After the survey research is conducted, I hope to find what causes college students to be susceptible to misinformation, and identify common trends among such students, such as their political beliefs, what sources dominate their news intake, and how being a student may impact their inclination to hold extremist views.

PRESENTER: AJAY JOSE, SOCIOLOGY
FACULTY MENTORS: DR. TABASSUM KHAN, MEDIA AND CULTURAL STUDIES
PROJECT TITLE: THE ROLE OF SOCIAL MEDIA MISINFORMATION AND DIGITAL HEALTH LITERACY IN VACCINE HESITANCY AMONG COLLEGE STUDENTS

Abstract: This literature review examines how social media misinformation contributes to vaccine hesitancy among college students and proposes digital health literacy as a potential solution. Vaccine hesitancy is a major global public health threat because it reduces vaccination coverage, weakens herd immunity, and increases the risk of outbreaks. College students are an especially vulnerable population because they rely heavily on digital platforms for health information and frequently encounter vaccine content passively while browsing social media. Social media has amplified vaccine hesitancy by accelerating the spread of vaccine misinformation through high-volume content, weak editorial oversight, platform algorithms that reward engagement, and amplification by influencers, bots, and peer networks. Exposure to misleading claims can increase perceived vaccine risk, reduce vaccination intentions, and weaken trust in public health institutions. At the same time, many students report limited confidence in evaluating the credibility of online health information, which increases susceptibility to misinformation and uncertainty. Digital health literacy helps reduce hesitancy by strengthening students' ability to verify sources, compare claims across credible references, recognize misleading narratives, and apply evidence-based health information to personal decisions. The findings in this literature review suggest that improving digital health literacy through targeted education and public health interventions can help reduce vaccine hesitancy among college students and support more effective public health outcomes. Generative AI tools were used during the early stages of this project solely to assist with brainstorming topic directions. All research, source selection, analysis, and writing of this abstract were completed independently by the author.

PRESENTER: ELIJAH KALAL, MUSIC
FACULTY MENTOR: DR. LIZ PRZYBYLSKI, MUSIC
PROJECT TITLE: A CROSS-CULTURAL COMPARISON OF VIDEO GAME MUSIC COMPOSERS IN THE UNITED STATES AND JAPAN

Abstract: With the advent of social media, artists face another dimension of exposure: Not only are their work and lives scrutinized to sensational degrees by the public, but millions can potentially view the most mundane aspects of their private and professional lives. Some artists have embraced this, using their social media accounts to give insight into their creative processes and personal lives, while others are comparatively more tight-lipped. In the world of video games, American music composers generally exhibit behaviors of the former, while Japanese composers are often characterized as the latter. To understand how this trend came about (and is evolving), I undertook a cross-cultural examination of

American and Japanese video game music (VGM) composers, primarily regarding their social media use and workplace cultures. Within the structure of an undergraduate Honors Capstone Project, I conducted this cross-cultural examination through case studies involving two American VGM composers and two groups of Japanese VGM composers. This presentation focuses especially on Austin Wintory, a Grammy-winning American VGM and film composer. In his openness online, he simultaneously exemplifies American VGM practices and provides a strong contrast to the other case studies, including Carlos Eiene, who has worked in both the US and Japan. By combining my findings in these case studies with existing sociological and ethnographic research into media ecosystems, I aim to demonstrate that differences in social media use, workplace cultures, and creative processes among VGM composers influence each other and are influenced by the media ecosystems in which they are embedded.

PRESENTER: ELLICE KANG, PSYCHOLOGY
ADDITIONAL PRESENTERS: ANTHONY RILLORTA, BIOLOGY AND AALIYAH RODRIGUEZ QUINONEZ, PSYCHOLOGY
FACULTY MENTOR: DR. DAVID ROSENBAUM, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: HUNTER B. STURGILL
PROJECT TITLE: LEFT OR RIGHT?: HOW PERCEPTUAL UNCERTAINTY DRIVES THE TRANSITION TO BIMANUAL EXPLORATION IN A FREE-RANGE HAPTIC SEARCH TASK.

Abstract: Humans frequently use both hands simultaneously, yet it remains unclear when the hands function as coupled versus relatively independent perceptual systems. Prior research suggests that interhand coordination can improve performance, particularly when perception and action are integrated across sensory modalities. The present study examines hand use choice in a free-range haptic search task. Pipes of various lengths were present in two separate containers and participants freely chose how to search them. Participants reported which of the two containers, left or right, had the target, a pipe whose length was significantly different from all the other pipes. In a given trial, distractors lengths were randomly selected based on a normal distribution and the target length was either one, two, or three standard deviations larger than the mean of the distractors. This established three levels of difficulty for our searches. We asked how hand choice and search performance varied as a function of the similarity of the target to the distractors. We hypothesize that the probability of using both hands would increase as the target becomes less salient (i.e., more similar to distractors), reflecting greater reliance on hand coordination and split attention between hands to locate the target. Data collection is ongoing. Results will provide evidence of participants' metacognitive awareness for bimanual hand use. Additionally, results will aid our understanding of how perceptual and motor processes interact during complex manual tasks and have implications for theories of attention, skill acquisition, rehabilitation, and design of assistive technologies.

PRESENTER: LAUREN KIZER, ENGLISH
FACULTY MENTOR: DR. JOHN BRIGGS, ENGLISH
PROJECT TITLE: FACING OUR DRAGONS: WONDER AS A TOOL IN CHILDREN'S LITERATURE

Abstract: For many cultures, the oral recitation and performance of children's stories combined with the images and illustrations common in children's literature is an individual's first interaction with storytelling and guided imaginative experiences. These stories may generally focus on academic, social, or ethical and moral instruction, especially through the use of anthropomorphic characters and magical or mythical elements. There is, however, a significant subgenre of children's literature which focuses

intently on exercises in imagination and wonder. Imagination and wonder are tools of communication, but even more they are a critical part of growing up. Literature as the inciting factor in wonder allows children to explore complex problems and their own concerns in a safe space.

This project is an exploration of communicative tools in children's literature with a special emphasis on how wonder is created and used in the telling of these stories. My project combines research with the creation of children's literature to develop a fuller understanding of how and why imagination is so ingrained in books for children. To do so, I am writing and illustrating three children's books with distinctive fantasy elements and characters and using my experience in authorship to ground my research in what elements are critical to "good" children's books. The research examines works of authors past and present to discover what is necessary for children's books to contain if they are to be hallmarks of children's literature which appeal to all people regardless of age

PRESENTER: RISHITHA KONA, PSYCHOLOGY
FACULTY MENTOR: DR. WEIWEI ZHANG, PSYCHOLOGY
PROJECT TITLE: THE RELATIONSHIP BETWEEN DANCE EXPERIENCE, ANXIETY, AND VISUAL WORKING MEMORY

Abstract: Dance offers benefits beyond physical movement, requiring the integration of visual input, auditory cues, mind–body coordination, and long-term memory recall. However, its influence on cognitive processes, particularly visual working memory (VWM), remains underexplored. VWM is essential for processing and retaining visual information, playing a key role in learning and decision-making. Additionally, dance also supports emotional states by providing an outlet for stress, a major disruptor of VWM. Thus, this study examines VWM performance through dancers and nondancers. Additionally, exploratory analyses considered whether anxiety's negative effects on VWM were dampened in dancers. Participants completed a dance history questionnaire, the Generalized Anxiety Disorder-7 item scale (GAD-7), and a dot-matrix task for VWM. Preliminary analyses showed no significant difference in memory performance between dancers and nondancers; however, there are hints of a potential correlation. When examining years of dance, a moderate significance was found. Participants with 4 years or more of experience had better VWM compared to those with less experience. Exploratory results showed that being a dancer significantly moderated anxiety's impact on recall error; higher levels of anxiety did not predict higher recall error in the dancer group as they did in the nondancer group. Data collection is ongoing, and a larger sample size is being pursued to more accurately determine whether observed patterns reflect a meaningful relationship or confirm null effects. By examining both cognitive outcomes and stress-related measures, this study aims to clarify how embodied movement and emotional state may jointly contribute to individual differences in memory ability.

PRESENTER: DRITI KUMAR, HISTORY
FACULTY MENTOR: DR. MICHELE SALZMAN, HISTORY
PROJECT TITLE: VISIBILITY AND SUSPICION: LIVIA, AGRIPPINA, AND DYNASTIC LEGITIMACY IN THE JULIO-CLAUDIAN PRINCIPATE

Abstract: This paper examines the political role of imperial women in the Julio-Claudian dynasty through a comparative study of Livia and Agrippina the Younger. Although ancient historians such as Tacitus and Suetonius portray Livia as a stabilizing presence under Augustus and Agrippina as a dangerously ambitious figure under Nero, my thesis argues that both women occupied structurally similar

positions within the imperial system. Their authority operated through soft power, lineage influence, and controlled visibility.

Drawing on an abundance of literary sources, this study demonstrates that titles such as *Augusta*, participation in priesthoods, and public benefactions were not informal signs of private influence but institutional components of imperial legitimacy, which both women embodied. In a regime lacking formalized succession, maternal lineage and curated presence were essential mechanisms for stabilizing lineages and the structure of Rome itself. The divergence in their reputations reflects not inherent differences in female ambition, but shifting political conditions and elite anxiety about succession. More broadly, this comparison reveals how women in positions of power are often narratively recast according to the stability of the political order they inhabit. When succession is secure, female prominence appears as continuity; when authority is contested, the same prominence is reframed as overreach. The case of Livia and Agrippina thus exposes how historiography can transform structurally necessary female authority into moralized suspicion, offering insight into the recurring tension between gender, legitimacy, and political power and how it is reflected in historical sources as a whole.

PRESENTER: SAWYER KUMAR, ECONOMICS AND POLITICAL SCIENCE/INTERNATIONAL AFFAIRS
FACULTY MENTOR: DR. PAUL D'ANIERI, POLITICAL SCIENCE
PROJECT TITLE: DOES NEUTRALITY PREVENT WAR? EVALUATING THE EVIDENCE AND APPLYING IT TO THE RUSSO-UKRAINIAN WAR

Abstract: Neutrality provisions have been a component of European international relations at least since the 19th century. A variety of proposals for securing peace in Ukraine after the current conflict have stipulated some form of neutrality as an important component. The argument is straightforward: if Ukraine is caught in a tug-of-war between the West and Russia, neutrality is a reasonable compromise that can help mitigate the security dilemma. This raises the question, how successful is neutrality in preventing war? Under what circumstances is it more or less likely to succeed? Surprisingly, there is almost no systematic research on the question. Working from a set of cases of neutrality since 1815, and tackling considerable selection effects, this paper evaluates the circumstances in which neutrality prevents war. Neutrality has a poor record of preventing war or invasion, but establishing causal relationships is difficult due to selection effects and the inability to rule out competing explanations. Neutrality may be necessary to getting Russia to agree to end the war, but it is unlikely to play a significant role in preserving peace afterwards.

PRESENTER: KATELYN LAU, NEUROSCIENCE
ADDITIONAL PRESENTER: AVIK SHRESTHA, BIOLOGY
FACULTY MENTOR: DR. DEEPA RAMAMURTHY, PSYCHOLOGY
PROJECT TITLE: OPTIMIZING DELAY-PERIOD TRAINING FOR A SENSORY DETECTION TASK IN MICE

Abstract: The delay-period task addresses a fundamental challenge in behavioral neuroscience: the temporal overlap of sensory, motor, and reinforcement signals during task performance. In sensory detection tasks, mice report detection of a stimulus by licking a spout to receive a water reward. By introducing a delay between stimulus presentation and the response window, this design separates sensory processing from the licking response and reward delivery, allowing cleaner interpretation of task-related neuronal activity.

In this task, the delay structure creates a defined lick-free sensory window following stimulus onset. This makes it possible to distinguish stimulus-evoked activity from movement- and reward-related signals. Pyramidal neurons in the primary somatosensory cortex show selective attention effects on sensory responses during this window, while vasoactive intestinal peptide (VIP) interneurons are more strongly associated with non-selective movement and arousal events.

The delay protocol structure allows for accurate identification of spatially focused attention-based modulation in neural activity, such as selective amplification of sensory responses and receptive-field shifts towards behaviorally relevant stimuli, which occur independently of generalized behavioral state changes like arousal and motion.

In this project, we analyze how progressive response window shifts and ramped reward schedules shape the acquisition of a stable lick-free period during training on the delay-period task, quantifying changes in lick timing, premature responses, and behavioral performance stability across sessions. Establishing quantitative guidelines for parameters used in shaping delay-period behavior will make our behavioral delay-period training protocol more widely adoptable in studies aiming to relate neuronal activity to sensory and cognitive processes.

PRESENTER: JESSICA LEUNG, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: WHEN AND WHY DID VIDEO GAMES BECOME MAINSTREAM? CINEMATIC GAMES AND GAME-LIKE FILMS

Abstract: From text-based descriptions to motion-captured performances by live actors, the narrative capabilities of American video games have grown immensely since their inception. Yet for much of their history, video games were dismissed, debated, or outright attacked by mainstream American culture even as their storytelling grew increasingly complex. At some point, however, a cultural shift occurred, and video games today exert major influence on entertainment, from casual mobile gaming to film and television adaptations. This paper aims to find when and why video games were embraced by popular culture, examining contemporary American newspaper reviews and film and television adaptations to track how non-gaming audiences perceived the medium from the 1980s to the present. This paper argues that video games' path toward cultural legitimacy as a storytelling medium was driven by their growing resemblance to film through shared genre conventions, advances in graphics, and increasingly mature storytelling.

PRESENTER: MARS LIN, PSYCHOLOGY
FACULTY MENTOR: DR. BRENT HUGHES, PSYCHOLOGY
PROJECT TITLE: HOW REJECTION SENSITIVITY ADJUSTS SOCIAL IDENTITY PRESENTATION

Abstract: Rejection sensitive individuals tend to anxiously expect, readily perceive, and strongly react to social rejection. This heightened sensitivity may shape not only how they experience social interactions but how they prepare for them—specifically, how they choose to present their identity to others. This study examines whether rejection sensitivity predicts the degree to which individuals strategically adjust how they present a shared social identity when anticipating a social interaction. Participants listed social groups they identified with and rated each on importance, identification, and belonging. They were then told they would have a conversation with another participant who shares one of their listed social

identities and were asked to provide the same ratings again, this time reflecting what they wanted to convey to their conversation partner. Rejection sensitivity was measured using the Rejection Sensitivity Questionnaire (Downey & Feldman, 1996). The primary analysis tests whether rejection sensitivity is associated with greater discrepancy between private and presented ratings of shared identity importance, identification, and belonging. We further test whether recent negative experiences associated with the shared identity—such as threatening, stressful, or stigmatizing encounters—moderate this association, amplifying the adjustment among those with more negative experiences. We expect that individuals higher in rejection sensitivity will show larger discrepancies between their private and presented identity ratings, and that recent negative experiences with the shared identity will strengthen this effect. These findings would suggest that rejection sensitivity shapes social identity presentation in anticipation of interaction, and that lived experiences of identity-based threat compound this tendency.

PRESENTER: LUKE LISI, ECONOMICS
ADDITIONAL PRESENTER: MICHAEL RASMUSSEN, ECONOMICS
FACULTY MENTOR: DR. AJIN LEE, ECONOMICS
PROJECT TITLE: AFFORDING TO CARE: THE EFFECTS OF MEDICAID EXPANSION FOLLOWING THE AFFORDABLE CARE ACT

Abstract: The Affordable Care Act's (ACA) expansion of Medicaid has been a pivotal but controversial initiative, the goal of which was increasing healthcare coverage for low-income adults across all 50 states. This paper examines previous research on the impact of Medicaid expansion across states that adopted it. We concentrated on changes to healthcare utilization, overall access, and specific effects on race, sex, and disability status as a means of evaluating the effects of the program. We have synthesized findings from various scientific journals, government reports, and academic sites examining the effects of Medicaid expansion to provide a comprehensive overview of all recent findings. The evidence we have gathered indicates a positive relationship between the state's implementation of expanded Medicaid and improved healthcare utilization, access, outcomes for racial and ethnic minorities, outcomes for women, and outcomes for disabled individuals. Initiatives to defund Medicaid would thus revoke many of the benefits accumulated over the last 15 years and potentially lead to increases to poverty, injury, morbidity, and mortality rates.

PRESENTER: HUGO LOPEZ PLASCENCIA, HISTORY
FACULTY MENTOR: DR. JOHN MARQUEZ, HISTORY
PROJECT TITLE: CONSUMING COLONIALISM: TOURISM IN PANAMA DURING THE EARLY 20TH CENTURY

Abstract: This research project examines the relationship between U.S. empire in Panama, emphasizing the links between the construction of the canal zone and Panama's tourist industry in the early twentieth century. In 1903, the Hay–Bunau-Varilla Treaty was signed. It granted the United States the right to build the Panama Canal, which would be completed in 1914. The Canal was known by many Americans as the greatest technological feat of the modern world, bringing national and international interest in visiting and learning about the site. In this research, I explore the creation of the early tourism industry in Panama by analyzing discourses of American imperialism, the construction of infrastructure, and its links to agribusiness. Using travel literature and agribusiness documents from the United Fruit Company, to perform a cultural analysis that showcases how both Panama and U.S. colonialism was represented and marketed. Scholars have often told the histories of American imperialism and capitalist development through tourism separately. Additionally, scholarship on the canal has not told the story of the parallel

development of the tourist industry. In my project, I contribute to the field by showing how the Panama Canal not only functioned to facilitate the consumption of goods, but that it too became a site of consumption through tourism. Ultimately, this project aims to show the influence of American colonialism on the development of Central America and to understand American visions of Panama through the analysis of imperial tourist discourse.

PRESENTER: COLIN LOVELAND; THEATRE, FILM AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. DAPHNIE SICRE; THEATRE, FILM AND DIGITAL PRODUCTION
PROJECT TITLE: THE DRAMATURGY OF UCR'S *FUENTEOVEJUNA*

Dramaturgy is an essential research-driven craft in theatrical production. The dramaturg serves as an intellectual resource who integrates historical, cultural, and textual knowledge to support directors, designers, and actors. Using tools like dramaturgical packets and presentations, dramaturgs provide the contextual foundation that informs artistic innovation in rehearsal. This role becomes especially complex when staging classical works rooted in real historical events, where sparse documentation, layered sociopolitical contexts, and competing narratives require rigorous research and thoughtful interpretation.

This presentation traces my work as the production dramaturg for UCR's production of *Fuenteovejuna* by Lope de Vega. Based on a little-documented uprising in Reconquista-era Spain, the play dramatizes the collective rebellion of Fuente Ovejuna's villagers against a tyrannical military commander. Lope de Vega reframes this event through a narrative centered on the mayor's daughter and her women-led resistance against systemic violence and sexual abuse.

The presentation illuminates my process of researching and contextualizing Lope de Vega's biography and artistic motivations alongside the real political figures, power structures, and historical events informing the play. It examines the development of the dramaturgical packet from initial research through revision to its final form, emphasizing decisions about inclusion and omission for rehearsal use. The presentation also incorporates an expanded research archive that impacted the packet but exceeded its practical scope, and an overview of additional dramaturgical responsibilities undertaken during production. By highlighting dramaturgy as both scholarship and creative labor, this presentation elucidates how historical research actively serves as the basis of contemporary classical performance.

PRESENTER: JACOB MACAULAY, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: BILLY THE KID: AMERICAN CAPTIVATION

Abstract: To this day, Billy the Kid's image has been reconstructed across the twentieth and twenty-first centuries to negotiate shifting American anxieties about masculinity, violence, and Frontier justice. Although this fascination exists, it has hidden just as much as it has revealed about the notorious outlaw. This research project examines a UCR special collection to show different representations of Billy the Kid. This special collection holds rare comics from the mid-twentieth-century Charlton Comics group, manuscripts, and photographs. These findings in this special collection are the foundation of what Billy the Kid is today, a legend of his time. These photographs, manuscripts, and comics have heavily influenced the way we look at the Old West and reveal the competing histories of masculinity and violence. This project will argue how the malleability of Billy the Kid's story reveals a wide range of concerns about American identity, violence, and heroism. Additionally, I will draw on secondary scholarly

pop culture sources, including Ronald Tavel's advanced theatrical reimagining, Miguel Antonio Otero II's biographical account, and Alfred Adler's case study. Although Adler is commonly known as a psychologist, this will draw upon works of masculinity. This research will show how Billy the Kid's image has been repeatedly revisited to serve the needs of different cultures in the twentieth to twenty-first centuries. By analyzing how each time period has reshaped his legacy, the project will demonstrate how popular culture uses these historical figures to address masculinity, justice, and the Old American West.

PRESENTER: LANCE MACK; THEATRE, FILM AND DIGITAL PRODUCTION
FACULTY MENTOR: DR. MEGAN TABAQUE; THEATRE, FILM AND DIGITAL PRODUCTION
PROJECT TITLE: *GUARDIANS OF THE RAINBOW* PILOT AND PITCH BIBLE

Abstract: For my Creative Project I decided to write a pilot script for animated children's television show. At the suggestion of my faculty mentor, I also decided to create a pitch bible (a comprehensive, visual document used in the entertainment industry to sell a TV show concept to producers and executives). I first wrote the pilot script based on the preexisting ideas I had for this television show. In the writing process I did research about the main characters' ethnic background to make sure she felt grounded. After finishing the script, I got feedback from my faculty mentor and began rewriting. Then I researched how to create a pitch bible. I read over 15 pitch bibles and then decided to model mine after a recent hit show titled, *The Owl House.* After completing the first draft, minus some art, I showed it to my mentor, got feedback and began the rewrite process. I am currently searching for an artist to collaborate with on the pitch bible. The final piece will be a show about an anxious teen girl who sets out on a journey to discover who she is only to come across a magical orb granting her superpowers. From there she will become Red Cat and have to stop the DarkSide of the Rainbow from stealing color from the world and depriving humanity of their emotions.

PRESENTER: ANALEAH MAFNAS, PSYCHOLOGY
FACULTY MENTOR: DR. AMANDA LUCIA, RELIGIOUS STUDIES
PROJECT TITLE: DYSFUNCTIONAL DYNAMICS IN HIGH-CONTROL IDEOLOGICAL GROUPS: NXIVM, SARAH LAWRENCE COLLEGE, THE PEOPLES TEMPLE, AND THE FUNDAMENTALIST CHURCH OF LATTER-DAY SAINTS (FLDS)

Abstract: High-control ideological groups enforce isolated communities based on shared beliefs and often use coercion and intense emotional manipulation to gain the following of members (Coates, 2012). Whether fueled by religious commitment or other motivations, these groups create power dynamics and abusive interactions that form dysfunctional emotional ties between leaders and followers. When manipulation and coercion infiltrate relationships, emotional ties play a role in establishing unhealthy bonds. This research seeks to understand the psychological mechanisms that underlie "trauma bonding" in individuals exposed to prolonged stress or abuse in these settings. This study provides an interdisciplinary approach to identifying psychological factors that make individuals vulnerable to harmful, manipulative groups. The author analyzes memoirs, articles, survivor accounts, and documentaries to observe how these emotional ties motivate members to join and remain affiliated despite abuse. This study focuses on NXIVM, Sarah Lawrence College, The Peoples Temple, and the Fundamentalist Church of Latter-Day Saints (FLDS) to gain knowledge about concerns ranging from sexual abuse to indoctrination. It summarizes evidence of physical, spiritual, psychological, and societal impacts and analyzes psychological tactics that influence power differentials. Understanding these abusive cycles and fear

dependency can help mental health practitioners and policymakers develop intervention and prevention strategies for people affected by high-control groups.

PRESENTER: AMRITPAL MAHMI, BIOLOGY
ADDITIONAL PRESENTERS: AYE AYE HTET, SOCIOLOGY; ABBY SORIANO, NEUROSCIENCE; DARRELL LIU, NEUROSCIENCE; ERIC MA, NEUROSCIENCE; JOHNNY KONG, BIOLOGY; JODI TRUONG, PSYCHOLOGY; NICOLE CORREA, PSYCHOLOGY; AND HARSH PATEL, BIOLOGY
FACULTY MENTOR: DR. DAVID ROSENBAUM, PSYCHOLOGY
PROJECT TITLE: TASK ORDERING AND PREVIEW: A "PEEK" INTO THE ORDER AND TIMING OF TASKS

Abstract: In everyday life, we often face multiple tasks, requiring decisions about when to complete them. How do we do so? Prior research has addressed this question by allowing people to choose the order of one-step tasks. We extend prior work by allowing participants to choose the order of multi-step tasks, either en masse or piecewise. We developed a paradigm in which participants completed two task types, each with multiple instantiations: a (difficult) parity judgment task, where participants determined whether both an odd and an even digit were present in a two-digit number; and a (less difficult) visual search task, where participants looked for the number 5 in a sequence of numbers. Both tasks were presented concurrently on the left and right sides of a computer display. This approach allows us to analyze both the order and the timing of the tasks. We found that initial task choice was influenced by both spatial location and task type. Within the chosen order, response times followed a consistent pattern: the first response was much longer, and the subsequent responses were shorter. The response-time dynamics aligned with a model introduced here, the Prioritized Evaluation of Evidence for Knowledge (PEEK). According to the model, when people perform a task, they "PEEK" ahead to stimuli they will encounter while completing the task. Whether task order choices take into account the ease of "PEEKING" is still an open question.

PRESENTER: SAVIT MALHOTRA, NEUROSCIENCE
ADDITIONAL PRESENTERS: VARUN KUMARAVELU; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY; DOMINIC NGUYEN, NEUROSCIENCE; VIVIAN DONG, BIOLOGY; MATTHEW KIM, BIOLOGY; JENNIFER IGWE, BIOLOGY; JEFFREY DONG, BIOLOGY; AND DAVID LE, BIOLOGY
FACULTY MENTOR: DR. WEIWEI ZHANG, PSYCHOLOGY
PROJECT TITLE: PRELIMINARY EVALUATION OF A VIRTUAL REALITY-BASED COGNITIVE TRAINING PROGRAM IN OLDER ADULTS

Abstract: Age-related cognitive decline threatens the independence and quality of life of older adults, with there being limited scalable, non-pharmacologic interventions available to support cognitive health. Immersive virtual reality (VR) has the potential to bridge this gap, offering a promising platform for multisensory cognitive training that can enhance neuroplasticity in older adults through enriched environmental stimulation, adaptive task difficulty, and real-time performance feedback. However, the lack of a standardized training protocol remains a barrier for translational impact, particularly in assisted-living based settings where implementation feasibility is critical. This project outlines the design and implementation of a structured VR-based cognitive training protocol aimed at improving attention, executive functioning, and visuospatial processing in older adults. Our training protocol utilizes a gamified training software, Mastermind Cognitive Training, that we expect will boost participant engagement and tolerability while providing an alternative means of assessing improvements across discreet cognitive domains. This software also provides comprehensive score reports that separate

different cognitive domains into different measures that can be compared with additional standardized cognitive assessments administered both pre- and post-intervention to evaluate domain-specific change. VR-therapy also provides for safe and accessible treatment for all demographics, particularly those with mobility issues. Supervised VR sessions using commercially available headsets can allow for rapid dissemination of the protocol, minimizing the need for costly medical-grade equipment and supporting broader scalability across assisted-living facilities and community centers. In addition to cognitive outcomes, feasibility metrics, such as usability, adherence, and tolerance, will inform the practicality of implementing VR-based cognitive interventions in aging populations.

PRESENTER: IRAJ MALLINA, BIOENGINEERING
FACULTY MENTOR: DR. KHALEEL RAZAK, PSYCHOLOGY
PROJECT TITLE: IMPACT OF CANNABINOID 1 RECEPTOR DELETION ON AUDITORY HYPERSENSITIVITY IN A MOUSE MODEL OF FRAGILE X SYNDROME

Abstract: Fragile X Syndrome (FXS) is the leading single-gene cause of intellectual disability, with symptoms similar to those of autism spectrum disorder. Within the auditory domain, individuals with FXS may experience hypersensitivity to sounds and atypical temporal processing. FXS occurs from the hypermethylation of the fragile X messenger ribonucleoprotein 1 (*Fmr1*) gene by the repeat expansion of the unstable CGG triplet on the X chromosome. The *Fmr1* knock-out (KO) mouse is a model of FXS with various phenotypes that mirror those seen in humans impacted by FXS. Electroencephalogram studies have shown repeated abnormalities with neural oscillations in both FXS individuals and mouse models of the disorder. *In vivo* recordings of the auditory cortex (AC) suggest that hypersensitivity occurs due to an increase in responses per neuron and reduced habituation of neuronal response.

Previous studies have shown that Cannabinoid 1 receptors (CB1Rs) can regulate cortical hyperexcitability through negative feedback inhibition of synaptic transmission. Our current study utilizes adult male mice in which CB1Rs are selectively deleted in the inhibitory neurons of both wild-type and *Fmr1* KOs. Data is being gathered through a depth multielectrode, which records in vivo spikes and local field potentials in the AC. Based on previous studies, we hypothesize that the heterozygous deletion of CB1Rs in inhibitory neurons will lead to improved electrophysiological phenotypes within *Fmr1* KO mice by normalizing the inhibitory circuit. Successful data collection will serve as a stepping stone for future research and potential therapeutic relevance to FXS.

PRESENTER: JUANA MAY MANAL, POLITICAL SCIENCE
FACULTY MENTOR: DR. YASEMIN IREPOGLU CARRERAS, POLITICAL SCIENCE
PROJECT TITLE: UNDERSTANDING WORKFORCE POLICY THROUGH LEGISLATIVE RESEARCH AND ENGAGEMENT

Abstract: During Fall 2025, I participated in the University of California Washington Center (UCDC) program, spending the quarter living and interning in Washington, D.C. I worked as a workforce development researcher, analyzing labor market trends, workforce shortages, and related policies. My responsibilities included reviewing policy reports, analyzing workforce data, and creating briefs on members of the United States Congress, focusing on their legislative priorities and positions on workforce development. I also attended congressional meetings and met with legislators and their staff, gaining firsthand insight into how research informs policy decisions and workforce initiatives.
Through the concurrent UCDC academic course, I examined how federal institutions, labor policy, and

political actors shape workforce development and economic opportunity. This combined experiential and academic approach strengthened my research, policy analysis, and professional communication skills, while deepening my understanding of how workforce policy is developed, debated, and implemented at the federal level.

PRESENTER: JUDE MANANSALA, HISTORY
FACULTY MENTOR: DR. MICHELE SALZMAN, HISTORY
PROJECT TITLE: UNITED IN DIVERSITY: ITALIC PERSPECTIVES IN THE SOCIAL WAR

Abstract: The Social War (91-87 BCE) was a pivotal conflict that profoundly transformed the late Roman Republic. Modern scholars, including Henrik Mouritsen and Christopher Dart, tend to focus on the half-century prior to the conflict and argue that one defining factor, such as a desire for citizenship or independence, drove all Italic allies (socii) to war. Such interpretations risk oversimplifying Italic perspectives and fail to account for the varied responses of Italic communities. For instance, the Samnites resisted longer than the Marsi, a revolt in northern Italy was quickly quelled by the offer of citizenship, and the Latins largely remained loyal to the Romans. These behaviors cannot all be explained by a singular overarching desire. This paper argues that Italic demands were not uniform or sudden, instead reflecting centuries-old patterns of interaction with Roman power and unequal integration into Rome's social and political institutions. I utilize three case studies of Italic cultural groups: the Sabellians, including the Marsi, Paeligni, and Picentes, the Oscans, such as the Samnites and Lucanians, and the Latins, to demonstrate that the dissimilar treatment of the socii by Rome influenced each group's political calculus throughout the Social War. Rome's unequal distribution of legal and civic statuses helps to explain the staggered participation of different communities on both sides of the Social War. By bringing to the forefront the diversity of Italic experiences, this study challenges monolithic explanations of the war and reframes the war as a product of unequal incorporation rather than a unified rebellion.

PRESENTER: JAHNAVI MANDA, PSYCHOLOGY
FACULTY MENTOR: DR. RACHEL WU, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: LEAH FERGUSON, ARASH MEHRKESH, AND ESRA KÜRÜM
PROJECT TITLE: RESULTS FROM A NOVEL SKILL-LEARNING INTERVENTION: LEARNING VARIETY MAY INCREASE COGNITIVE PERFORMANCE FOR OLDER ADULTS

Abstract: Many aging studies have shown that cognitive abilities in healthy older adults may be less susceptible to decline with an increase in variety and novelty in their daily activities. Much of this data, however, is observational and has yet to be explored through an experimental intervention design. This study presents two-year follow-up results from a skill-learning intervention that examines the independent and combined effects of learning frequency and skill variety in a 2x2 design. Seventy-one community-dwelling older adults (80.3% female, M_{age} = 70.49 years) were assigned to one of four 8-week conditions that varied in frequency of participation and the variety of new skills to be learned. Intervention skills included drawing, music composition, Spanish, singing, or acting. Participants completed in-person cognitive assessments measuring cognitive control and working memory before and after the intervention period. Due to COVID-19 restrictions in 2020 and 2021, in-person cognitive assessments were only completed for baseline, pretest, and at the 2-year follow-up timepoint in Spring of 2022. Latent change score analyses indicated that participants exposed to greater variety in skill-learning demonstrated larger gains in working memory relative to those in low-variety conditions, though frequency did not. No significant changes were revealed for cognitive control. These findings provide experimental support for

the idea that engaging in diverse learning experiences, if only for a few hours, may promote some aspects of cognitive function in later adulthood.

PRESENTER: ITZEL MAR, HISTORY
FACULTY MENTOR: DR. JORGE LEAL, HISTORY
PROJECT TITLE: *CULTURA SONIDERA*: THE SOUNDS AND DANCES OF MEXICO CITY IN ORANGE COUNTY, CALIFORNIA

Abstract: From the 1990s to the 2000s, the *Sonidero* Club scene in Orange County, California, flourished among the region's growing Mexican immigrant populations. This research creates and interrogates a *Sonidero* Archive, rooted in personal and family collections, in conversation with peer-reviewed research on the *Sonidero* scene in Mexico City.

By examining photographs, newspaper clippings, fliers, clothes, drawings, and oral histories, this *Sonidero* project shows how the club and music scene fostered transnational cultural ties, created communities among the southern California immigrant community, and anchored their Mexican identity in the United States. The *Sonidero* culture, though not well-studied and at times dismissed as a "club culture," or "*barrio* culture," has nonetheless become an essential part of Mexican identity for many immigrants, especially for those who came from La Ciudad de Mexico. By assembling, curating, and analyzing *Sonidero* materials, books, and articles, my project argues that *Musica Sonidero* and the culture formed part of a transnational Mexican immigrant identity that bridged Mexico City and Southern California.

PRESENTER: MAYRA MARTINEZ, POLITICAL SCIENCE
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: SCROFANO LAW PC

Abstract: I participated in the Fall 2025 UCDC Program as a Legal Intern at Scrofano Law, PC. Scrofano Law, PC is a small criminal defense firm located in Maryland, Virginia, and Washington DC. As a legal intern, I was assigned daily tasks by Miles Heffernan, who is the main legal assistant of Joseph Scrofano, the founder of Scrofano Law, PC. By participating in this internship, I was given the opportunity to work with the criminal division of the Superior Court of the District of Columbia. Some of the responsibilities I was assigned was gathering documents of our clients from the criminal division section of the courthouse. This includes printing documents, getting signatures that are critical for the cases of our clients, and gathering information that cannot be disclosed on public websites of our clients. I was also tasked with attending the DMV Adjudication Services to receive information of DUI cases for several clients. Being able to work at Scrofano Law, PC presented me with the opportunity to attend two court hearings, one of which was a Jury Trial on a Carrying a Pistol Without a License case. I assisted both Grace Bruer, the second legal assistant of the DC location, and Jason Kalafat, the other attorney of DC. I was responsible for watching and taking notes of the jurors to present them to the attorney. Joining this criminal defense firm taught me how District of Columbia criminal laws function and how they differ from California criminal law.

PRESENTER: SAMANTHA MASUCCI, PSYCHOLOGY
FACULTY MENTOR: DR. MEGAN ROBBINS, PSYCHOLOGY
PROJECT TITLE: WHEN AND WHY DO WE ENGAGE IN OUT-LOUD SELF-TALK? SELF-REPORTED ANALYSIS OF TYPES OF SELF-TALK

Abstract: This study documents how individuals engage in out-loud self-talk (OLST) to understand the components that determine when, how, and to what extent people will verbally express their self-talk (ST). Previous research has shown that ST can improve athletic performance, enhance self-efficacy, and reduce unpleasant feelings. However, fewer studies focus on "naturally" occurring ST. This study bridges that gap and lays a foundation for recorded instances of OLST and its utilization. Providing an understanding of OLST and the relationship between behavior, emotional regulation, and cognitive functioning can aid in creating affordable and accessible regulation and coping strategies. A literature review guides current findings on OLST, acting as a framework for codes and themes that emerge from the data. Survey responses were gathered from a larger ST study conducted at the University of California, Riverside (UCR) in the Psychology Department's Observe Lab. Using data from open-response questions inquiring about instances of self-talk, a review determines how many participants reported engaging with various ST strategies. Responses from 365 participants were collected and analyzed following Thematic Analysis (Braun & Clarke, 2006). Findings of this study indicate that OLST is expressed predominantly when feelings of anxiety or frustration emerge. Additionally, numerous participants reported utilizing emotion regulation strategies and improving cognitive processing through OLST practices. Valences indicate that the bulk of responses occur when the participant is experiencing or reflecting on a negative situation. However, OLST valences are more evenly distributed among positive, negative, and neutral, indicating different methods are used to combat negative experiences or emotions.

PRESENTER: EMILY MATA, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: PANELS, PRESSES, AND PARALLEL PATHS: WOMEN IN SOUTHERN CALIFORNIA COMICS

Abstract: Focusing on figures such as Trina Robbins, whose involvement in the underground comix movement challenged male dominance in countercultural comics, Phil Yeh's documentation of early Southern California comics communities, and Jackie Ormes, one of the first Black women to create nationally syndicated strips, this project traces how women produced and circulated comics while sustaining creative communities on their own terms. When conventional pathways were inaccessible, women built parallel spaces that made their work visible, shared, and supported.

Drawing on documentaries, autobiographical writings, and scholarly sources including She Changed Comics and H. Zahra Caldwell's work on gender and representation, this study identifies recurring experiences of exclusion alongside strategies of adaptation and creative defiance. Women's narratives reveal how collaborative practices, community-based publishing, and grassroots fan networks expanded artistic and narrative possibilities while laying the foundation for today's independent comics culture. By centering Southern California as a distinct site for these developments, this project recovers a history of creative labor often overlooked in comics scholarship, showing how marginalized creators reshape cultural industries not only by gaining access to institutions but by building new structures to support their work and communities.

PRESENTER: EMILY MCCARTNEY, ART HISTORY
FACULTY MENTOR: DR. YONG CHO, ART HISTORY
PROJECT TITLE: THE NARRATIVE OF "BEATLEMANIA"

Abstract: The narrative around the cultural perception of the Beatles shifts over time depending on public opinion based on star behavior, press releases, and new media about the Beatles. I will explain their initial rise in popularity in America beginning with the "Ed Sullivan show" debut up until the band's disbandment. I take into account how they portray themselves to the public through iconic photographs, their dramatized film personas, and the dominant narrative of various documentaries. The early fans of the Beatles not so famously began with the screaming voices of teenage girls welcoming them onto the stage. I argue that they recognized their star power and chose specifically to appeal to young women. Their early stylings, joyful and lighthearted romance songs, unique and relatively low plot based storytelling in films such as "Help!" and "A Hard Days Night" focus the viewer on the characterization and close relationships of each of the Beatles. The young woman subculture of fans eventually is absorbed into the pop culture mainstream, which leads to the origins of Beatles fame being pushed aside in favor of the more dominant fan culture.

PRESENTER: KALOM MCKEAND, HISTORY
FACULTY MENTOR: DR. MICHELE SALZMAN, HISTORY
PROJECT TITLE: TACITUS AND PLINY VERSUS VELLEIUS PATERCULUS: TIBERIUS A VILLAIN BY SIMILARITY

Abstract: The writings of the Roman senators Tacitus and Pliny the Younger from the late first and early second century CE are important sources for understanding the relationship between the senatorial class and emperors. Both men lived and thrived under the emperor Domitian whose reign was problematic for elites who served him. Their experiences under Domitian colored the way both men viewed Roman history. They view Trajan as the ideal emperor due to his virtues: generosity, just, and dutiful. Most importantly, he was respectful toward the Senate. Tiberius is understood through the lens of Domitian with whom he shares many qualities; he is reclusive, paranoid, and suspicious. However, in contrast to Tacitus's vision of Tiberius, we have the positive view of Velleius Paterculus, a contemporary source who offers a startlingly positive view of Tiberius as an effective emperor and good man. Thus, based on these different views of earlier emperors, I will argue that Tacitus' and Pliny's lived experiences influenced their interpretation of the past and the qualities any emperor - living or dead - should have.

PRESENTER: ANNA MEDVEDEVA, PSYCHOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: HAILEY ROUSEY AND YUSHAN GUO
PROJECT TITLE: THE RELATION BETWEEN WALKING AS A MOTOR MILESTONE AND INFANT VOCABULARY SIZE

Abstract: Walking is a developmental milestone that has been found to be associated with various areas of cognitive development, such as language development (West & Iverson, 2022). Previous research has observed that as infants transition from crawling to walking, caregiver speech input changes, with walking infants receiving more action directives and locomotor verbs than crawling infants (West et al., 2023; West & Iverson, 2021). Although caregiver speech is known to support language development (Rowe, 2012), it is unclear whether the transition to walking contributes to language development through

these changes in speech input. This current research aims to fill the gap by using the MacArthur-Bates Communicative Development Inventory-Short Form to assess vocabulary size in 13-month-old infants following the onset of walking. Within our pilot study, 13-month-old infants will be categorized based on motor status (walker or crawler) and will engage in a 15 minute, video-recorded free play lab session. This will allow us to code for action directives in caregiver speech. Following the free play sessions, caregivers will fill out the CDI-Short Form, and we will compare results between crawling and walking infants. Based on prior findings, we hypothesize that walking infants will have greater vocabulary sizes than crawling infants. By comparing the vocabularies of these infants with different motor skills and differences in caregiver speech input, this study provides insight into whether the walking milestone is associated with language development. This work enhances our understanding of how motor development may shape early language acquisition through changes in infants' learning environments.

PRESENTER: EMMY MELEIKA, PSYCHOLOGY
FACULTY MENTOR: DR. OLIVIA ATHERTON, PSYCHOLOGY
PROJECT TITLE: THE ROLE OF NEUROTICISM AND NARCISSISM ON PERCEIVED ARTISTIC ABILITY AND CHANGE IN CREATIVITY OVER 20 YEARS

Abstract: People have long speculated about the personality tendencies of the creative person, with many hypothesizing "mad genius," or the concept that highly creative people experience psychopathology. However, it remains unclear which personality characteristics actually predict perceptions of artistic ability, creativity, and creative change over time. Using data from the Berkeley Longitudinal Study (N = 251), we will explore how narcissism and neuroticism are associated with perceived artistic ability in college, self- and peer-reported creativity in college, and perceived creative change at a 20-year follow-up assessment. Participants self-reported on their narcissism, neuroticism, perceived artistic ability, and perceived creative change. Creativity during college was measured via self- and peer-reports that were completed after participants engaged in a group decision-making task. We will test associations by using linear regression models with narcissism and neuroticism as predictor variables. Based on prior empirical research, we hypothesize that people higher in narcissism will perceive themselves as having greater relative artistic ability and greater increases in creativity over time, while people higher in neuroticism will perceive themselves as having lower relative artistic ability and little change in creativity. Due to mixed findings in prior literature, we do not expect a significant association between narcissism or neuroticism with self- and peer-reported creativity in college. This research has important implications for how personality traits influence creative perceptions and may help explain why some individuals thrive in creative environments while others struggle.

PRESENTER: GERALYNN MENDOZA, NEUROSCIENCE
FACULTY MENTORS: DR. CRISTINA GOMEZ-VIDAL; SOCIETY, ENVIRONMENT, AND HEALTH EQUITY
PROJECT TITLE: HIDDEN LOAD: EXPLORING THE COGNITIVE, EMOTIONAL, AND CULTURAL DIMENSIONS OF INFORMAL CAREGIVING AMONG FILIPINO-AMERICAN EMERGING ADULTS

Abstract: Informal caregiving is a critical yet understudied experience among emerging adults, particularly within Filipino-American multigenerational households where cultural values shape expectations around family responsibility. This qualitative study examines how caregiving responsibilities influence the cognitive and emotional well-being of Filipino-American emerging adults (ages 18–25) providing care to older relatives. Semi-structured virtual interviews explore caregiving roles, cultural meaning-making, family health communication, and impacts on identity development, academic

functioning, and emotional health.

Preliminary thematic analysis of three early interviews reveals several emerging patterns. Participants described caregiving roles ranging from supervisory monitoring to intensive physical care for grandmothers experiencing dementia and chronic illness. Entry into caregiving was often characterized as a gradual or situational transition rather than a formal assignment, shaped by implicit cultural values such as *utang na loob* (debt of gratitude) and strong intergenerational bonds. Participants reported complex emotional experiences, including simultaneous fulfillment, gratitude, resentment, and guilt, suggesting an ambivalent emotional landscape. Early findings also highlight cognitive and lifestyle impacts, including decreased focus, increased time structuring, reduced social engagement, and accelerated perceptions of maturity. Cultural factors appeared to influence both caregiving motivation and communication patterns around illness, with some participants describing limited open discussion of health or emotional distress within the household.

By centering Filipino-American emerging adults, this work addresses a critical gap in caregiving research and contributes to culturally informed understandings of caregiver burden during a key developmental period. Ongoing data collection will further examine how cultural identity, family dynamics, and caregiving responsibilities intersect to shape well-being and support needs.

PRESENTER: SAMUEL JAMES MERCADO, NEUROSCIENCE
ADDITIONAL PRESENTERS: SIMON NGUYEN, BIOLOGY AND HENRY WANG, COMPUTER SCIENCE
FACULTY MENTOR: DR. IAN BALLARD, PSYCHOLOGY
PROJECT TITLE: TEMPORAL HAZARD OF ATTENTION LOSS: MODELING THE "GATEWAY EFFECT" STUDENT DISTRACTION

Abstract: Student in-lecture phone use is often viewed as sporadic and random, yet the association with reduced learning outcomes has been predicted to be substantial. In this study, we seek to determine how attentional disengagement from instructional material caused by phone-related attention switches impacts future behavior and memory retention, demonstrating that such switching follows a predictable temporal pattern in which early disengagement can cascade into sustained distraction. To examine how attentional shifts influence distraction, we analyzed data from 103 undergraduates who attended lab-replicated video lectures in addition to post-lecture quiz analysis. Student activity was modeled through survival analysis, comparing lecture time to phone-related switching, allowing us to model temporal relationships in phone-related attention shifting. Using Mann-Whitney U and survival analysis, we identified a possible "Gateway Effect", where switches occurring within the first five minutes led to a 3x increase in total switching frequency. Survival analysis also revealed a median "survival" time of 15 minutes before the first switch ($p<0.001$), indicating that students tend to initiate phone use halfway through the analysis. Counter to our hypothesis, we concluded that student quiz scores remained stable regardless of timing or frequency of switching behavior. ($p = 0.499$). The implications of this data may suggest that in-lecture phone use may not severely impact retention as previously believed. Our findings further indicate that in-lecture phone switching may follow predictable patterns, with its immediate effects on academic performance potentially moderated by factors such as material difficulty or students' prior knowledge

PRESENTER: CAMILO MILLER-VERGARA, HISTORY
FACULTY MENTOR: DR. DAVID BIGGS, HISTORY
PROJECT TITLE: GLOBAL KNOWLEDGE TRANSFERS, INTERNATIONAL COOPERATION AND THE CHILEAN NUCLEAR ENERGY PROGRAM, 1960S–1980S

Abstract: My thesis witch I'm working on as part of the history majors senior thesis program explores the history of the Chilean nuclear program, with particular attention to the aid provided by the International Atomic Energy Agency (IAEA) and the end goal of answering the central question of why did Chile never build a nuclear reactor. Beginning in the 1950s, Chile initiated discussions about developing a national nuclear program and applied for funding from both the IAEA and the United Nations Development Fund. This project investigates the international contacts and exchanges that supported Chile's early nuclear ambitions, including academic exchange programs and technical visits. And how the politics of the Pinochet regime influenced and changed the trajectory of the program from potentially building a nuclear power reactor to basic medical research and research reactors. In the project I will be looking into several aspects of the program including uranium mining, academic exchanges, the micro and macroeconomics of the Chilean program and nuclear research in general and the overall global historical and economic context of the period.

PRESENTER: JULIAN MINNIE, DANCE
FACULTY MENTORS: DR. HEATHER RASTOVAC AKBARZADEH, DANCE
PROJECT TITLE: BODIES OF WATER, BODIES OF MEMORY: WEST AFRICAN COSMOLOGY AND BLACK AMERICAN FAITH IN ALVIN AILEY'S "TAKE ME TO THE WATER"

Abstract: This research examines "Take Me to the Water," the second section of *Revelations* choreographed by Alvin Ailey, as a powerful embodiment of spiritual resilience and cultural memory within the African diaspora. Ailey's Southern Baptist upbringing served as the inspiration for the choreography's Christian river baptism, but this analysis argues that the piece also evokes deeper West African cosmologies, particularly Yoruba devotion for Ọ̀ṣun, the river orisha of healing, fertility, and renewal. The research looks at how gestures, costumes, spatial design, and water imagery serve as layered symbols of purification, transformation, and collective identity through a detailed movement analysis of the 2015 Lincoln Center performance. Both Yoruba ritual approaches to sacred water and Christian baptismal rites are visually represented by the flowing white garments, undulating torsos, circular processions, and wave-like phrasing. The essay places the choreography in the larger historical context of the Transatlantic slave trade and the cultural changes made while enslaved, based on research on African American religious history. Despite being forcibly displaced, enslaved Africans held onto their core cosmological beliefs of water as a living, sacred force and reinterpreted them within Christian frameworks. Therefore, "Take Me to the Water" becomes an embodied archive of survival and resistance rather than merely a representation of baptism. The continued existence of Yoruba values and the lasting presence of ancestral knowledge within Black American identity are ultimately supported by Ailey's work, which shows how African spiritual memory survived under imposed religious forms.

PRESENTER: MADELYN MOORE, ANTHROPOLOGY
FACULTY MENTOR: DR. SANG-HEE LEE, ANTHROPOLOGY
PROJECT TITLE: POSSIBLE INDICATORS OF GENDER-BASED CANNIBALISM AMONGST NEANDERTHALS

Abstract: Neanderthals, our closest relatives, lived from roughly 400 to 40 thousand years ago. Their material culture, body-selves, and social structures carry many implications about what it means to be human. Consequently, evidence of violence amongst Neanderthals is often the subject of public imagination—especially when this evidence may indicate cannibalism. However, little is understood about the frequency, motives, or possible social meanings behind these deaths. We do not yet know whether or not Neanderthals had social gender categories, or treated one another differently on the basis of sex. In this literature review, I will analyze cases of possible cannibalism against female and male Neanderthals alike, to determine whether any differences are present. By identifying—or not identifying—patterns specific to female Neanderthals, I hope to provide further context to the nature and origins of gender-based violence.

PRESENTER: JULIANA MULLALLI, PSYCHOLOGY
FACULTY MENTOR: DR. BRENT HUGHES, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: ARSHIYA AGGARWAL
PROJECT TITLE: THE EFFECT OF STIGMATIZING EXPERIENCES ON IDENTITY EXPRESSION

Abstract: Stigmatization, discrimination, and prejudice have long shaped how people express social identities. While research shows that negative interpersonal experiences impact an individual's psychological well-being, less is known about how they affect felt control over identity expression. Adjusting one's self-presentation to navigate spaces where stereotyping or threat may be present is often framed as a self-motivated behavioral shift. Rather than reflecting free choice, this adaptation may be a response to constraint, such that negative experiences may reduce individuals' sense that they can choose when and how to present their identity. Alternatively, negative experiences may increase felt agency through heightened awareness of identity. The present study examines whether individuals who report negative experiences related to social group identity report less agency in expressing that identity. Participants listed social groups they identified with and rated each on negative experiences and agency. Negative experiences are defined as self-reported threatening, stressful, or stigmatizing encounters within the past one to two weeks. Agency refers to the extent to which someone feels they can choose when and how to present their identity across settings. We predict that individuals who report more negative experiences will report less felt agency, suggesting that negative encounters constrain one's identity expression. Conversely, individuals may report increased agency, indicating identity empowerment. This provides a foundational understanding of the relationship between identity-related negative experiences and self-reported control. Future research can build on these findings to explore the mechanisms through which negative experiences erode felt agency and examine how this constraint shapes behavior in interactions.

PRESENTER: HANAE NAKAYAMA, POLITICAL SCIENCE
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: DESIGNING INSTITUTIONS FOR THE NEXT ENERGY SYSTEM: LABOR AND LICENSING SYSTEMS AS BARRIER FACTORS FOR NUCLEAR POWER INTRODUCTION IN THE UNITED STATES

Abstract: As U.S. electricity demand accelerates due to AI data centers, modernization, and decarbonization of industry, small modular reactors (SMRs) are increasingly positioned as a reliable zero-carbon core power source. However, the primary limitation for nuclear power plant construction is no longer a matter of technical feasibility. There are two institutional bottlenecks that threaten to stall progress. The first is the capacity of the workforce, and the second is the uncertainty surrounding permits.

This project demonstrates that the future of advanced nuclear energy depends on coordinating the timelines for human capital development and regulatory frameworks. The U.S. nuclear sector faces a workforce crisis due to the retirements of experienced workers, while SMR deployment plans require tens of thousands of additional skilled workers in areas such as construction, operations, digital systems and cybersecurity. Simultaneously, the prolonged and uncertain federal permitting process creates capital risk and delays the deployment of use cases. This slows the advancement of the technology learning curve and the mobilization of the workforce.

Based on the policy analysis I conducted during the UCDC program, I propose an institutional modeling approach that synchronizes workforce development pipelines with predictable, timely permit frameworks. The core of my thesis is that the success of the energy transition depends not only on infrastructure investment but also on institutional advancement. The expansion of nuclear power plants can achieve success only if the training of workers and the permitting process keep pace with the construction of power plants.

PRESENTER: RYLIE NASH, PSYCHOLOGY
ADDITIONAL PRESENTER: JACQUELINE TRAN, PSYCHOLOGY
FACULTY MENTOR: DR. ELIZABETH DAVIS, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: RICKY HANEDA, PSYCHOLOGY
PROJECT TITLE: SOCIOECONOMIC STRESS AND INFORMANT DISCREPANCIES IN CHILD ANXIETY: EVIDENCE FROM THE INLAND EMPIRE

Abstract: The Latinx community occupies over half of the Inland Empire (IE) in California (U.S. Census Bureau, 2020). They face various stressors (e.g. economic, health) and experience elevated levels of anxiety (Mullins et al., 2024). This highlights the need for examining what may contribute to these disparities. One important aspect may be discrepancies between a parent's perception of their child's anxiety symptoms and a child's own perception of their anxiety symptoms. Previous studies investigated this using the Screen for Child Anxiety Related Disorders (SCARED; Birmaher et al., 1997) questionnaire, and found children reported greater anxiety symptoms for themselves compared to their parents' perception of their child. In addition to further investigating discrepancy scores, we aim to target an issue pertinent to the IE: financial burden of disease. We plan to investigate how financial burden of disease is associated with these discrepancies between parents' and their child's perceptions of the child's anxiety symptoms. We will analyze this by correlating the Financial Stressors Questionnaire developed for the Health Disparities Research (HDR) project with a discrepancy score (absolute difference between child and parent report) from the SCARED. Independent t-tests will also be conducted to describe group differences in symptom discrepancy scores across race and gender. We expect to find that financial burden of disease will be positively associated with discrepancy scores of the child's anxiety symptoms. Findings will provide insight into how disease-related financial stress may be related to the phenomenon of parent-child discrepancies in anxiety symptom reports in underserved communities.

PRESENTER: KARA NGUYEN, PSYCHOLOGY
ADDITIONAL PRESENTERS: DANIEL PUNZALAN, PSYCHOLOGY AND MADDY CHANG, PSYCHOLOGY
FACULTY MENTOR: DR. WEIWEI ZHANG, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: RAMITHU DE SILVA, SOFIA OSPINA, VINH YANG, SHLOKA VEMULPALLY, AND INIK KIM
PROJECT TITLE: COMPETITION BETWEEN WORKING MEMORY PRECISION AND HIPPOCAMPAL PATTERN SEPARATION DURING MEMORY RETRIEVAL

Abstract: Working memory (WM) is the cognitive system that allows people to remember information for a short amount of time. Visual representation in WM can be placed into two different categories: capacity (i.e., the number of items maintained concurrently) and precision (i.e., the fidelity of the remembered stimuli). A recent hypothesis of exploring the neurocomputational mechanisms for WM precision posits that hippocampal pattern separation allows to retain precise memory representation over short-delay. The present study tested this hypothesis by examining the potential competition between WM precision and behavioral hippocampal pattern separation. Specifically, it is predicted that a high load on WM precision, not capacity, would reduce lure discrimination, which relies heavily on hippocampal pattern separation. Experiment 1 incorporated a change detection (CD) task with the load manipulation of WM capacity and precision into the test phase of the mnemonic similarity task (MST). Experiment 2 incorporated the CD task into the MST's encoding phase. Results show no noticeable difference in lure discrimination of MST between WM capacity and precision loads of the CD task. However, Experiment 1 revealed reduced CD task performance under high precision load during MST lure trials, suggesting that WM precision and pattern separation during retrieval may share computational resources. These findings indicate that competition between WM precision and hippocampal pattern separation may arise during the retrieval of information from long-term memory.

PRESENTER: THINH NGUYEN, PSYCHOLOGY
FACULTY MENTOR: DR. TABEA SPRINGSTEIN, PSYCHOLOGY
ADDITIONAL PRESENTER: MACEY GRISSO, PSYCHOLOGY
PROJECT TITLE: NEGATIVE AFFECT IN WORKING STUDENTS AFTER A WORKPLACE CONFLICT: THE MODERATING ROLE OF MOMENTARY EMOTION REGULATION STRATEGIES

Abstract: Relationship conflict, such as personality clashes or miscommunication, often occurs in the workplace and can lead to negative consequences. Workplace conflict not only affects productivity but also carries emotional costs. Although research has established that workplace conflict has a negative effect on full-time employees' emotional well-being, limited research has explored the real-time dynamics of these affective processes among student workers. This study examines how workplace conflict influences negative affect and whether three emotion regulation strategies (i.e. reappraisal, suppression, and masking) moderate this relationship both at the between- and within-person levels. We plan to recruit up to 200 undergraduate students from diverse backgrounds to complete 21 days of experience sampling (six times per day), during which they will be asked about their daily experiences, including conflict in workplace interactions and their emotional states. Multilevel modeling will be used to test interactions between workplace conflict and emotion regulation strategy use in predicting negative affect. We

hypothesize that reappraisal will buffer the effect of workplace conflict on negative affect, while suppression and masking will exacerbate it. This study will extend affective science by showing how emotion regulation could be leveraged to manage social stressors, specifically in the working student population where negative workplace experiences might carry over into school or personal life domains.

Presenter: Van Nguyen, Psychology
Faculty Mentor: Dr. Annie Ditta, Psychology
Project Title: The Effect of AI-assisted Note-taking on Memory Retention and Test-taking Stress

Abstract: Note-taking is beneficial for learning because it engages cognitive processes that allow students to gain a deeper understanding of the materials. However, students are now using artificial intelligence (AI) in ways that may support or harm their traditional note-taking. AI use can be helpful to students' learning because it can summarize the main ideas of the learning materials. Additionally, it may reduce their test-taking stress by making them feel more prepared. However, AI use may harm learning if it replaces the cognitive processes involved in note-taking. Therefore, this study addressed: 1) whether using AI to assist with note-taking is more effective at supporting learning than traditional note-taking, and 2) whether having AI support during learning can alleviate test-taking stress. In this study, participants read a passage and took a knowledge test under one of three conditions: control (read only), note-taking, and AI-assisted note-taking (using AI to identify the main points of the passage in conjunction with their own notes). Then, participants answered questions about their levels of stress when preparing for the test. A one-way ANOVA revealed no significant difference in test scores or stress levels between the groups. However, the AI-assisted group reported feeling significantly more prepared for the exam than the read-only group. Though it is still unclear whether AI use is more beneficial or harmful for learning, this study was a critical first step in determining how AI use could potentially benefit students in higher education.

Presenter: Mary Ogbogu, Neuroscience
Faculty Mentor: Dr. Brent Hughes, Psychology
Additional Contributor: Arshiya Aggarwal
Project Title: Desirability of Self-Aspects Shape Self-Presentation In Social Settings

Abstract: People regularly navigate the tension between expressing who they are and managing how others perceive them. But what determines which aspects of identity get revealed and which get concealed? This study examines whether individuals' perceptions of how socially desirable their traits and values are shape the way they construct and present their identity to others.

Participants listed their core personality traits, values, and social group memberships, then rated each on perceived social desirability for each of their traits and values. Using these elements, participants built an identity network by mapping the causal connections they see among their traits, values, and groups (e.g., "I value fairness, and that's why I identify with this justice-oriented group"). Participants were then told they would have a conversation with another participant who shares one of their social identities, and were asked to build a second identity network representing how they would want this person to understand them. Comparing the private and presented networks allows us to detect which identity elements are amplified or suppressed when social interaction is anticipated — and to test whether perceived desirability and shared social identity predicts these shifts. We hypothesize that elements

perceived as more desirable will be more central in the presented network, while those perceived as less desirable will be diminished or dropped. Together, these findings aim to examine the gap between personal and perceived desirability of self-aspects and how it affects social interactions in the real world.

PRESENTER: SAMANTHA PACINI-CARLIN, ENGLISH
FACULTY MENTOR: DR. ANDREA DENNY-BROWN, ENGLISH
PROJECT TITLE: THE WINDS OF CHANGE: HOW FANTASY BREATHES THROUGH THE OH HELLOS

Abstract: Fantasy creates a unique emotional experience for the audience that draws them into other worlds. Rather than being pure escapism, however, this genre uses its distance from reality to critique, re-imagine, and un-make the supposed limits of our world as its emotional processes intertwine with critical discussion. For the American folk band, The Oh Hellos, this discussion manifests in their songs. Through this lens of fantasy, I dissect how they utilize the genre's emotional resonance to take the listener on an otherworldly journey alongside the protagonist, inspiring them to follow a path of personal growth manifested in breath. The colloquially-named collection of albums known as "The Four Winds" embellishes the visceral collapse of a narrow perspective with song, mythology, and empathy for the protagonist. Pain, healing, and self-discovery set to the cycle of the seasons paints the messy path of growth, tearing apart the old roadmaps to Fortuna's deceptive blessing to insist that a fuller, better existence requires constant, chaotic change. Breath then acts as the bridge between the world of "The Four Winds" and our reality. It models the physical feeling of change, which ranges from suffocating from fear to eventually breathing in tandem with sacred winds. And by virtue of breathing, we are already on that path to discovering a more defined version of ourselves. One only needs to persist in spite of their fears to see spring again

PRESENTER: ELIZABETH PARK, LINGUISTICS
FACULTY MENTOR: DR. EMILY GRAHAM, COMPARATIVE LITERATURE AND LANGUAGES
PROJECT TITLE: CROSS-CULTURAL COMMUNICATION: EXAMINING TRANSLATION GAPS BETWEEN KOREAN AND ENGLISH

Abstract: In recent days, we experience varying media entertainment presenting different languages and cultures through the assistance of subtitles. In particular, the rise of Korean dramas and films are attributed to the expansion of a more global audience with the help of English translations. While this enables viewers to interact with Korean culture and language, studies reveal that English translations frequently overlook nuances of the Korean language, producing inaccurate or misleading interpretations. Specifically, I look into what levels of formalities and social hierarchy standards in Korean society are revealed through its language but often left out of English version translations, and how this provides an analysis of power dynamics and cultural implications found in both Korean and American society. Through case studies and literature searches of different examples of Korean media and their related English subtitle translations, I make a comparison between the two societies and their language, and ultimately highlight the differences that provide translation challenges along with its possible implications. As Korean culture becomes a widely recognized and valued phenomenon, a deeper analysis into how its language translates onto a more global audience will allow viewers to gain a deeper understanding of how to communicate, socialize and empathize with Korean society and communities.

PRESENTER: ADAMADIA PEGADIOTES, PSYCHOLOGY
FACULTY MENTOR: DR. OLIVIA ATHERTON, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: PRISCILLA WHANG, PSYCHOLOGY
PROJECT TITLE: PERCEIVED FAIRNESS IN HOUSEHOLD LABOR AND DEPRESSIVE SYMPTOMS: THE MODERATING ROLE OF SOCIAL SUPPORT

Abstract: Prior research has examined how unequal division of household labor, and perceived fairness in those divisions, are associated with depressive symptoms among women, showing that perceptions of unfairness are particularly important for elevated depressive symptoms. Although research has shown that social support is an important psychosocial factor that can protect against depression, little is known about whether social support buffers the association between perceived unfairness in household labor and depressive symptoms. The present pre-registered study examines how perceived fairness in household labor is associated with depressive symptoms among married women and whether social support from spouses, other family members, and friends moderate this association. We use data from the Midlife in the United States (MIDUS) Refresher 1 and MIDUS 3 cohorts (N= 2,121 married women, age range 25-74). Multiple linear regression analyses will be used to test the associations among perceived fairness, depressive symptoms, and three sources of support (spouse, family members, and friends). The present study will help shed light on how relational resources may influence the psychological consequences of perceived inequity in household labor.

PRESENTER: NOLA PERIFEL, PSYCHOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: HANZHI WANG, PSYCHOLOGY
PROJECT TITLE: THE RELATIONSHIP BETWEEN CAREGIVER SCREEN USE AND THEIR RESPONSIVENESS TO INFANT NEEDS

Abstract: Screen use from phones, television, tablets, and computers has increased dramatically in recent years. Caregiver screen use has become a growing concern due to its effect on their responsiveness—how promptly caregivers respond to their child's needs. Prior work that studied caregiver screen time mainly used self-report surveys (e.g., Attai et al., 2020), which can be subjective and biased. In contrast, objective observation may provide more reliable measures for caregiver screen use. Some studies had researchers observe caregivers directly in playgrounds, and found that caregivers with a lower degree of responsiveness spent longer time on cellphones (Abeele et al., 2020; Abels et al., 2018; Wolfers et al., 2020). However, the direct observation made in the home environment—where caregivers and infants spend most of their time in—is missing. The current study aims to understand how screen use might predict caregivers' self-reported responsiveness in the home environment. We recorded caregivers' eye movement using Pupil Invisible eye-tracking glasses and coded the duration of caregiver attention to screens (e.g., phone, tablet, TV). We also asked caregivers to complete a Parental Responsiveness survey(Anikiej-Wiczenbach & Kaźmierczak, 2021). We have collected preliminary data for 8 sessions. By April, we will have data for 20 sessions. We predict that caregivers with lower self-reported responsiveness might have a higher screen use score. This study will validate the use of a more naturalistic measure of caregivers' screen use, and will shed more light on the implications that screen use has on early childhood development.

PRESENTER: ERICK PFLUCKER, PHILOSOPHY
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: THE LEGISLATIVE PROCESS IN PRACTICE: A CONGRESSIONAL INTERNSHIP EXPERIENCE

Abstract: During the Fall 2025 UCDC program, I interned in the Office of Congressman David Valadao, where I observed firsthand how constitutional design operates within the daily realities of congressional governance. My experience focused on the relationship between national lawmaking and district representation, and how members of Congress navigate the tension between institutional responsibility and constituent expectations. Working in the Washington, D.C. office immersed me in the rhythm of legislative decision-making. Drafting policy memoranda and engaging with constituent correspondence revealed how policy priorities are shaped not only by ideology, but by district needs and strategic negotiation. Exposure to committee hearings demonstrated how political constraints and party dynamics influence the development of legislation long before a bill reaches the floor. I also observed how collaboration across offices and agencies is often necessary to advance policy objectives within a system defined by checks and balances. Through this experience, I came to understand constituent services as a central mechanism of democratic accountability. Representation is not limited to voting on bills; it requires sustained responsiveness and the ability to translate complex federal issues into meaningful outcomes for individuals and communities. This exposure deepened my academic interest in federal legislative process and constitutional governance by connecting theory to practice. Observing Congress from within affirmed that the separation of powers is not merely structural but lived and shaped by negotiation and compromise. This experience in a congressional office strengthened my commitment to pursuing a career at the intersection of law and public service in American government.

PRESENTER: TIANA PHAN, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. CASSIA ROTH; SOCIETY, ENVIRONMENT, AND HEALTH EQUITY
PROJECT TITLE: RESTRICTING CHOICE: THE INTERSECTION OF LAW, POLICY, AND PUBLIC OPINION ON ABORTION RIGHTS

Abstract: Abortion access has long been a contentious issue in the United States, subject to changing social values, new scientific findings, and public policies. With a focus on the effects of the Supreme Court decision of Roe v. Wade (1973) and its overturning with Dobbs v. Jackson Women's Health Organization (2022), this research outlines the role of historical, political, and cultural factors in determining abortion policy and access in the United States. Analyzing significant court rulings and laws, the study engages in a multidisciplinary literature review of legal, public health, and sociological studies to assess the ways in which abortion policies are made, carried out, and disputed. Then, this study discusses legal and policy approaches that can improve access to reproductive healthcare within these structural limitations. To demonstrate how different legal and political frameworks influence access to abortion in the post-Dobbs environment, this paper employs a comparative case study of Texas, an abortion-restricted state, and California, an abortion-access state. Research outcomes show that abortion regulations, specifically gestational limits, funding restrictions like the Hyde Amendment (1976), and state abortion bans following Dobbs have restricted access to abortion for disadvantaged groups. These policies illustrate the impact of legal frameworks on both accessibility to abortion services and overall reproductive health outcomes. This study supports the creation of evidence-based policies that safeguard reproductive autonomy and adds to ongoing conversations on healthcare equity, public policy reform, and reproductive justice by identifying the legal, ideological, and structural mechanisms that result in its unequal access.

PRESENTER: BATUL PULLWALA, NEUROSCIENCE
ADDITIONAL PRESENTER: ETHAN FINLAY, NEUROSCIENCE
FACULTY MENTOR: DR. ANUBHUTI GOEL, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: WILLIAM MOL, NEUROSCIENCE
PROJECT TITLE: A BEHAVIOR PARADIGM TO STUDY PREDICTIVE ENCODING IN MICE

Abstract: Humans and other animals exist in complex environments that require us to use past experiences to predict how we should respond to a situation. We currently do not know the specific pathways in the brain that allow us to carry out these predictive processes. Predictive encoding posits that previous sensory stimuli drive reaction behavior towards imminent events. In order to investigate this model of predictive encoding, we created a visual paradigm to track the response of a water deprived mouse with a licking port. They first learned a 4-element sequence of differently oriented gradients (200ms each) in the sequence A-B-C-D (separated by 300ms gray screens) using a positive feedback mechanism. The sequence D-B-C-A was then introduced to test if the mouse could differentiate between the sequences and recognize that only one is rewarded. The goal is for the mouse to recognize that gradient A appearing first is of the correct sequence, and to only lick because they predict gradient D will appear, supporting the idea of predictive encoding. We test this by comparing both the licking percentage and the time the mouse begins to lick. Hypothetically, the mice should be able to demonstrate this predictive processing through their behavioral responses with this paradigm.

PRESENTER: ANMOL QURAISHI, POLITICAL SCIENCE
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: EXPERIENCING EDUCATION LAW AND COMMUNITY IMPACT IN WASHINGTON, D.C.

Abstract: While I was in Washington DC, I was interning at a nonprofit organization named “Advocates for Justice and Education”. This was a nonprofit to help families navigate school discipline, and the education system by offering resources and legal representation. From a combined lens of academic and legal policy experience, I was able to see how regional politics and federal laws played a role with education law. I worked with a number of different tasks, like creating guides for families to refer for civil litigation, creating report reports on public policy, testimonies, and creating outreach and fundraising materials for our events. I also got to witness administrative hearings, which helped me better understand the Individuals with Disabilities Education Act, student rights, and due processes in D.C.

My time in D.C allowed me to work with attorneys, advocate for justice, and be immersed in the community. I saw how legal advocacy goes beyond court, and it relies on communication, trust, and systemic reform efforts. Both my internship and classes allowed me to immerse myself and open myself up to new perspectives. I got to see how these policies affected students, families, and marginalized communities within Washington D.C. Together, my internship in Washington D.C and the UCDC program together was an experience like no other and it helped me develop academically and professionally. UCDC served as a practical tool for building my career beyond UCR.

PRESENTER: ANIRUDH RAM SRIDHAR, POLITICAL SCIENCE
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: FINANCIAL ENFORCEMENT & CONSUMER PROTECTION IN WASHINGTON, D.C.

Abstract: I participated in the Fall 2025 UCDC program as an Enforcement & Protection Intern with the Department of Insurance, Securities, and Banking, which is responsible for regulating local insurance, banking, and security sectors within the District. Under guidance of established senior officials, I conducted investigations regarding regulatory violations, analyzed DC-DISB regulations for compliance, and authored monthly Consumer Reports to inform vulnerable residents and small businesses of data privacy and fraud risks. Additionally, I attended conference meetings representing DISB and ECPD, presenting findings and potential barriers. My work included tracking legislative and policy developments, producing detailed outlines to support enforcement actions, and implementing preventative action for vulnerable consumers. My tasks were assigned by both the Director & Assistant Director of the Enforcement & Consumer Protection Division, Mr. Michael Ross and Mr. Brian Bressman. Their leadership and division organization led to an immersive experience that taught me critical insight for a future career. This experience provided informative insight into the functional practices of financial regulation and consumer protection, showcasing how enforcement practices, regulatory analysis and public education work together to safeguard vulnerable residents and small businesses in the District of Columbia.

PRESENTER: ALONDRA ROQUE, SPANISH
FACULTY MENTOR: DR. FREYA SCHIWY, MEDIA AND CULTURAL STUDIES
PROJECT TITLE: VISUALIZING INTERDEPENDENCE. FOOD JUSTICE AND DOCUMENTARY FILM

Abstract: Although food is central to life and well-being it is also designed to benefit corporations such as Monsanto (now owned by Bayer). It is not evenly accessible with many people living in food deserts or affected by land dispossession and monoculture. Films like *2040* and *Before the Flood* present easy solutions to the problem based solely on individual consumer choice. Building on the ideas of Kyle White, “Settler Colonialism and Ecology Environmental Justice,” Natalia Hernandez Vidal “Countertemporalities in the Polyculture,” Jason Moore “The Rise of Cheap Nature,” and Ayshia Galvez, *Eating Nafta*, I examine representations of food justice in a selection of independent documentary films from Abya Yala (Latin America) and Turtle Island (North America). How do *Qué les pasó a las abejas* (Adriana Otero Puerto y Robin Canul Suárez), filmed in Mexico; *Inhabitants*, focusing on the perspectives of and Native tribes located in the US; and the short film *How South L.A.'s Front Lawn Farm Movement is Fighting Food Insecurity* presents the problem of food (in)justice? Can we think about food justice in relation to settler colonial violence? I will argue that independent films can help us understand that when we remove ourselves from the way food is produced and when we just mindlessly consume it we are participating in neoliberal capitalism that is not only unsustainable, and detrimentally affects the collective of humans, non humans, and the more than human.

PRESENTER: REBECCA SEAÑEZ, ANTHROPOLOGY
FACULTY MENTOR: DR. ELIZABETH BERGER, ANTHROPOLOGY
PROJECT TITLE: CHOCOLATE WELLNESS TOURISM IN CENTRAL AND SOUTH AMERICA

Abstract: Chocolate wellness tourism has become increasingly popular in recent years, especially in countries in Central and South America, where cacao and chocolate originated and were used by ancient civilizations. Chocolate wellness tourism has significantly influenced the medicinal uses and values associated with chocolate and cacao. Previous research on chocolate wellness tourism has focused on the economic and marketing aspects of cacao farms and tastings. There has also been research on the health benefits of consuming chocolate. However, there is a need to investigate how tourism may change the values surrounding chocolate, as tourism involves the exchange of values and ideas across different backgrounds and cultures. Using a cultural diffusion framework, this project examines tourism literature, archival data on chocolate and cacao, and case studies of cacao farms and tastings. This project examines how the growth of chocolate tourism has changed how tourists and communities present chocolate's wellness value. By engaging with local communities, tourism allows for cultural preservation, educational exchange, and intercultural connections.

PRESENTER: KAVIN SELVAN, PSYCHOLOGY
FACULTY MENTOR: DR. JIMMY CALANCHINI, PSYCHOLOGY
PROJECT TITLE: UNIVERSITY OF CALIFORNIA RIVERSIDE STUDENTS' PERCEPTIONS OF LAW ENFORCEMENT

Abstract: University students are often exposed to two types of police officers: some dedicated solely to campus policing, and others dedicated to the broader community. My goal for this project is to better understand UCR students' perceptions of both types of officers. Additionally, I assess students' comfort interacting with campus police officers who either share or do not share their race/ethnicity and gender. Students first completed a series of surveys assessing their perceptions of campus and community police. Next, they read a series of vignettes describing good deeds the officers performed and rated their perceptions of officers in each vignette. Students rated campus police officers moderately positively, and rated campus police more positively than community police officers. However, match between participants' and officers' race/ethnicity or gender was not related to participants' comfort levels. Given that campus police officers were more positively perceived than community police officers, campus police might highlight their role in serving the campus specifically to further improve their relationship with students. Moreover, our findings that officer race/ethnicity and gender were unrelated to participants' comfort level suggests that daily positive interactions with police officers are especially important to students' comfort.

PRESENTER: JESSLY SEPULVEDA, ENGLISH
FACULTY MENTOR: DR. TIMOTHY PETETE, ENGLISH
PROJECT TITLE: "THE TRUST AND TREATY RESPONSIBILITIES OF THE UNITED STATES ARE NOT OPTIONAL": FEDERAL EDUCATION RESTRUCTURING AND THE IMPACT ON TRIBAL SOVEREIGNTY

Abstract: This presentation examines the Trump administration's proposal to transfer the Office of Indian Education (OIE) to the Department of the Interior. The disruption of governance in Native education will be analyzed through the context of Indian education being central to tribal identity, as well as the responsibility within the federal government trust. Although the transfer is framed as a supported administrative alignment, research reveals $1 billion in budget cuts to tribal programs, affecting Native small businesses and tribal colleges and universities, further highlighting the concerns for the lack of tribal consultation. Referring to Scott Richard Lyons' theory of rhetorical sovereignty, which asserts the inherent right of Indigenous peoples to determine their own narrative, this research envisions education as a means of Indigenous self-determination. The OIE transferring resources to a department primarily focused on land and resource management further underscores the risk of shifting priorities from tribal-

defined educational goals. Although supporters argue that restructuring the OIE and the Department of the Interior would improve oversight of the Bureau of Indian Education (BIE), this research shows that such administrative efficiency does not protect tribal sovereignty or Indian education. The analysis of tribal responses examined through the National Congress of American Indians (NCAI) and the Standing Rock Sioux Tribe, one of the K-12 affected tribes along reservations, reveals concern regarding treaty obligations and Native students' rights to equitable but culturally grounded education. Ultimately, this presentation will demonstrate the interconnection between undermining tribal sovereignty and Indian education while exploring the effects of federal reconstruction.

PRESENTER: AARON SHEH, BIOLOGY
FACULTY MENTOR: DR. DAVID ROSENBAUM, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: ARINEH MORADIAN
PROJECT TITLE: PREVIEW AND PERFORMANCE: EVIDENCE FOR ANTICIPATORY "PEEKING" RATHER THAN MEMORIZING

Abstract: Preview, the act of looking ahead, improves performance. However, the underlying mechanisms remain unclear. It is unknown whether these benefits arise from the upfront memorization of decisions or the perceptual sampling of stimuli because prior studies have not provided data on the moment-by-moment state of decision-making when preview was present or absent. We developed a method to explore this topic. In Experiment 1, participants judged whether strings of numbers contained more even or odd values. In Experiment 2, participants from the same population judged whether a target digit was present or absent. In both experiments, in one condition (control), all strings remained visible. In another (disappearing), all strings disappeared after the first response was made. First-response times were significantly longer in the disappearing condition than in the control condition, and accuracy was lower in the disappearing condition than in the control condition. The results suggest that participants did not memorize all upcoming decisions before the initial response. Instead, they "PEEKED" ahead -- a play on words for the model introduced here, the Prioritized Examination of Evidence for Knowledge model. According to the model, preview works by sampling stimuli with increasing likelihood the sooner the stimuli must be judged.

PRESENTER: SANYA SHETH, POLITICAL SCIENCE
FACULTY MENTOR: DR. PAUL D'ANIERI, POLITICAL SCIENCE
PROJECT TITLE: DEMOCRACY AND ENDLESS WAR: EXPLAINING AMERICA'S PROLONGED CONFLICTS

Abstract: While democracies are explained to prevent prolonged conflicts, the United States has repeatedly found itself in said conflicts that can be described as "forever wars". My poster research will address the question: While democracies are usually thought to tackle wars conclusively, why has the United States, despite being a strong and stable democracy, become involved in long-lasting "forever wars"? Based on my analysis of the cases (Vietnam, Iraq, and Afghanistan), I have concluded that the United States consistently won the initial battle, but remained in long-enduring wars due to: misjudged political climates, underestimated insurgencies, and a lack of postwar strategy. In my paper, I highlight the three wars as separate entities - explaining why they started, who the actors were, and milestones occurred in each war. Overarchingly, I will tie in the role that the United States played in each war and why its involvement in the war pushed for a prolonged conflict in all three wars. With this outline, I will emphasize that the lengthy United States' involvement stemmed from their overconfidence in their military superiority, the assumption that local civilians would blindly support their intervention, and the

lack of planning between war generals and the Secretaries of War. It was due to these mistakes that the United States struggled to stabilize societies they involved itself in, and was unable to fight insurgencies.

PRESENTER: MARK SHIMIZU, BIOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: ZACHARY KELLY, PSYCHOLOGY
PROJECT TITLE: EFFECTS OF COGNITIVE LOAD ON EYE AND HEAD MOVEMENTS DURING A 3D VISUAL SEARCH TASK

Abstract: Cognitive load theory describes the idea that individuals have a limited capacity for processing information, with attentional resources being divided across multiple processes (Sepp et al., 2019). This is consistent with evidence that cognitive load and postural control compete for limited cognitive resources: When balance is experimentally disturbed under concurrent cognitive load, trade-offs in performance occurred relative to baseline and single-task conditions, with results varying depending on whether participants were explicitly instructed to focus on their balance (Andersson et al., 2002). However, it remains unclear to what extent varying levels of cognitive load affect movement in a three-dimensional environment while participants complete a visual search task. We collected eye-tracking and inertial movement data from 40 UCR participants. Participants searched 3 × 3 grids of pictures on three walls, encompassing a 270° field of view. Cognitive load was manipulated by having participants count backward from 100 at varying intervals. To quantify motion, horizontal head and eye rotational movements were recorded using two inertial movement sensors placed on the head and neck. We hypothesize that participants under lower cognitive loads will exhibit greater eye and head movements due to increased available cognitive resources. Under higher cognitive loads, participants are expected to exhibit smaller movements, reflecting divided attentional resources. These findings can further our understanding of how cognitive load affects movement and how limited cognitive resources are allocated throughout complex, real-world tasks.

PRESENTER: ABIGAIL SMITH, PSYCHOLOGY
FACULTY MENTOR: DR. JOHN FRANCHAK, PSYCHOLOGY
ADDITIONAL CONTRIBUTOR: AYLIN LUNA
PROJECT TITLE: OBSERVING THE VARIATION IN TODDLERS' BODY POSITIONS ACROSS DAY-TO-DAY ACTIVITIES

Abstract: Playing, eating, and reading are activities that take up a substantial amount of time in infants' day-to-day lives. These activities influence various behaviors, such as which body position they are in (Franchak et al., 2026). Past work using a text message sampling method found that infants aged 4-13 months were likely to be sitting during mealtime, whereas during playtime, they were likely to be upright. However, text message surveys are unable to capture infant's natural rhythms and behaviors. Thus, our study expands on these findings by observing toddlers' moment-to-moment transitions between different body positions across time spent playing, eating, and reading. Additionally, our study will observe whether past findings will replicate within toddlers. Caregivers of toddlers ages 18-30 months ($N = 44$) recorded five-minute videos of themselves interacting with their toddler in each activity across two days. We scored the various body positions of each infant as sitting, prone, upright, held, or supine. We found that infants transitioned their body positions more during playtime compared to reading, such that during play, infants transitioned about 3.75 times per minute and 1.26 times per minute during reading. During meal time, infants typically only transitioned 0.22 times per minute. Consistent with past work, toddlers

were frequently sitting during mealtime and reading time compared to playtime and were most frequently upright while playing. Future work can look closer at the individual differences in body position transitions by focusing on the role caregivers play in facilitating opportunities for variations in movement.

PRESENTER: ISABEL SOHN, PUBLIC POLICY
FACULTY MENTOR: DR. TANYA NIERI, SOCIOLOGY
PROJECT TITLE: AM I ASIAN ENOUGH? ETHNIC-RACIAL SOCIALIZATION AND KOREAN AMERICAN YOUNG ADULTS' MENTAL HEALTH

Abstract: Ethnic-racial socialization (ERS) in Asian American families is understudied. This study addresses that gap by focusing on Korean American families. Prior research shows an association between ERS and mental health, although these studies primarily focused on the association in childhood. This paper examines the association in emerging adulthood. The results stem from a qualitative analysis of interviews with 20 Korean American young adults, aged 18-25 years, from Southern California. We assessed parents' messages about racism, Asian Americans, and other people of color, received while growing up, and their relation to participants' current mental health. We found that all but one participant described messages about racism as a problem. However, when participants also received messages minimizing racism and denigrating other groups of color, they described having negative mental health outcomes. We also found that some participants who described messages denigrating other groups of color also described messages characterizing either Korean Americans or Asian Americans as a model minority. The relation to negative mental health may be explained by parents' lack of preparation of their children for racialized experiences and discrimination, either through their minimization of the threat or by suggesting that Korean American/Asian American superiority obviates the need to personally prepare for bias or collectively respond to systemic racism. We will discuss the implications for practice, including health-promoting family discussions about ethnicity and race.

PRESENTER: JOHNNY SOLIMAN, NEUROSCIENCE
ADDITIONAL PRESENTERS: ANGELA TRAN, PSYCHOLOGY; KATHY LE, PSYCHOLOGY; AND RIYA ASHOK, NEUROSCIENCE
FACULTY MENTOR: DR. IAN BALLARD, PSYCHOLOGY
PROJECT TITLE: HOW EARLY DISENGAGEMENT PREDICTS ATTENTIONAL PATTERNS AND TEMPORAL MEMORY IN DIGITAL LEARNING ENVIRONMENTS

Abstract: Although the evolution of technology has increased access to asynchronous educational content, social media and other digital entertainment compete for attention. It raises questions on whether attentional disengagement from instructional material is linked to subsequent engagement and sequential memory. To examine how early disengagement is associated with later attentional behavior, we analyzed behavioral data from 112 participants watching an online lecture while having unrestricted access to TikTok. Continuous screen recording allowed precise measurement of the timing of initial disengagement and subsequent attention switching. A temporal memory task assessed how increased distraction influences an individual's perception of time and their ability to recall the order of lecture material content. We examined the relationship of early switching behavior on downstream attentional patterns, gauged by total switches, and temporal memory performance to characterize the relationship between attentional timing, sustained distraction, and memory organization. Our results indicated that early switching within the first ten minutes constituted was linked to a higher total number of attention switches across the lecture ($p<0.001$). In addition, a greater number of early switches was associated with poorer

temporal memory performance. Together, these findings suggest that increased attentional disruption results in weakened memories of event sequences. Rather than reflecting isolated lapses, distraction appears to disrupt the continuous integration of temporal information, impairing the coherence of memory for extended instructional content.

PRESENTER: JASMINE SPOONER, PSYCHOLOGY
FACULTY MENTOR: DR. GENE BREWER, PSYCHOLOGY
PROJECT TITLE: INTEREST AND FAMILIARITY AS DUAL MECHANISMS OF THE ILLUSORY TRUTH EFFECT

Abstract: The Illusory Truth Effect occurs when repeated exposure to information increases the likelihood that people believe it is true. This phenomenon has implications for political campaigns, propaganda, social media, and advertising, all of which rely on repeated messaging. As information becomes increasingly accessible, there is a growing need for a mechanistic account of how repeated exposure to messaging shapes judgements about truthfulness. One explanation for this influence on truthfulness judgments centers on familiarity. Early research suggested that familiarity enhances processing fluency, thereby increasing perceived truthfulness. When information feels familiar, individuals tend to evaluate it less critically, allowing repeated exposure to affect truth judgments. Another influence on this effect is the degree of an individual's interest in a particular piece of information. Prior work supports that interest, particularly in domains where individuals consider themselves knowledgeable, influences truth judgments. In this study, we examine how familiarity and interest interact to produce the Illusory Truth Effect. 40 participants will rate their interest in the presented statements using a 6-point scale. Participants will then be presented with new statements and re-exposed to interest-rated statements, and they will provide truth ratings for all items. We hypothesize that repeated statements will receive higher truth ratings, trivia statements rated as more interesting will receive higher truth ratings, and that statements rated as less interesting will show a smaller effect of repetition

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

Abstract: A major goal of education is to not only teach students information (i.e., comprehension), but also to ensure students can effectively apply their learning in new contexts (i.e., creativity), all of which is dependent upon the manner in which material is presented. Designing effective learning materials is challenging because there must be a balance between communicating course content and not overloading the student. Cognitive load (CL) describes the amount of mental effort required to attend to and process information; students learn better from materials designed to reduce CL during learning. However, it remains unclear whether such reductions are sufficient to improve students' ability to utilize their knowledge in creative ways. We hypothesized that reducing CL during learning would increase students' ability to transfer learned material to a related creative thinking task, and that comprehension partially mediates the relationship between CL and creativity. Across two experiments, participants either watched a straightforward (low CL) or a complex (high CL) statistics lecture, took a comprehension test, and completed a creative thinking task. Creative thinking was scored in terms of functional fluency (FF)—the number of correct ideas generated using knowledge from the lecture. Experiment 1 found a significant effect of CL on comprehension, but contrary to our hypotheses, neither experiment found a significant effect of CL on FF, nor a significant mediated effect. While a brief lecture may delineate the effect of CL

on comprehension, it might not be sufficient to teach students how to apply their knowledge to an open-ended creativity task.

PRESENTER: APARNA SURESHBABU, BIOLOGY
FACULTY MENTOR: DR. ANTOINE LENTACKER, HISTORY
PROJECT TITLE: FROM INSTITUTIONS TO PHARMACEUTICALS: THE UNINTENDED CONSEQUENCES OF MENTAL HEALTH REFORM

Abstract: With the introduction of psychiatric drugs in the mid-1950s, California began to move toward deinstitutionalization and community-based care, with the majority of state mental hospitals closing during the 1960s and 1970s. The 1967 Lanterman-Petris Short (LPS) Act ended involuntary long-term institutionalization and expanded civil rights protections. However, inadequate funding and a lack of community support contributed to the inability to provide promised community-based care. The LPS Act focused on releasing patients from state mental hospitals, but did not provide them with adequate resources, leaving many patients unhoused. Over time, the gaps in the LPS Act contributed to increased reliance on emergency psychiatric holds and increased numbers of unhoused individuals. This study evaluates the progression of forced psychiatric treatment in California by analyzing digitized medical and legal journals from the 1950s to 1970s. It will look at the shift from institutional asylums to the rise of pharmaceuticals, and back toward forced psychiatric treatment as a response to gaps in community care. Currently, California has a severe shortage of inpatient beds and high treatment costs, which are contributing to new rates of untreated mental illness. Newly implemented initiatives such as CARE Court aim to provide court-ordered treatment and housing support, but data has shown limited participation relative to the projected need. This research highlights how underfunded community care options have contributed to over-reliance on emergency treatment and court-ordered treatment. Through this analysis, the gaps in California's mental health system will be highlighted, allowing further research into how these issues can be addressed.

PRESENTER: ANGEL TANG, PSYCHOLOGY
FACULTY MENTOR: DR. REBEKAH RICHERT, PSYCHOLOGY
PROJECT TITLE: THE ROLE OF LANGUAGE ENGAGEMENT IN BILINGUAL CHILDREN'S RELIGIOUS FAITH DEVELOPMENT

Abstract: Language critically shapes religious identity and practices and plays a significant role in understanding multilingual children's religious development. The current study investigated how bilingual children's linguistic preference in religious contexts influences the development of their religious identity. Participants were 20 bilingual Chinese- and English-speaking middle schoolers ($M = 12.692$, $SD = 1.008$), who reported their language use across religious contexts and their religious connections. A One-way Analysis of Variance revealed that children's religious identity differed significantly based on their language use in both personal ($F(2, 17) = 5.47$, $p = 0.01$, $\eta^2 = 0.39$) and church contexts ($F(1, 18) = 6.55$, $p = 0.01$, $\eta^2 = .27$). Additionally, specific language pairing patterns across contexts were significantly different in religious identity ($F(5, 14) = 5.50$, $p = 0.005$, $\eta^2 = 0.66$). Contrary to our hypothesis, post hoc comparisons showed that children who used English in both contexts reported significantly lower religious identity than those who used English in church and Cantonese in personal prayers ($p = 0.04$). Furthermore, children who used both languages across both contexts reported higher religious identity than those who used only one language in at least one of the contexts ($p = 0.04$). Together, these findings show that bilingual children's linguistic engagement patterns across religious

settings shape the development of their religious identity, extending existing literature on the understanding of language as a key religious development factor and motivating future studies to extend research in exploring other linguistic patterns to children' religious developments.

PRESENTER: SAMANTHA TERRIQUEZ, POLITICAL SCIENCE
FACULTY MENTOR: DR. YASMINE IREPOGLU CARRERAS, POLITICAL SCIENCE
PROJECT TITLE: FORCIBLE DISPLACEMENT

Abstract: As an intern at the Political Violence Lab, I developed substantive knowledge regarding the global refugee system. Analyzing numerous World Refugees School (WRS) reports from the 1980's to the present day has educated me on international conflict and humanitarianism. With this understanding, I completed different data and research tasks. For example, I built datasets using the United Nations High Commissioner (UNHCR) for Refugees Executive Committee funding reports to organize the allocation of resources to different solutions, such as repatriation, rehabilitation, and local integration, in countries of need. This exposed the political matters in which countries receive greater or lesser funding from other countries, and from which donors specifically. I also extracted and reformatted text from the U.S State Department Human Rights Reports to save for reference in further academic research on forcible displacement. For much of my internship, using information gathered from WRS and UNHCR, I was assigned over 20 refugee dyads (a set of an origin country and 2-5 host countries) to assess nationals in the host countries. Next, I coded various variables such as refugee and asylum seeker counts, forced and/or voluntary repatriation, gender-based violence, poor conditions in and outside camps, and violence/tension with locals. Altogether, this internship provided me with a vast understanding of global refugees and the politics surrounding them. I'm now deeply invested and passionate about these matters and intend to pursue this work in my future career.

PRESENTER: WESLEY TING, PUBLIC POLICY
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: ADVANCING PLAY EQUITY THROUGH RESEARCH, OUTREACH, AND COMMUNITY PARTNERSHIP

Abstract: No abstract submitted

PRESENTER: ANTONIO TORRES, PUBLIC POLICY
FACULTY MENTOR: DR. CHIKAKO TAKESHITA; SOCIETY, ENVIRONMENT, AND HEALTH EQUITY
PROJECT TITLE: THE RHETORIC OF AUSTERITY: A COMPARATIVE ANALYSIS OF POLITICAL DISCOURSE AND HIGHER EDUCATION FUNDING (1980-1989)

Abstract: Public higher education in the United States has undergone a structural transformation with a massive transfer of costs from the state to the student. While the economic impact of this "cost-shift" are well documented in research, the political communication strategies utilized to legitimize this divestment remain under-analyzed. This capstone project tests the hypothesis that austerity policies were preceded by a measurable shift in executive rhetoric. Using a Mixed Methods Design, this study introduces the Negative Metaphor Density Index (NMDI), a quantitative metric designed to measure the saturation of "market-based" and "burden" framing in gubernatorial discourse. A comparative analysis of nine U.S.

states (N=9) reveals a robust, statistically significant negative correlation ($r = -0.81$, $p = .008$) between the negative rhetorical density gathered and per capita funding levels. Linear regression modeling indicates that rhetoric functions as a leading indicator for policy retrenchment; States like Florida that adopted a "Taxpayer Burden" narrative saw significantly steeper funding declines than states like California that maintained "Public Good" framing. These findings challenge the assumption that budget cuts were purely economic inevitabilities, arguing instead that they were the result of a deliberate, Agenda Setting, strategy that reconstructed the public university as a private commodity. By quantifying this ideological pivot, the study demonstrates that the privatization of the university began not in the ledger, but in the language. Ultimately, these findings provide a critical historical baseline, suggesting that contemporary debates over tuition and debt are the enduring echo of this foundational rhetorical shift.

PRESENTER: CODY TRANG, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: *DISCO ELYSIUM*: MARKET, PERIPHERY, AND ARTISTIC DISSONANCE

Abstract: In 2019, ZA/UM published *Disco Elysium*, an isometric role-playing game that swept the Game Awards that year for its complex narrative and its gameplay innovations within the role-playing genre. The brainchild of Estonian authors Robert Kurvitz and Kaur Kender, *Disco Elysium* was first and foremost an artistic endeavor, a way to convey their understanding of substance abuse, politics, and their experience of post-Soviet life through the video game medium. As the game expanded in scope and complexity, so too did ZA/UM, ultimately growing beyond the lead creators themselves with their eventual firing in 2021, owing to the company's increasing financial stakes, personality conflicts, and the contradictions of creating art as a commodity.

This paper uses *Disco Elysium* as a case study in the tension between art and commerce in the games industry. Drawing on interviews, investigative documentaries, alongside scholarship on creative labor and cultural production in the game industry and peripheral value chains, this paper argues that *Disco Elysium*'s story is not an anomaly but an illustration of structural contradictions within video game production. The very success that validated the game's artistic ambitions also created financial stakes and institutional pressures that ultimately displaced the artists themselves. By tracing this trajectory, the paper examines what *Disco Elysium* reveals about authorship, ownership, and the limits of artistic autonomy in an industry where creative vision depends on capital it cannot control.

PRESENTER: MASON TSANG, ECONOMICS
FACULTY MENTOR: DR. UGO ANTONIO TROIANO, ECONOMICS
PROJECT TITLE: THE EFFECT OF THE 2017 TAX CUTS AND JOBS ACT'S CORPORATE TAX RATE ADJUSTMENTS ON FIRM INCOME AND PROFITABILITY

Abstract: This research paper analyzes the consequences of adjusted corporate tax rates and seeks to determine what system of tax adjustments can lead to the most growth from firms. The research will focus on the 2017 Tax Cuts and Jobs Act and assess the implications of the corporate tax rate adjustments on firms' net income, profitability, and U.S. tax revenue. By conducting difference in differences regression analyses using United States firms as the treatment group and Canadian firms as the control group, this paper will present and explain data regarding the complex relationship of the tax rate overhaul from the 2017 Tax Cuts and Jobs Act and firms within the United States. The dependent variables that are analyzed in our empirical model are the net income and profitability of firms. Understanding how the

corporate tax adjustments within the 2017 Tax Cuts and Jobs Act affect these dependent variables contributes to a better understanding of the corporate sector's elasticity but also lays the foundation for future fiscal policy.

PRESENTER: PETER VALDEZ, POLITICAL SCIENCE
FACULTY MENTOR: DR. YASEMIN IREPOGLU CARRERAS, POLITICAL SCIENCE
PROJECT TITLE: EXPERIENTIAL LEARNING IN WASHINGTON: INSIGHTS FROM UCDC AND ADST

Abstract: This presentation reflects my experience as an intern with the Association for Diplomatic Studies and Training (ADST) while participating in the University of California Washington Center (UCDC) program. During this internship, I engaged directly with the professional world of diplomacy, public service, and historical preservation, gaining insight into how practitioners document and analyze U.S. foreign policy. My work involved supporting oral history projects, assisting with research and archival tasks, observing how firsthand accounts from diplomats contribute to scholarship, education, and policy understanding, and gaining exposure to congressional processes through policy briefings, legislative research, and observation of how diplomatic perspectives inform legislative discussions. This experience deepened my understanding of how personal narratives and lived experiences contribute to the study of international relations. The internship also strengthened my professional skills, including research, communication, and analytical thinking, while exposing me to the collaborative environment of a policy-focused nonprofit.

This symposium talk will discuss how experiential learning in Washington, D.C. bridges academic study and real-world application, highlighting key lessons about diplomacy, institutional knowledge, and career pathways in public service. More broadly, it demonstrates how internships like ADST provide students with practical exposure to policy work, helping them connect classroom concepts to the institutions and individuals who shape global affairs.

PRESENTER: CARMEN VAN IZQUIERDO, DANCE
FACULTY MENTOR: DR. HEATHER RASTOVAC AKBARZADEH, DANCE
PROJECT TITLE: CULTURAL CARETAKING: CONTEMPORIZING PERUVIAN DANCE IN THE DIASPORA

Abstract: In this project, I analyze the collaboration of traditional Peruvian dance styles with modern and contemporary aesthetics and techniques, arguing that these intersections reveal an ongoing process of cultural caretaking. I specifically focus on Marinera, Festejo, and Andean dance styles to query how they have sustained tradition over time. Through my analysis of a dance video by Peruvian choreographer and dancer Fredi Ghoul, which melds Peruvian styles and influences with contemporary/modern aesthetics, my presentation intervenes into assumptions that traditions exist only outside contemporary experimentation. Ghoul's choreography raises the question not of whether such blending should occur, but how it simultaneously takes place without diminishing the embodied knowledge and cultural grounding that these forms carry. I further ask: How do these hybrid aesthetics speak to culture and sociality through time? Why is there a misconception that contemporary movements cannot be culturally based? Through examining the understudied topic of contemporary dance in Peru, this analysis helps further understanding of culture, gender, and social norms in Peru, among other aspects of Peruvian life and culture. In the process, this analysis can also help people outside of Peru – those who are part of the culture and those who are not—find connection, understanding, and respect for Peruvian culture.

PRESENTER: JACQUELINE VARGAS, PSYCHOLOGY
FACULTY MENTOR: DR. RAYMUND PAPICA, UNIVERSITY WRITING PROGRAM
PROJECT TITLE: *SILENCE AT LAST*

Abstract: Betrayal. Wrath. Secrets. At age fifty-four, Matthew Wilson decides to start anew by leaving his old life in Los Angeles, California, to pursue a reinvention in Govan, Washington. Hoping to outrun the ruins of his failed marriage with his ex-wife, Adeline, and now separated from his grandchild, Weston, Matthew trusts that seclusion in an unfurnished house will silence the noises in his head.

Govan is not the serenity he hoped for. It is a ghost town where he frequently encounters his neighbor, Mateo Garcia, an 11-year-old boy and the boy's mother, Carmen, who repeatedly searches for her "missing" son. Although Wilson chooses to dismiss the oddities, he comes to terms with the eeriness. Objects in his new home begin to move, shadows crawl within the empty rooms, and mysterious messages appear. When his paranoia begins to consume him, he is convinced that his torment is the doing of his ex-wife. But Matthew must face a suppressed truth hidden behind the hallway closet door he desperately avoids. Wilson finally understands how Govan's hauntings are echoes of his own voices and how some pasts cannot truly be silenced.

Watching crime documentaries with my uncle shaped my fascination with psychology and darker paths within the mind. During COVID, I discovered my love for writing. My novella, *Silence at Last*, allows me to explore the themes of trauma, identity, and how pain can distort the truth while reshaping personal reality.

PRESENTER: HOLDEN VIGNA, HISTORY
FACULTY MENTOR: DR. MICHELE SALZMAN, HISTORY
PROJECT TITLE: COUNTING SHEEP: DREAMING OF AN AGRICULTURAL ESCAPE IN LATE-REPUBLICAN ROME

Abstract: The latter half of the first century BCE at Rome was filled with constitutional crises and civil wars, but many great works of Latin literature also stem from this period. A survey of key works from ca. 60 to 30 BCE finds that the unrest of this period fueled a fascination with a particular theme, namely that of an idealized rustic, agricultural lifestyle.

This motif emerges across genres, from poetry to philosophy and historiography. We find this motif, for example, in Lucretius' *On the Nature of the Universe*, an epic poem, as well as in Sallust's historical monographs, *War with Catiline* and *War with Jugurtha*. Their imagined natural world is more bountiful, and the same wandering men who live off of it are themselves physically stronger. Such a lifestyle honors traditional Roman values in the face of contemporary corruption and it rejects zealousness for political and military glory as a response to the on-going failures of the Roman state.

For its Roman audience, the idealized rustic world and simpler life provide an escape from current events. Beyond literature, however, this motif became a real, lived experience which provided a genuine alternative to the urban, hyper-political, and hyper-violent world in which the Romans were living. My research contributes to our understanding of Roman cultural history and the ways in which Romans interpreted the present collapse of republican institutions. I conclude that this motif represents not only a literary escape, but offers a collective cultural opposition to the turmoil in late-Republican life.

PRESENTER: NATHAN WANG, NEUROSCIENCE
FACULTY MENTOR: DR. WEIWEI ZHANG, PSYCHOLOGY
PROJECT TITLE: DEVELOPMENT OF A JOURNAL AI WITH APPLICATIONS OF ACCEPTANCE COMMITMENT THERAPY

Abstract: This study examines the integration of machine learning (ML) in journaling to enhance self-reflection, promote client self-awareness, and facilitate improvements in habits and behaviors. The primary objective is to investigate how artificial intelligence (AI) can map and analyze conversational data to derive valuable insights and promote client accountability. We propose a novel AI-driven approach that leverages natural language processing (NLP) through large language models (LLMs) to analyze journaling sessions. The system will implement retrieval augmented generation (RAG) techniques to aggregate information from all previous journals. Further enhancements to the LLM include fine-tuning, hybrid searching, and prompt engineering. The LLM will be fine-tuned using sentiment analysis collected from HuggingFace datasets and other generated journal prompts. The system aims to improve on current journal LLMs that output general therapeutic advice. This project aims to focus the intent of the LLM on sentiment and virtue analysis and bring contradicting values to light when the user is journaling. The machine will not provide direct insight, but that responsibility relies on the user's own self-reflection. The system exists to provide a push without creating machine-driven insight. This work contributes to the emerging field of AI-assisted journaling by providing a practical application of machine learning in mental health domains. The insights gained from this study may inform the development of similar tools for other helping professions, ultimately enhancing the quality and accessibility of supportive services. This project will bridge the gap between data-driven decision-making and the user's ability to self-reflect.

PRESENTER: CHRISTINA WILLIAMS, HISTORY
FACULTY MENTOR: DR. ALEJANDRA DUBCOVSKY, HISTORY
PROJECT TITLE: APOLLO 11: THE COMPLEX REALITY OF RESPONSES TO THE MOON LANDING

Abstract: The Apollo 11 moon landing in July 1969 is celebrated as a moment of national triumph and global wonder, yet public responses to the mission were more complex and contested than popular memory suggests. This project examines both American and international reactions to Apollo 11, analyzing how media portrayals of the mission reflected Cold War tensions, national pride, and skepticism about space exploration priorities. Drawing on UCR Special Collections, this study reveals how the moon landing functioned simultaneously as a unifying national achievement and a divisive symbol of American Cold War priorities. By recovering both celebratory and critical responses, this project challenges triumphalist narratives of Apollo 11 and demonstrates how a single event could generate profoundly different meanings across national and ideological boundaries in an era rife with tension.

PRESENTER: MYA WILSON, HISTORY
FACULTY MENTOR: DR. ALEXANDER HASKELL, HISTORY
PROJECT TITLE: SAME MEANS, DIFFERENT ENDS: MOTOLINÍA AND ALVA IXTLILXOCHITL'S STRATEGIC USE OF NEZAHUALCOYOTL

Abstract: The first friars sent to New Spain had royal orders to evangelize the "infidels" of the territory in order to prepare for the Second Coming of Christ. Engaging in such a task required Franciscans like Fray Toribio de Benavente Motolinía to depend on previously established native systems of government.

Simultaneously, Indigenous nobility recognized that in order to maintain authority after the conquest, they'd need to establish themselves within the colonial order. Thus, not only Motolinía but also Tetzcocan nobleman Fernando de Alva Ixtlilxochitl were faced with a problem of establishing their credibility in order to bring their hopes to fruition. Interestingly, both Motolinía and Alva Ixtlilxochitl employed a similar strategy to execute their goals: bolstering the influence and power of Indigenous *tlatoani* (ruler), Nezahualcoyotl, whose strategical conquest strengthened the city of Tetzcoco's political legitimacy. For Motolinía, Nezahualcoyotl's strict leadership offered him an opportunity to highlight the sophistication of the Tetzcocan people to King Charles V. Meanwhile, Alva Ixtlilxochitl was well aware that his own noble privilege rested on Nezahualcoyotl's military prowess and political success, motivating Alva Ixtlilxochitl to aggrandize Nezhualcoyotl's influence to his contemporaries. By analyzing Motolinía's *1555 Letter to Charles V* and his *Memoriales* as well as Alva Ixtlilxochitl's chronicles, this project explores how Nezahualcoyotl became central to a theory of the Spanish monarchy's role in the "consummation of the world," while also advancing Tetzcocan noblemen's efforts to secure authority in New Spain.

PRESENTER: FABYEN YUMAKAEVA, CLASSICAL STUDIES
FACULTY MENTOR: DR. NATHAN KISH, CLASSICAL STUDIES
PROJECT TITLE: THE EVOLUTION OF HELENUS IN THE TROJAN WAR NARRATIVE: ANTIQUITY THROUGH THE MIDDLE AGES

Abstract: In the three thousand years since the story was born, the heroes of the Trojan War have undergone great literary evolution. One such hero is Helenus, a Trojan prince and prophet of Apollo. His reliability as an augur—a reader of signs—is continuously demonstrated, and his prophetic knowledge is essential to the fall of Troy. Previous scholarly attention has been primarily restricted to Helenus' appearances in Book 3 of Virgil's *Aeneid* or Book 7 of Homer's *Iliad*, but chiefly as an advisor to the major Trojan princes, Aeneas and Hector. Thus, he remains peripheral. I, however, focus on Helenus himself and uncover the complexities of his character, particularly his evolution from warrior to peaceful clergyman. For this thread of research, I analyze two texts: Homer's *Iliad* (ca. 8th century BC) and John Lydgate's *Troy Book* (AD 1420). In the former, in addition to being a prophet, Helenus is a skilled, respected warrior; in the latter he becomes a pacifist and "cowardly priest." This difference is reflective of the shift of ideals over time; from Greek augurs on the battlefield to "pure" and nonviolent Catholic priests. The sharp contrast between Homer's and Lydgate's treatments of Helenus is representative of his greater, dynamic tradition in Greco-Roman mythology, a subject that I intend to make the basis of my future research in a senior thesis and as a graduate student.

College of Natural and Agricultural Sciences

PRESENTER: RYAM ABDULHASAN, BIOLOGY
FACULTY MENTOR: DR. ANA BAHAMONDE, CHEMISTRY
PROJECT TITLE: PHOTOREDOX COPPER CATALYZED AMINE *N*-ARYLATION

Abstract: Carbon-nitrogen (C-N) couplings have an essential role in the production of commodity chemicals. For example, 84% of drugs contain at least one nitrogen atom, with amines and amides being the most common functional groups, and 59% incorporating nitrogen-containing heterocycles. Based on previous literature, C-N cross coupling has been extensively accomplished through palladium (Pd) and nickel (Ni) catalysis which present high costs. This research will focus on developing a new methodology for amine *N*-arylation with an inexpensive copper (Cu)-indole system as catalyst under photochemical conditions. Through multiple chemical experiments in which various laboratory techniques are utilized, a set of conditions will be tested to identify the optimal conditions for increasing product yield. Each reaction parameter like temperature, concentration, and stoichiometry will be investigated in separate experiments to determine their effect on product formation. The project will also explore the role and optimal structure of the indole ligand in the reaction. This optimized reaction will be useful in the pharmaceutical industry utilizing a C-N bond between an aryl and an amine during medicinal drug making.

PRESENTER: ASHLEY AFFLECK, NEUROSCIENCE
FACULTY MENTOR: DR. TREVOR BOLDUC, CHEMISTRY
PROJECT TITLE: THE EFFECT OF MUSIC ON STUDY EFFICIENCY AND MEMORY RETENTION

Abstract: Academic success in large-enrollment STEM courses varies across student populations, and educational support resources are insufficiently established for students facing learning barriers and inequities, contributing to higher attrition rates. This experimental study investigates whether learning outcomes and memory retention can be improved by listening to music in undergraduate organic chemistry courses at the University of California, Riverside (UCR). The goal is to determine whether music can serve as an accessible, low-cost tool to enhance performance and study habits in challenging STEM courses.

Participants are recruited from UCR organic chemistry classes and randomly assigned to a music intervention or a control group. The intervention group includes two conditions: (1) classical music and (2) pop music, each played during non-graded Qualtrics quizzes. The control group completes the same quizzes without music. These quizzes—separate from the course assessment structure—are administered throughout the academic quarter to measure short-term and long-term student performance. Quiz results, course grades, prior general and organic chemistry performance, and survey feedback will be analyzed to compare outcomes between groups. Analyses will control for prior performance and demographics to isolate music's effect on learning outcomes.

This study aims to address a gap in existing literature by investigating how music influences learning and memory in real-life STEM classroom settings. Furthermore, it explores the impact on grades, student persistence, and sustained enrollment in undergraduate STEM courses. The findings are expected to advance understanding of cognitive strategies supporting student success and provide evidence-based approaches to improve enrollment and academic equity in undergraduate STEM education.

Presenter: Simrah Ali, Microbiology
Additional Presenter: Tanish Singh, Biology
Faculty Mentor: Dr. Ahmed El-Moghazy, Microbiology and Plant Pathology
Project Title: Nanovesicles from Avocado Processing Waste as Sustainable Antimicrobial Nanoplatforms for Food Safety

Abstract: Plant-derived nano vesicles (PDNVs) are nanoscale lipid bilayer particles capable of transporting diverse bioactive molecules and are gaining growing attention as sustainable antimicrobial agents. This study investigates the extraction of PDNVs from avocado (*Persea americana*) processing byproducts, an abundant agricultural waste stream, and evaluates their antimicrobial activity against foodborne pathogens. Valorization of avocado byproducts as a source of functional antimicrobial platform materials offers a promising approach aligned with circular bioeconomy and sustainable food safety strategies. PDNVs were isolated from avocado peel and pomace using a scalable protocol that involved tissue homogenization, filtration and centrifugation to enrich nanoscale vesicle populations. Ongoing work focuses on optimizing extraction conditions and assessing vesicle yield, stability, and physicochemical properties. Antimicrobial activity will be evaluated against representative foodborne pathogens, including *Escherichia coli* and *Listeria monocytogenes*, using viable cell enumeration and minimum inhibitory concentration (MIC) assays. Preliminary results indicate that avocado peel yields higher quantities of PDNVs compared to avocado pomace, identifying peel as the potential source material for vesicle recovery. Subsequent phases will develop curcumin-loaded avocado PDNVs hybrids and assess visible-light–activated antimicrobial activity against foodborne pathogen models. Overall, this work demonstrates the promise of agricultural waste–derived EVs as natural, sustainable antimicrobial agents and supports their application in food safety interventions and nano-enabled packaging systems.

Presenter: Samuel Alston, Biochemistry
Faculty Mentor: Dr. Pingyun Feng, Chemistry
Project Title: Pore Space Partitioned Metal Organic Frameworks with Pyridine-Based Ligands for Gas Sorption and Separation

Abstract: Metal-Organic Frameworks (MOFs) are a class of crystalline porous materials composed of metal clustered interconnected by organic linkers. These materials can function as tunable hosts capable of selectively interacting with guest molecules for gas sorption and separation. In this study, a series of partitioned-acs (pacs) MOFs were synthesized using the pore-space partition (PSP) strategy to divide their porous cavities with pyridine-based trimodal ligands. Multiple mixed-metal trimers, carboxylate linkers, and pore-partitioning ligands such as 2,4,6-tri(4-pyridyl)-1,3,5-triazine (TPT), Tri(pyridine-4-yl)amine (TPA), and tris(pyridin-4-ylmethyl)amine (TPMA), were employed to synthesize pacs MOFs to demonstrate precise control over pore size and geometry within the pacs platform for gas sorption and separation. Tailoring the partitioning ligand enabled dramatic molecular selectivity. Vapor-phase selectivity for benzene over cyclohexane increased from 4.5 in CoV-BDC-TPT to 482.5 in CoV-FA-TPA, showcasing effective pore space portition. Building upon this tunability, pacs utilizing the flexible ligand TPMA were synthesized with dicarboxylate ligands of varying length to systematically compress the pore space of the material. Single crystal X-ray diffraction revealed that geometric compression resulted in a coordination transition of TPMA from a tritopic spiral structure to a ditopic configuration. This response significantly altered the pore space dimensions and surface areas of the material. Gas sorption studies showed strong structure and property correlations, with the compressed CoV-BCP-TPMA exhibiting enhanced C_2H_2/CO_2 selectivity. These results demonstrate that PSP-enabled geometric control can govern pore architecture, and selective hydrocarbon separations.

PRESENTER: LAKSH ATHAPPAN, BIOCHEMISTRY
FACULTY MENTOR: DR. LUCIANO COSME, ENTOMOLOGY
PROJECT TITLE: TRANSCRIPTOMIC VALIDATION OF DENGUE VECTOR COMPETENCE GWAS CANDIDATES IN *AEDES AEGYPTI*

Abstract: Dengue virus, transmitted primarily by *Aedes aegypti* mosquitoes, causes approximately 400 million infections annually. Genome-wide association studies (GWAS) have identified genomic loci associated with vector competence, yet the functional mechanisms underlying these genetic associations remain unclear. This study bridges the gap between genetic association and molecular function by examining whether GWAS-identified candidate genes exhibit differential expression during Dengue infection.

We analyzed two independent RNA-sequencing datasets: GSE222893 (whole-body, 18 samples across three post-infection timepoints) and PRJNA729510 (midgut tissue, 6 samples at 60 hours post-infection). Raw FASTQ files were processed using the nf-core RNA-seq pipeline, which aligned reads to the AaegL5 reference genome and quantified gene expression. GWAS candidate genes were cross-referenced against differentially expressed gene lists to identify genes showing both genetic association and functional expression changes during infection.

Genes demonstrating significant differential expression in both datasets represent high-confidence candidates in which genetic variation may directly influence DENV susceptibility by altering gene regulation. Conversely, GWAS candidates lacking expression changes suggest alternative mechanisms such as protein-level effects or non-coding regulatory variation. Results were contextualized using epidemiological data from the GIDEON database to assess potential translation to vector control strategies.

This integrative approach validates GWAS findings through functional genomics, advancing our understanding of mosquito-virus interactions and identifying potential molecular targets for Dengue control interventions.

PRESENTER: VARSHINI BALAJI, MICROBIOLOGY
FACULTY MENTOR: DR. JASON STAJICH, MICROBIOLOGY AND PLANT PATHOLOGY
ADDITIONAL CONTRIBUTORS: JESSICA WU-WOODS AND MIA MIYATAKE
PROJECT TITLE: THERMAL AND HEAVY METAL TOLERANCE OF ENDOLITHIC FUNGAL COMMUNITIES IN DESERT SANDSTONE ROCKS.

Abstract: Extremophilic microbial communities are vital in understanding the various biological mechanisms that allow microorganisms to survive in harsh environments. Our project aims to identify the endolithic fungal community composition present in desert rocks sampled from Southwestern US deserts and analyze their resistance to toxic heavy metals and high heat. The sampled rocks are sandstone rocks from the Valley of Fire State Park and the Burns Piñon Ridge Reservoir. Rocks were chosen from both locations, and fungal isolates have been grown from rock dust collected from the interior. 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. We have already identified 56 isolates from these communities; these isolates will be exposed to varied concentrations of Iron and

Copper as well as a range of heat temperatures to test their sensitivity to extreme environmental conditions. Survivability will be measured via growth observations and measuring CFUs after plating. Based on preliminary results, we hypothesize that the two communities will have similar compositions of extremophilic fungi that can survive the harsh conditions. We also hypothesize that certain melanin-containing isolates will have greater survivability in extreme conditions due to the presence of the certain pigments that may help with resistance.

PRESENTER: ANIKA BHUSHAN, MATHEMATICS
ADDITIONAL PRESENTER: BRANDON CHOI, MATHEMATICS
FACULTY MENTOR: DR. WEITAO CHEN, MATHEMATICS
PROJECT TITLE: EFFECTS OF DIFFERENT KERNEL FUNCTIONS IN BAYESIAN OPTIMIZATION METHOD APPLIED TO MODEL CALIBRATION FOR SHOOT APICAL MERISTEM

Abstract: To maintain stem cell homeostasis in the *Arabidopsis* shoot apical meristem, it is critical to maintain precise regulation of the WUSCHEL(WUS) - CLAVATA3(CLV3) loop. The physical model built to associate with the interaction integrates this same transcriptional and post-translational regulation; however, it is computationally expensive to calibrate using conventional search methods due to its high-dimension and nonlinear parameter space. In this study, we use Bayesian Optimization (BO) to efficiently search for parameter sets for our physical model that reproduces the WUS and CLV3 gradients throughout the cell layers found from experimental data. We are primarily focusing on exploring how different kernel functions in the Gaussian Process Regression (GPR) surrogate model affect its performance. We test several commonly used kernels: Radial Basis Function (RBF), Matérn (1/2, 3/2, 5/2), Rational Quadratic, Exponential, and ARD variants. Kernels such as RBF capture smoother functions, while Matérn kernels work well with irregular functions. Since different kernels assume properties about the regularity of a function space, we measured performance based on the surrogate accuracy, acquisition behavior, and convergence speed. We want to understand how kernel selection impacts both the accuracy of the surrogate function and the stability of the optimization. We hypothesize that the selection of kernels will improve the reliability of Bayesian Optimization for complex biological model calibrations.

PRESENTER: ELOISA BUENAVENTURA, CHEMISTRY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
PROJECT TITLE: COMPARING DIFFERENT J-DOMAIN PROTEIN AFFINITY PROFILES

Abstract: No abstract submitted

PRESENTER: AXEL BUSCH CASTRO; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. JULIA BAILEY-SERRES, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: DR. SYED ADEEL ZAFAR, BOTANY AND PLANT SCIENCES
PROJECT TITLE: UNDERSTANDING THE ROLE OF *WOX10* GENE IN ROOT XYLEM PLASTICITY UNDER DROUGHT

Abstract: Rice is a major staple crop, feeding over half the global population. Due to being typically grown in flooded "paddy" fields, it has evolved to be a drought-sensitive crop. Climate models predict an increase in the frequency and severity of drought, posing a growing threat to global rice production. Rice can alter its root anatomy in response to drought. This plasticity includes changes in number and size of

xylem vessels, which are the main water transport channels in plants. Thus, understanding the molecular regulation of root xylem plasticity is critical in engineering drought-resilient root phenotype. Previously, our group identified several genes encoding transcription factors including *WOX10* that are predicted to control root xylem plasticity using cell-type-specific gene expression profiling of rice roots. To confirm the role of *WOX10* gene in root xylem plasticity, we used CRISPR-Cas9 genome-editing tool to develop loss-of-function mutants of *WOX10*, making abnormal WOX10 protein. Comparative imaging of root cross sections of *wox10* mutant and the wild-type (normal) rice roots has shown altered root xylem patterning in *wox10* under drought, confirming an important role of *WOX10* gene in root xylem plasticity. To further understand the molecular role of *WOX10* in transcript, a genome-wide gene RNA expression analysis (transcriptome) of roots from well-watered and droughted plants is underway. This should uncover downstream targets and molecular pathways controlled by *WOX10*.

PRESENTER: ANDREW BYRD, BIOLOGY
FACULTY MENTOR: DR. SYDNEY GLASSMAN, MICROBIOLOGY
ADDITIONAL CONTRIBUTORS: ESBEIRY CORDOVA-ORTIZ, MARIA ORDONEZ, AND EHSAN SARI
PROJECT TITLE: CHARACTERIZING THE POTENTIAL OF PYROPHILOUS BACTERIA TO PRODUCE AND BREAKDOWN ORGANIC ACIDS

Abstract: Wildfires are becoming more frequent, severe, and widespread across earth. Wildfires have large impacts on soil microbiomes, often reducing biomass and richness substantially and altering composition such that pyrophilous or fire loving microbes that were rare or absent prefire become more prevalent. Fire can alter the nutrient cycle by creating hard to break down aromatic compounds including pyrogenic organic matter (PyOM). Bacteria play a key role in nutrient cycling through its metabolic processes including the potential breakdown of PyOM, producing more bioavailable forms of carbon. We isolated pyrophilous bacteria from burned soils and smoke after fires in Southern California, and we selected a subset of 20 to characterize their traits. The production of organic acids may enable pyrophilous bacteria to lower the elevated post-fire pH, thereby facilitating the rapid turnover of the burnt soil microbiome and enhancing the breakdown of PyOM. We tested the production of organic acids with Leifson's oxidative-fermentation (OF) media, and the consumption of organic acids using Simmons Citrate Acid (SCA) media, which both show color changes in response to pH changes. Of the 20 pyrophilous isolates tested, 13 changed the color of the OF media indicating a production of organic acid. In contrast, only 2 changed the color of the SCA test, indicating consumption of organic acids. Our results indicate that organic acid production, not consumption, is common among pyrophilous bacteria, suggesting that these bacteria might produce acid as a strategy to counteract elevated post-fire pH and create conditions favorable for microbial succession and PyOM degradation.

PRESENTER: MELYSSA CABRERA, MICROBIOLOGY
FACULTY MENTOR: DR. AMIR VERDI, ENVIRONMENTAL SCIENCES
PROJECT TITLE: EVALUATING THE EFFECTS OF PLANT CHOICE AND IRRIGATION MANAGEMENT ON ENVIRONMENTAL COOLING POTENTIAL OF GROUNDCOVERS

Abstract: As climate change continues to intensify, California faces increasing drought, wildfire risk, and elevated urban temperatures driven by the urban heat island (UHI) effect. Urban vegetation is widely recognized for its cooling potential; however, limited data exist on how irrigation rates and application methods influence the cooling behavior of groundcover species. This study evaluates the irrigation induced cooling potential of plant species used for urban groundcovers by optimizing irrigation rates

through two applications: drip and sprinkler.

Eight native and non-native groundcover species were evaluated on an experimental field located in Riverside, CA, USA. A randomized plot design consisting of 144 plots was used to test three reference evapotranspiration (ETo)-based irrigation treatments (20%, 40%, and 60% ETo) applied to drip and sprinkler irrigation methods. Monthly measurements of albedo (ratio between 0 to 1), air temperature (°C), surface temperature (°C), and Normalized Difference Vegetation Index (NDVI) values were collected to assess cooling performance and vegetation condition.

The results showed that albedo fluctuation on the three ETo-based irrigation rates remained consistent within each species across irrigation treatments, averaging approximately 0.20, suggesting that irrigation rate had minimal influence on surface reflectivity. *Cistus × skanbergii 'Light Pink'* exhibited the greatest cooling effect, with the lowest mean canopy temperature of 31.47 °C. Higher irrigation rates generally enhanced cooling, though results differed between drip and sprinkler systems, indicating that the irrigation application plays a significant role in modulating plant cooling efficiency. This study highlights a species-specific trade-off between maximizing cooling potential while minimizing water use.

PRESENTER: PEISHAN CAI, CHEMISTRY
FACULTY MENTOR: DR. RYAN JULIAN, CHEMISTRY
PROJECT TITLE: PHOSPHOROUS UPCYCLING FROM COLLISIONAL ACTIVATION OF GAS-PHASE PHOSPHATE CLUSTERS

Abstract: Polyphosphates are energy-rich phosphate assemblies central to biological energy storage and widely used in industrial applications, yet their synthesis remains environmentally unfriendly and mechanistically under-explored. Existing solution-phase and solid-state synthetic methods involve multiple coupled chemical processes, preventing direct observation of the elementary steps that govern phosphate chain growth. As a result, the mechanistic factors that control whether phosphate units successfully condense into extended chains remain unknown. Resolving these elementary processes is therefore essential for developing more efficient and sustainable strategies for polyphosphate synthesis, and gas-phase ion chemistry offers a solvent-free platform to isolate individual phosphate condensation steps.

Phosphate salt clusters were generated by negative-mode electrospray ionization and analyzed using multistage tandem mass spectrometry (MS^n) with collision-induced dissociation. Continuous ion trapping enabled repeated activation of the same ion cluster population, allowing fragmentation behavior to be monitored across successive MS^n stages. Preliminary experimentation revealed two competing fragmentation pathways of -18 Da loss corresponding to dehydration and -98 Da loss matching a phosphoric acid unit. To assess whether this behavior was ion-dependent, comparative experiments were performed with different counterions. Clusters containing singly-charged cations (Na^+, K^+, Li^+) exhibited dominant -18 Da loss, enabling cumulative dehydration across successive activation steps. In contrast, clusters containing doubly-charged or transition metal cations (Mg^{2+}, Ba^{2+}) preferentially undergo -98 Da phosphate loss, limiting dehydration and truncating chain growth. These results demonstrate gas-phase mass spectrometry as a mechanistic platform for resolving intrinsic factors that govern productive versus truncating phosphate condensation pathways, with implications for more efficient and sustainable industrial polyphosphate synthesis.

PRESENTER: NAYAN CAMALON, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. ANSON D'ALOISIO, PHYSICS AND ASTRONOMY
PROJECT TITLE: REGULATING THE IONIZING OUTPUT OF GALAXIES WITH REIONIZATION

Abstract: The epoch of reionization marks a major transition in our cosmological history when the first ionizing sources transformed the intergalactic medium (IGM). Over the past decade, observations of high-redshift quasars have improved to the point of tightly constraining the Lyman-alpha forest transmission between z = 5 and 6. Interpreting these measurements with simulations, recent studies have suggested that the cosmic ionizing emissivity evolves during this period, potentially sharply, and coinciding with the end of reionization. The cause of this evolution remains unknown. In one proposal, it results from the suppression of star formation owing to reionization's photo-heating of the IGM. Using theoretical models, I will discuss this proposal, its parameter space, and ways to test it.

PRESENTER: ALEXIS CASTANEDA, STATISTICS
FACULTY MENTOR: DR. ELIA SCUDIERO, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTORS: FRANCESCO MORBIDINI AND BHAWANA ACHARYA
PROJECT TITLE: PORTABLE L-BAND RADIOMETRY AND MACHINE LEARNING TO MONITOR SOIL MOISTURE AT HIGH RESOLUTION IN A MICRO-IRRIGATED CITRUS ORCHARD

Abstract: Accurate, high-resolution soil moisture (SM) monitoring is essential for advancing precision irrigation in specialty crops. Currently, stationary in-situ sensors such as Time Domain Reflectometry (TDR) are used by farmers and practitioners to measure SM. These stationary measurements are generally accurate but not representative of SM variability unless sensors are deployed in large numbers, which is cost-prohibitive. This study investigates whether a novel Portable L-Band Radiometer (PoLRa), a passive microwave sensor that detects natural microwave radiation emitted by soil/vegetation, can be used to estimate SM at high spatial resolution (< 2m). The research was conducted in a 1-acre micro-irrigated navel orange orchard (*Citrus x sinensis* Osbeck) at the University of California, Riverside, during 13 surveys between March and April 2025. Ground-truth volumetric water content (%) measurements were made using a handheld TDR (TDR350, FieldScout) sensor at 9-11 spatially dispersed locations per survey (133 total). The PoLRa recorded data for a minute at each location from the side of an all-terrain vehicle (~1.5m above ground, at a 45° angle). We observed a strong linear correlation (r = -0.84) between soil microwave emission and TDR. Random forest, support vector machine (SVM), and XGBoost regression models were tested using PoLRa-derived predictor variables. SVM regression yielded the lowest mean (from a 500-iteration Monte Carlo random cross-validation) root mean square error of 4.13%. Our research suggests the PoLRa is a promising tool for accurate SM monitoring. However, further research is needed to determine its success across different soil types, canopy sizes, and environmental conditions.

PRESENTER: JUSTIN CHAO, BIOLOGY
FACULTY MENTOR: DR. WENDY SALTZMAN; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: CHRISTIAN TAN
PROJECT TITLE: PRELIMINARY ANALYSIS OF PLANT-FOCUSED NUTRITION IN PATIENTS WITH DIABETES AND CHRONIC KIDNEY DISEASE (PLAFOND)

Abstract: Chronic kidney disease (CKD) affects 10-15% of U.S. adults, and approximately 30-40% of individuals with diabetes mellitus (DM) also have CKD. High-protein diets with significant animal protein content are linked to glomerular hyperfiltration, which can accelerate the decline of renal function

in these patients.

There is significant controversy regarding the risks versus benefits of plant-based diets for those with CKD/DM. Current clinical guidelines are often based on expert opinion rather than rigorous data, leading to conflicting recommendations on protein sources. Major concerns involve whether plant-based diets might trigger protein-energy wasting or hyperkalemia.

We propose a pilot feasibility randomized controlled trial to establish rigorous evidence for dietary interventions.

The trial will involve 120 patients with stage 3-5 CKD/DM over a six-month period. It compares a plant-focused diet (0.6-0.8 g/kg/d protein, >2/3 plant-based) against the standard-of-care renal diet (<1/3 plant-based).

We evaluate dietary adherence and separation at three and six months, and monitor nutritional status, body composition, and glycemic measures using continuous glucose monitoring alongside traditional metrics and motivational interviewing.

This study will provide essential feasibility and safety data required for larger multi-center trials. The findings aim to reinvigorate the role of nutrition in CKD/DM management, potentially slowing disease progression and improving patient-centered outcomes.

PRESENTER: EVA CHEN, CHEMISTRY
FACULTY MENTOR: DR. KEVIN KOU, CHEMISTRY
PROJECT TITLE: ASYMMETRIC TOTAL SYNTHESIS TOWARDS NORCRASSIN A

Abstract: Norcrassin A is a tetranorditerpenoid isolated from *Croton crassifolius* that features an unusual 5/5/5/6 tetracyclic framework and is a potential lead for Alzheimer's disease therapeutics. This project seeks an efficient asymmetric synthesis of norcrassin A (and its epimer) from cost-effective starting materials to enable future structure–activity relationship studies. Our strategy integrates tandem transformations with enzymatic resolution, highlighted by a planned one-pot aldol/aldol/lactonization sequence that forges three bonds in a single operation. To advance this plan, we established a practical access to key enantioenriched building blocks. A dimethylated cyclohexenol intermediate was prepared via α-methylation of cyclohexenone with methyl iodide mediated by lithium diisopropylamine/hexamethylphosphoramide, followed by nucleophilic addition to the ketone with a methyllithium lithium bromide complex. This sequence produced four stereoisomers (dr = 2:1). Extended silica-gel column chromatography separated the mixture into two racemic diastereomeric fractions. Comparison of their proton nuclear magnetic resonance (^{1}H NMR) spectra and preliminary nuclear overhauser effect spectroscopy (NOESY) correlations support tentative assignment of the major fraction as the *trans*-dimethyl isomer and the minor fraction as the *cis*-dimethyl isomer; additional NOESY experiments are planned for confirmation. Each diastereomer was advanced through a vanadium-mediated 1,3-transposition of an allylic alcohol and then subjected to Novozyme 435-catalyzed (*R*)-enantioselective esterification, furnishing two enantioenriched esters with distinct optical rotations ($[\alpha]_D$ +72.9 and +23.7). Enzyme loading was optimized to 50 mg per mmol of substrate. Racemic reference compounds are being synthesized via pyridinium chlorochromate oxidation, lithium aluminum hydride reduction, and a Johnson–Claisen rearrangement to enable future enantiomeric excess measurements and guide optimization toward the naturally occurring enantiomer of norcrassin A.

Presenter: Alekhya Chippada, Neuroscience
Faculty Mentor: Dr. Vijilakshmi Santhakuma; Molecular, Cell, and Systems Biology
Project Title: Role of LC Modulation of DG in the Regulation of Dentate Excitability and Seizure Susceptibility

Abstract: The dentate gyrus (DG) is the first relay station in the hippocampus, receiving inputs from the cortex and relaying them to the other hippocampal subfields. Inhibitory neurons in the DG maintain low network excitability and limit the propagation of hyperexcitable signals or seizures. In addition to the local circuit, external circuits can influence DG activity levels through long-range projections. One such projection is from the locus coeruleus (LC), a region responsive to stress that releases noradrenaline in response to acute stress. Stress is a known trigger for seizure onset in both clinical and animal studies.

In the present study, combining acute restraint stress induction, immunohistochemistry (IHC) staining, and kainic-acid-induced seizure, we investigated the effect of stress on the neuronal excitability in the DG and LC areas and s on the seizure threshold. Our data revealed elevated cFos expression in the LC, indicating increased neuronal activity. Furthermore, the hippocampal DG area was co-activated by acute stress. Finally, stress induction shortened the latency to the onset of kainic-acid-induced seizures. Taken together, our data reveal co-activation of the LC and DG in response to stressors, suggesting a neuromodulatory regulation of DG excitability by LC inputs, which promotes seizure onset.

Presenter: Audrey Choi, Biology
Faculty Mentor: Dr. Prue Talbot; Molecular, Cell, and Systems Biology
Additional Contributors: Rattapol Phandthong, Mohamad Kudsi, Brianna Ramirez, Marianne Elias, Maria Nashed, and Teresa Martinez
Project Title: Quantitative Assessment of Airway Remodeling and Genotoxic Stress in 3D Human Tracheobronchial Epithelium Induced by Nicotine and Nicotinamide Electronic Cigarette Aerosols

Abstract: This work quantitatively assessed concentration-dependent airway remodeling and DNA damage induced by nicotine- and nicotinamide-containing electronic cigarette (EC) aerosols using a three-dimensional (3D) human tracheobronchial epithelial tissue (hTET) model.

While EC aerosols contain chemical mixtures capable of producing adverse effects in the airway epithelium, quantitative evaluation of airway pathology remains limited. To address this gap, airway remodeling and injury were quantified using a multiparametric assay, including immunofluorescence of secretory mucins, squamous differentiation, cilia loss, and DNA damage. Morphometric endpoints included epithelial thickness and nuclear orientation. This 3D hTET model enables monitoring of squamous metaplasia (SM) progression and exposure-induced airway pathology.

Little is known about the effects of emerging "nicotine-free" alternatives on the human respiratory system. Nicotinamide-containing EC formulations, such as Nixotine®, are increasingly marketed as safer substitutes for nicotine; however, their effects on airway epithelial fate and genomic stability are unknown. This study demonstrated that nicotinamide-containing EC aerosols generally produced pathological and genotoxic responses comparable to nicotine-containing aerosols. The induction of SM by Nixotine is important as SM impairs normal epithelial functioning and can progress to squamous cell

carcinoma. These data are relevant for both regulation of nicotinamide containing products and protection of human health.

PRESENTER: FRANCES ISABELLE CRISTOBAL, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. HEATHER FORD, EARTH AND PLANETARY SCIENCES
ADDITIONAL CONTRIBUTOR: BETH SHALLON, EARTH & PLANETARY SCIENCES
PROJECT TITLE: USING SEISMIC ATTENUATION TO IMAGE THE SUBSURFACE STRUCTURE OF EASTERN CALIFORNIA

Abstract: The Walker Lane region is located on the California/Nevada border and is a region of significant seismic hazard. However, while the location of faults at the surface are well characterized, large uncertainties in structure at greater depths means that seismic hazard may be inaccurately characterized. There are multiple methods used to measure and quantify subsurface structure, such as seismic attenuation. For our analysis, we use a MATLAB GUI to obtain t* values (a proxy for seismic attenuation) across the study area. To date, we have made 58 t* measurements in the study area. Preliminary linear inversion results provide us with t* values ranging from -0.4 to 0.5. We observe the most negative (least attenuating) values in northern Owens Valley, east of Mammoth and south. Large positive anomalies (more attenuating) are highly localized and have larger errors, indicating that additional measurements need to be made. Once our measurements and results are finalized, we will compare our results to the location of geologic structures in the region.

PRESENTER: MEGHNA DASH, BIOLOGY
FACULTY MENTOR: DR. MARGARITA CURRÁS-COLLAZO; MOLECULAR, CELL, AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: ELENA KOZLOVA, YUSEF ELHAJJAOUI, SARAH SUTJIPTO, DEVIN SWARTZ, AND SAMHITA BALAKRISHNAN
PROJECT TITLE: EXPLORING THE EFFECTS OF GESTATIONAL PFOS AND PFOA EXPOSURE ON AUTISM-RELEVANT BEHAVIOR

Abstract: Autism Spectrum Disorder (ASD) is diagnosed through assessment of social communication and repetitive behaviors. Although ASD etiology is not completely understood, environmental exposures to persistent organic pollutants such as Polyfluoroalkyl Substances (PFAS) may contribute. Two common PFAS species, perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA), contaminate 95% of Americans. During pregnancy, maternally transferred PFAS bioaccumulate in the placenta and the fetal brain. We hypothesized that offspring maternally exposed to PFOS or PFOA would exhibit increased ASD-like behaviors, including impaired social recognition and exaggerated repetitive behaviors. C57BL/6 dams were assigned to five treatment groups: vehicle control, low-/high-dose PFOA, or low-/high-dose PFOS (0.1/0.3 mg/kg) throughout gestation. Offspring were weaned at P21 and evaluated for ASD-related behavior: marble burying test (MB; P40), three-chamber sociability and short-term social recognition memory (SRT; P50). Male mice exposed to low-dose PFOS ($p=.17$) and high-dose PFOA ($p=.12$) displayed abnormal SRT scores whereas VEH/CON ($p<0.01$), low-dose PFOA ($p<.01$) and high-dose PFOS ($p=.06$) preferred to explore novel mice (n=6-11). This result was not due to deficient sociability since all male groups, explored novel mouse more than novel object (p<.05-.0001). High-dose PFOS (exaggerated) and low-dose PFOA (reduced) showed abnormal MB scores vs VEH/CON males ($p<.05$). In general, females tested for SOC and MB were not affected by PFAS exposure. Our findings are the first to characterize abnormal ASD-like phenotype in a murine model of PFAS exposure.

PRESENTER: SWARAJ DASH, DATA SCIENCE
FACULTY MENTOR: DR. XIAOQIAN LIU, STATISTICS
PROJECT TITLE: DEEP LEARNING-BASED STOCK PRICE FORECASTER WITH TECHNICAL INDICATORS AND SENTIMENT ANALYSIS

Abstract: Accurate short-term equity forecasting is challenging due to nonstationarity and noisy market signals. This project develops an end-to-end forecasting prototype that predicts short-horizon price movement (future return over a user-selected horizon) for a selected stock. Historical open–high–low–close–volume (OHLCV) data are retrieved using yfinance and transformed into a compact set of core technical indicators, including daily returns, moving averages, RSI, Bollinger percent B, average true range (ATR), and volume/range-based measures. To incorporate qualitative market information that may not be fully captured by prices alone, the system also retrieves recent news headlines for the chosen ticker and computes VADER sentiment scores, producing a sentiment signal used to generate sentiment-adjusted forecast for demonstration. The forecasting model is a Long Short-Term Memory (LSTM) network, a recurrent neural architecture designed to learn patterns and dependencies in sequential time-series data, and it is used because it can model temporal structure in engineered financial features across fixed-length historical windows. Model uncertainty is summarized using holdout residual variability to provide a confidence interval for predicted prices. The trained model, scaler, and metadata deployed through an interactive Streamlit application that displays results including predicted returns, uncertainty range, sentiment summary, and optional back test comparisons.

PRESENTER: CYNTHIA DE LEON, BIOCHEMISTRY
FACULTY MENTOR: DR. LINDA WALLING, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTORS: ERIC CHEANG, INAIARA DE SOUZA PACHECO, TIMOTHY ROOSE, RICHARD A. REDAK, AND PETER W. ATKINSON
PROJECT TITLE: EVALUATION OF TRANSMISSION OF *XYLELLA FASTIDIOSA* BY *HOMALODISCA VITRIPENNIS* VIA AN ARTIFICIAL DIET SYSTEM

Abstract: Glassy-winged sharpshooters (GWSS), *Homalodisca vitripennis*, are an invasive species brought to California from the Southeastern United States. They are pests that serve as vectors for the bacterium *Xylella fastidiosa (X.f.)*—a pathogen of various plants of great economic importance for California, including grape and citrus. In grapes, *X.f.* causes Pierce's disease (PD), which famously eradicated over 40% of the Temecula grapevines in the 1980's and continues to cause millions of dollars in losses to viticulture. In vitro experiments are essential for evaluating strategies to control GWSS, such as CRISPR. The goal of this experiment is to determine the optimal parameters for *X.f.* transmission by GWSS via two artificial diet systems; one is our newly developed artificial stem and the other has a more traditional design. Using the *in vitro* system previously developed and validated by us, the ability of *X.f.* to colonize the GWSS foregut and precibarium was assessed after 2, 4, and 6 hours of the acquisition access period. The presence of bacteria in GWSS mouthparts will be observed by fluorescence microscopy using *X.f.* that express the Green Fluorescence Protein (GFP) transgene. In addition, we will detect *X.f.* levels by polymerase-chain reaction (PCR) using *X.f.*-specific primers. The resulting data will lead to future transmission experiments validating the success of gene-edited GWSS incapable of *X.f.* transmission

PRESENTER: KORA DEY, STATISTICS
FACULTY MENTORS: DR. ZHE FEI, STATISTICS AND DR. JOHN FRANCHAK, PSYCHOLOGY
PROJECT TITLE: PREDICTING INFANT LOCOMOTION STATES FROM WEARABLE SENSOR TIME SERIES

Abstract: Characterizing infant locomotor behavior—crawling and walking—is important for studying healthy human development. Infant locomotion emerges through rapid, uneven transitions that can shift within a single play session and across sessions. This project aims to develop a statistical pipeline that leverages video-derived labels aligned with wearable sensor features to accurately predict infrequent crawling and walking events despite extreme class imbalance and high-dimensional features, using latent-state modeling to impose temporal structure.

The data consist of over 340,000 second-by-second observations from 97 independent sessions of infant locomotion. Accelerometer and gyroscope signals are recorded from wearable sensors at four body locations (both ankles and hips) during naturalistic sessions. Videos are annotated with interpretable per-second labels: none, crawling, and walking. The sensor streams are summarized into sliding-window feature vectors (over 400 features) that capture movement magnitude and coordination patterns over time. The main challenge is that the labels are highly imbalanced, with 'no locomotion' dominating most time windows (over 95%). To fit a Hidden Markov Model (HMM) with 400+ engineered sensor features, we apply feature reduction (e.g., Principal Component Analysis (PCA)) and model the reduced signals with state-dependent emissions, so rare crawling/walking events are captured as transitions into distinct latent regimes rather than isolated points. After fitting, we decode the latent state sequence for each session and use it as a temporally smoothed representation to improve the prediction of the highly imbalanced labels (none, crawling, walking). We then evaluate alignment between decoded states and video labels and summarize sessions via occupancy, transition rates, and bout timing/duration.

PRESENTER: KUSHNEET DHAMI, BIOLOGY
ADDITIONAL PRESENTER: SANYA PURI, NEUROSCIENCE
FACULTY MENTOR: DR. EDWARD ZAGHA; MOLECULAR, CELL, AND SYSTEMS BIOLOGY
PROJECT TITLE: MAPPING MOTOR CORTEX CONTRIBUTIONS TO DISTRACTOR SUPPRESSION THROUGH BEHAVIORAL AND HISTOLOGICAL ANALYSIS

Abstract: Financial strain is recognized as a social determinant of health, particularly among college students facing rising tuition costs, debt burdens, housing instability, and food insecurity (Broton & Goldrick-Rab, 2018). Chronic financial stress may contribute to dysregulation of stress-response systems and cumulative biological risk, increasing vulnerability to cardiometabolic dysfunction, including hypertension and adiposity (Kivimäki & Steptoe, 2018). Few studies have examined associations between validated measures of financial stress and objectively measured cardiometabolic markers in diverse undergraduate populations. This study examines whether self-reported financial stress is independently associated with cardiometabolic health among young adult college students. We will analyze cross-sectional data from 1,230 students who participated in the 3E Study: Economic and Educational Contributors to Emerging Adults' Oral and Cardiometabolic Health. Participants were first-year, second-year, and recently transferred undergraduate students aged 18–24 who completed a survey and an in-person health assessment from September 2023 to February 2026. Financial stress was measured using the validated 14-item Financial Stress Scale (Northern et al., 2010). Cardiometabolic outcomes include objectively measured body mass index (BMI), and systolic and diastolic blood pressures. Multivariable linear and logistic regression models will assess associations between financial stress and cardiometabolic outcomes, adjusting for demographic characteristics, socioeconomic indicators, and health behaviors

(e.g., tobacco and alcohol use). We expect higher financial stress to be associated with elevated BMI and blood pressure, independent of socioeconomic measures. Our findings will contribute to understanding how economic stress during early adulthood may shape cardiometabolic health and inform integrated campus-based interventions targeting financial well-being and physical health

Presenter: Ashley Dixon, Neuroscience
Faculty Mentor: Dr. Todd Fiacco; Molecular, Cell, and Systems Biology
Project Title: Identifying Laser-Induced Confounds in Astrocyte Volume Regulation

Abstract: The brain's extracellular space (ECS) is regulated by astrocytes, which have a direct impact on brain excitability by maintaining homeostasis. In order to define the roles that astrocytes play in brain function and illness, real-time volume imaging and electrophysiological recordings will be used to explore how astrocytes regulate the ECS. Increased levels of extracellular potassium (K+) cause astrocyte swelling, decrease the ECS, and raise neuronal excitability. In past research, findings demonstrated that astrocytes dominate ECS volume regulation during K+ changes and reveal a direct link between astrocyte swelling, ECS reduction, and neuronal excitability. Currently, our focus is on volume-regulated anion channels (VRAC) and the required pore-forming subunit LRRC8 proteins, which are activated by cell swelling. Cre+ and Cre- mice, bred with other mice containing loxP sites flanking the LRRC8A, or SWELL1 gene (which is part of VRAC), are being used to study the effects of this gene on astrocyte and ECS volume changes. My project will be focused on the performance of a critical control experiment to determine if the laser light being used to image rapid volume changes in cells causes regulation of volume due to elevating cellular metabolism. This may be causing a dampened response from the astrocytes even under high K+ conditions, where they are expected to swell. If a connection is found between the usage of lasers and cellular volume regulation, the regulation of astrocyte volume in astrocyte VRAC cKO mice is expected to be significantly different compared to controls.

Presenter: Thanh Thien Elizabeth Duong, CNAS Undeclared
Faculty Mentor: Dr. Olakunle Olawole, Microbiology and Plant Pathology
Project Title: Evaluating Combination Therapy to Enhance Phage Antibiotic Synergy Against Resistant *Raoultella planticola* Variants

Abstract: The rise of multidrug resistance poses a critical threat to modern medicine, projecting to cause millions of deaths annually. *Raoultella planticola* is an emerging opportunistic pathogen increasingly linked to antibiotic resistance, drastically limiting treatment options for bacterial infections. Bacteriophage (phage) therapy offers a promising alternative, and when combined with antibiotics, may enhance bacterial suppression through phage–antibiotic synergy (PAS). This study investigates whether PAS can improve inhibition of resistant *R. planticola* variants (RP8ΔϕMur, RP8ΔϕEli, RP8ΔϕDur, and RP8ΔϕDuo) and delay resistance. Optical density growth curves were used on these phage-resistant variants to assess the effects of five classes of antibiotics: Trimethoprim, Colistin, Ciprofloxacin, Ertapenem, and Kanamycin. After 24 hours, no Minimum Inhibitory Concentrations (MICs) were detectable for Trimethoprim and Kanamycin, indicating full resistance across all bacterial strains. Colistin and Ciprofloxacin had an MIC of 2 μg/mL against RP8ΔϕMur. Ertapenem presented an MIC of 1 μg/mL for RP8ΔϕMur and 2 μg/mL for the remaining strains. These results confirm high-level resistance to most antibiotics tested, except for Ertapenem in RP8ΔϕMur. *R. planticola* demonstrated resistance to phages ϕMur and ϕDur and antibiotics produced stronger overall growth inhibition than phage alone, supporting combination phage-antibiotic therapy as a more effective strategy for suppressing resistant *R. planticola*.

Ongoing work will quantify PAS in *R. planticola* using antibiotics evaluated in this study, focusing on defining optimal antibiotic concentrations and phage multiplicity of infection (MOI) parameters to maximize synergy and delay resistance. Future studies will utilize the mechanistic basis of PAS to support design of clinically translatable phage–antibiotic therapy.

PRESENTER: ZAKARIA ELSWEDEY, BIOENGINEERING
FACULTY MENTOR: DR. JASON STAJICH, MICROBIOLOGY AND PLANT PATHOLOGY
ADDITIONAL CONTRIBUTOR: JULISSA PEREZ-MARRON, MICROBIOLOGY
PROJECT TITLE: AN INVESTIGATION INTO THE DIVERSITY OF AEROBES IN THE HERPTILE GUT MICROBIOME

Abstract: Few environments can claim to be as extreme yet innocuous as the gut. With its defining features including anoxic conditions and low pH, the gut supports a diverse array of aerobic and anaerobic bacteria that further break down anything consumed by the host organism. In herptiles, this microbiome needs to support their typically diverse insect and plant diets, while adapting to dynamic temperature conditions due to the host's ectothermy. This experiment seeks to investigate the diversity of aerobes in the herptile gut microbiome with the ultimate goal being to facilitate the culturing of these microbes for their cellular products. Here we will perform culture-based assays, and recovered microbial communities will be sequenced and analyzed using bioinformatic approaches to further characterize the aerobic-tolerant fraction of the herptile gut microbiome.

PRESENTER: JOHAN ENRIQUEZ; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. SIMON GROEN, NEMATOLOGY
ADDITIONAL CONTRIBUTOR: ANDREA ROMERO
PROJECT TITLE: THE TRITROPHIC EFFECTS OF PYRROLIZIDINE AND TROPANE ALKALOIDS ON ENTOMOPATHOGENIC NEMATODES

Abstract: Roundworms, or nematodes, are found almost everywhere on our planet, yet are overlooked despite their large role in ecological processes. Previous work on nematode interactions focused on entomopathogenic nematodes (EPNs) as natural enemies of herbivorous insects, usually in two-way interactions. Not many studies have investigated the effects of toxins that plants produce as defenses against herbivores on their natural enemies within tritrophic interactions. Our research goal is to examine how toxic alkaloids produced by Californian wildflowers affect behavior and survival of entomopathogenic nematodes through a tritrophic lens. We are looking at how three species of EPNs (*Steinernema* sp.) are affected by pyrrolizidine alkaloids within woolly bear caterpillars after they fed on the fiddleneck and by tropane alkaloids found in potato beetles and tobacco hornworms after they fed on jimsonweed. Our first research objective was to identify whether the plants' toxins would repel the different EPN species, through an attraction-repulsion assay involving EPN responses to herbivore excrement. We found that the nematodes were indifferent to either type of alkaloid in herbivore frass. Our current research objective is to conduct a tolerance assay where nematodes are exposed to different concentrations of the alkaloid plant toxins and record how much of each toxin they can tolerate before they die. We will also conduct a fitness assay that will expose the nematodes to concentrations of toxins they are able to survive and record their reproduction rate. Accounting for tritrophic interactions is vital when running experiments, as ecological interactions rarely occur in just two dimensions.

Presenter: Charlotte Foulk, Biochemistry
Faculty Mentor: Dr. Katherine Borkovich, Microbiology and Plant Pathology
Additional Contributors: Monique Quinn and Sriram Vasireddy
Project Title: Heterotrimeric G-proteins Regulate Degradation of Starch in the Fungus *Neurospora crassa*

Abstract: Eukaryotic organisms including fungi utilize G-protein signal transduction to sense and respond to the environment including sensing the availability of nutrients. Previous studies from our group have demonstrated that the filamentous fungus *Neurospora crassa* regulates the degradation of cellulose through heterotrimeric G-protein signal transduction. In this study, we investigate whether G-protein signaling also controls the degradation of starch, another glucose polymer. Understanding the role of G-protein signaling in the degradation of starch has applications to biotechnology and plant pathogenesis. In the industrial global enzyme market about 25% of the enzymes produced are for the degradation of starch. Closely related plant pathogens are known to utilize similar degradation pathways to *N. crassa* and have a strong preference for starch. To investigate a role for G-protein signal transduction in the degradation of starch, gene knockout mutants lacking several G-protein signaling components were analyzed for phenotypes during growth on starch. We measured biomass, supernatant protein and the activity of amylase, an enzyme that is critical for starch utilization. Perturbation of G-protein signal transduction leads to a reduction in these three traits, suggesting that *N. crassa* utilizes G-protein signaling to sense and degrade starch polymers.

Presenter: Brooke Freeman, Biochemistry
Faculty Mentor: Dr. Joseph Genereux, Chemistry
Project Title: Characterizing DNAJB8 Isoforms as Misfolded Protein Sensors

Abstract: DNAJB8 is a human J-domain protein that maintains protein homeostasis by binding misfolded proteins and delivering them to other chaperoning machinery. Our laboratory uses this property to identify destabilized and misfolded proteins on the basis of their apparent binding affinity to ^{FLAG}DNAJB8^{H31Q}, a mutant that cannot hand off the misfolded protein. The mechanism of how DNAJB8 recognizes and binds misfolded proteins is unclear. Characterizing DNAJB8 structure, kinetics and molecular behavior would allow us to improve our assay, while providing better understanding of how DNAJB8 engages misfolded proteins. While optimizing purification of ^{FLAG}DNAJB8^{H31Q} bound to misfolded proteins, we observed on the basis of gel migration that when expressed in HEK-293T cells, ^{FLAG}DNAJB8^{H31Q} has at least two distinct isoforms: the expected 27 kilodalton (kDa) and a less abundant population at a larger 28 kDa size. We were also able to observe the presence of our suspected DNAJB8 isoforms through intact mass analysis. Additionally, we cross confirmed this finding with mass spectrometry-based proteomics using trypsin digested samples. We also found that while ^{FLAG}DNAJB8^{H31Q} in human cells is mostly partitioned into high molecular weight structures, preliminary data suggest that the 27 kDa isoform is primarily a monomer. We are currently working on isolating the different isoforms to single residues and assessing the functional impact of DNAJB8 isoforms further through mutagenesis. This investigation into DNAJB8 isoforms will allow us to better optimize our misfolded protein assay and better understand how post-translational modifications impact J-domain chaperone function.

PRESENTER: RICHARD GAO, BIOLOGY
FACULTY MENTOR: DR. GREGOR BLAHA, BIOCHEMISTRY
PROJECT TITLE: OPTIMIZING CRYSTALLIZATION OF CRBNMIDI

Abstract: CRL4CRBN E3 is a 4-subunit ubiquitin ligase complex that marks proteins for degradation through ubiquitination. Of the four subunits, cereblon (CRBN) acts as the substrate receptor site, binding to proteins to be marked for degradation. The cereblon binding site is a common target for pharmaceuticals that alter cereblon's protein specificity. This ability to shift specificity can be leveraged for therapeutic applications that target, ubiquinate, and degrade disease-linked proteins. To understand the complexing of cereblon and pharmaceutical compounds, structural analysis of the cereblon subunit is crucial. Through biochemical techniques, $CRBN^{midi}$, a soluble cereblon construct, can be expressed, purified, and crystallized. Through X-ray crystallography of the crystallized protein, the spatial orientation of monomeric units may be determined. Procedures purifying CRBN midi are available; however, reproducibility is limited. The literature-provided methods for expressing, purifying, and crystallizing the CRBN midi require optimization to produce high-quality, reproducible results. The following presentation will explore the techniques used to transform, express, purify, and crystallize the CRBN midi construct.

PRESENTER: LEANNA GILLESPIE, BIOLOGY
ADDITIONAL PRESENTER: SHIVALI VISHWAKARMA, BIOLOGY
FACULTY MENTOR: DR. JOEL SACHS; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: IMPACT OF *RALSTONIA THOMASII* INFECTION ON LEGUME-RHIZOBIA MUTUALISM

Abstract: The symbiotic relationship between legumes and the nitrogen-fixing bacteria, rhizobia, is critical in sustainable agriculture, yet such interactions range from beneficial to exploitative strains that utilize host resources without contributing nitrogen. While previous research provides evidence of hosts rewarding beneficial rhizobia and sanctioning uncooperative strains, the mechanism behind the persistence of exploitative strains in natural populations is poorly understood. This project investigates if infection by the bacteria *Ralstonia thomasii* disrupts the legume-rhizobia mutualism in various *Acmispon* species by decreasing the host's available resources to reward beneficial symbionts. While *R. thomasii* has unknown plant pathogenicity, recent in-vitro inoculations have produced pathogenic phenotypes now under investigation. We will test if pathogen infection impacts host investment, nitrogen fixation benefits, and host-control mechanisms. Seedlings of *Acmispon* and *Lotus japonicus* will be cultivated in-vitro using agar plates and will be inoculated with a fixing strain, a mutant non-fixing strain, or both in combination with one of seven diverse *R. thomasii* strains. We are assessing nodule number, biomass, and nitrogen-fixation to quantify host investment and benefits from symbiosis. We will also quantify *in planta* abundance of each rhizobia strain via quantitative culturing to measure changes in host sanctions. We hypothesize that *R. thomasii* infection will divest host resources from symbiotic interactions, resulting in reduced nodule size, diminished nitrogen fixation, and weakened host sanctions against non-fixing rhizobia. This study will provide novel insight into how potentially pathogenic interactions may shape the evolution of plant-microbe mutualisms and can offer strategies to improve biological nitrogen fixation for agricultural use.

PRESENTER: SAMANTHA GULI, BIOCHEMISTRY
ADDITIONAL PRESENTER: NATALIE SAHAGUN, BIOCHEMISTRY
FACULTY MENTOR: DR. SARAH RADI, BIOCHEMISTRY
PROJECT TITLE: IMPACT OF STRUCTURED STUDY TEMPLATES ON STUDENT UNDERSTANDING OF THYROID HORMONE SIGNALING

Abstract: Understanding hormone signaling pathways requires students to integrate molecular mechanisms, cellular localization, and regulatory feedback, which can present a challenge in upper-division biochemistry courses. This study evaluates the impact of a structured study template on student performance related to thyroid hormone synthesis, storage, secretion, and receptor signaling. Students enrolled in an upper-division human biochemistry course (BCH120) were provided with a comprehensive thyroid hormone pathway template (Fig. 2) as an optional study aid. The material was presented by filling out this template together in class in real time. Student's attitudes towards the templates as well as how often they utilize the study tool will be assessed using post-instructional surveys. The impact on academic performance will be assessed using a single standardized exam question focused on thyroid hormone mechanisms, allowing for direct comparison between students who utilized the template and those who did not, as well as between the cohorts before and after the template was introduced. Exam performance between groups will be analyzed to determine whether structured visual and organizational learning tools improved conceptual understanding. This study aims to inform evidence-based instructional strategies that support student learning in complex biochemical signaling pathways.

PRESENTER: ANNHI HA, PLANT BIOLOGY
FACULTY MENTOR: DR. KATE OSTEVIK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: FLORAL MORPHOLOGICAL DIVERGENCE AS A POTENTIAL MECHANISM OF REPRODUCTIVE ISOLATION IN DUNE *HELIANTHUS PETIOLARIS* AND NON-DUNE *HELIANTHUS ANNUUS*

Abstract: Understanding how plants adapt to local environments is an important aspect in studying the evolution of phenotypic and genetic divergence across ecotypes. Floral traits are especially influenced by environmental pressures and can differentiate groups in terms of reproductive success and reproductive isolation. In this study, we compared floral traits of dune *Helianthus petiolaris* and non-dune *Helianthus annuus*, highlighting pistil, anther, petal, and pollen morphology. Flowers at anthesis were collected from dune and non-dune populations. Floral organs, including petals, anthers, and styles, were imaged in nature to avoid tissue degradation, while pollen grains were later imaged under a microscope in the lab to assess morphology. Morphometric analyses were conducted to assess differences in reproductive organ size and structure between ecotypes. Results revealed consistent divergence in floral traits. Dune *H. petiolaris* exhibited smaller reproductive structures and broader, rounder petals, whereas non-dune *H. annuus* displayed longer anthers and styles and more elongated petals. These differences may reflect adaptation to arid, sandy environments and could influence pollen delivery and pollinator interactions. Morphological divergence in reproductive structures suggests a potential mechanism contributing to reduced gene flow between ecotypes. This study expanded our understanding about how environmental conditions affect floral trait differences and how floral traits may help promote early reproductive isolation in natural plant populations.

PRESENTER: CASSETTY HABIB, PLANT BIOLOGY
FACULTY MENTOR: DR. CAROLYN RASMUSSEN, BOTANY AND PLANT SCIENCES
PROJECT TITLE: UNDERSTANDING AIR9 FUNCTION VIA NATIVE AND MITOTIC EXPRESSION IN *ARABIDOPSIS THALIANA*

Abstract: Since plant cells cannot migrate, cell division plane orientation is crucial for proper plant organogenesis. Plant cell division plane positioning is mediated by microtubule structures such as the preprophase band (PPB) and phragmoplast, and several proteins which are responsible for maintaining proper construction and function of these structures. TANGLED1 (TAN1) and AUXIN-INDUCED-IN-ROOT-CULTURES-9 (AIR9) are two redundantly functioning microtubule-binding proteins which localize to the division site. Although loss of either TAN1 or AIR9 has a negligible effect on division plane orientation, tan1 air9 double mutants have severe division plane defects, reduced root length, and abnormal root cell file organization. Because of this functional redundancy, functional analysis on the AIR9 protein has been hindered and little is known about AIR9's functional domains. AIR9 is composed of a basic serine-rich MT-binding domain (MBD), a leucine-rich repeat domain (LRR), and a series of tandemly-repeated "A9" sequence blocks (Buschmann et. al, 2006). Overexpression of AIR9 in the tan1 air9 double mutant rescues its division plane and growth defects. My project focuses on analyzing the functional domains of AIR9 by expressing the full-length AIR9 coding sequence, as well as specific truncations of the AIR9 containing only the MT-binding region and leucine-rich repeat region, and AIR9 containing only the leucine-rich repeat and A9 repeat regions using both the AIR9 native promoter and a mitotic-specific promoter. This research plays an important role in understanding the mechanisms behind cell division plane positioning in plants.

PRESENTER: MARLENE HERNANDEZ, BIOLOGY
FACULTY MENTOR: DR. BODIL CASS, ENTOMOLOGY
ADDITIONAL CONTRIBUTOR: SEAN HALLORAN, ENTOMOLOGY
PROJECT TITLE: BIOLOGICAL CONTROL POTENTIAL OF PREDATORY MITES AGAINST SPIDER MITES IN DATE FARMING SYSTEMS

Abstract: *Oligonychus pratensis* (Acari: Tetranychidae, Banks), a spider mite commonly known as the Banks grass mite, is a significant pest affecting grass and palm crops in the United States. In the eastern Coachella Valley, effective management of this pest is significant for the edible date (*Phoenix dactylifera*, Arecaceae) farming industry, especially where the susceptible Deglet Noor variety predominates acreage. Prolonged use of pesticides targeting these mites can lead to resistant mite populations and there are potential environmental and human health concerns, prompting many farms in the area to adopt organic practices. This study investigated a biological control approach utilizing a commercially available natural enemy, *Galendromus occidentalis* (Acari: Phytoseiidae, Nesbitt), the western predatory mite. Through a series of no-choice and two-choice assays, we found that *G. occidentalis* feeds on all immature stages and preferentially targets the larval stage of *O. pratensis* prey. In field experiments assessing the efficacy of releasing this predatory mite by hand onto infested date bunches in commercial date gardens, webbing densities were reduced when initial *O. pratensis* populations were low, and not when initial pest pressure was high. Evaluations of fruit scarring at harvest are underway for these field trials, and for a third trial in which the predatory mites were released by an aerial drone. These initial results show promise for the use of this predatory mite species as an organic pest control option in date production.

PRESENTER: SHANNON HERRERA, BIOLOGY
FACULTY MENTOR: DR. SIMON GROEN, NEMATOLOGY
ADDITIONAL CONTRIBUTOR: ANDREA ROMERO, BOTANY AND PLANT SCIENCES
PROJECT TITLE: MODERN RE-CHARACTERIZATION OF A LOCAL WILDFLOWER PARASITIC NEMATODE

Abstract: Plant-parasitic nematodes are a prevalent agricultural pest responsible for devastating losses in domestic crop yields every year. *Mesoanguina amsinckiae*, a species whose populations commonly form galls within flowering plants across the *Amsinckia* genus are of particular importance. Their host plants produce toxins (pyrrolizidine alkaloids) that pose a significant risk to grazing livestock animals. Despite this, the specific mechanisms and life history of the nematodes that parasitize them are seldom studied. The last works documenting and illustrating their physical attributes, differences between sexes, and stages of growth were published in the 1930's.

For this project, we aim to reclassify *M. amsinckiae* and bring our understanding of their morphology into the modern era. Using techniques such as microscopy, DNA barcoding, field phenology studies, de novo genome assembly and life stage specific RNA sequencing, we will reexamine the species' morphometric traits and expand on the work done nearly a century ago.

To date, we have confirmed a species collected from local Riverside fiddlenecks as *M. amsinckiae* via DNA barcoding, and will proceed with classifying their growth stages to recreate their otherwise unknown life cycle.

By modernizing our understanding of *M. amsinckiae* morphology and genome landscape, we will provide insights into the mechanisms used to withstand plant toxins. This is knowledge that is essential for improving both livestock safety and sustainable agricultural pest management.

PRESENTER: EMERSYN HIDALGO, NEUROSCIENCE
FACULTY MENTOR: DR. CRYSTAL REYNAGA; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: CHARACTERIZATION OF GROUND REACTION FORCES TO INVESTIGATE FORE- AND HINDLIMB FUNCTIONAL ASYMMETRY

Abstract: The Senegal running frog (*Kassina senegalensis*) is known for its unique quadrupedal walking gait, with longer forelimbs relative to jumping frogs and increased flexion in hindlimbs which minimize fluctuations in body pitch posture. Shown in previous studies, the anuran quadrupedal walkers have more proportional limb lengths relative to other specialized anuran locomotors. The longer forelimbs enable more upright quadrupedal posture while the increased flexion in the hindlimb helps to minimize the upward or downward tilting of their body throughout a stride. These slight modifications to the species body plan may provide advantages in walking, allowing for efficient quadrupedal movement. Here, we characterized the ground reaction forces in *K. senegalensis* to investigate their fore- and hindlimb functional asymmetry. We used 3D high speed videography to capture the frog's movement in an arena containing a multiaxis force platform. The animals were filmed laterally and dorsally to visualize their movements in a three-dimensional space, with both cameras being calibrated using a 36-point calibration object. Seventeen points were digitized along the body, forelimb, and hindlimb that were closest to the camera views. The digitization of these X, Y, Z coordinate points were analyzed using a MATLAB script to calculate resultant, medial lateral, anteroposterior, and dorsoventral forces, as well as joint torques. *K. senegalensis* generated larger forces in the dorsal ventral direction. However, they generated substantial

forces in the medial-lateral directions for both fore- and hindlimb, indicating the hindlimb's functional role in generating greater stabilizing forces in contrast to the forelimb.

PRESENTER: LYNA HUYNH, BIOLOGY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
ADDITIONAL CONTRIBUTOR: QIQI LIN
PROJECT TITLE: INVESTIGATING THE ROLE OF SPP INHIBITION ON PROTEIN TRANSLOCATION INTO THE ER

Abstract: Signal peptide peptidase (SPP) is an intramembrane protease that processes residual signal peptides after protein translocation through the Sec61 channel into the endoplasmic reticulum (ER). We hypothesized that SPP inhibition could impair protein translocation, leading to accumulation of ER-targeted proteins in the cytosol. This hypothesis is based on the idea that blocking SPP leaves signal peptides embedded in the ER membrane, which could inhibit Sec61. It has been shown that viruses exploit SPP as a host factor, therefore, understanding its role in protein translocation may reveal new antiviral targets. To test this, the maturation of a model secretory protein, FLAG-tagged transthyretin (TTR), was monitored in HEK293T cells treated with the SPP inhibitor LY-411575. Experimental controls were included for protease specificity and cellular degradation pathways, such as the γ-secretase inhibitor Semagacestat and the proteasome inhibitor Bortezomib. Translocation efficiency was directly assessed by quantifying the ratio of immature to mature TTR with quantitative Western blot analysis. Results from multiple replicates demonstrate that pharmacological SPP inhibition alone does not produce a significant increase in the immature TTR fraction compared to a vehicle control under proteasomal inhibition. A critical next step is to confirm the efficacy of our SPP inhibitor LY-411575 using an established positive control, the HCV (hepatitis c virus) core protein, a known SPP substrate. This will allow us to definitively interpret our TTR results and refine our understanding of how SPP inhibition can disrupt protein translocation into the ER.

PRESENTER: LEEN ISMAIL; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. CHRISTOPHER CLARK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: SOUMYADEEP CHATTERJEE
PROJECT TITLE: HOW HORMONES INFLUENCE IRIDESCENT FEATHER STRUCTURE IN ANNA'S HUMMINGBIRDS

Abstract: Male Anna's hummingbirds display bright iridescent plumage used in courtship, while females display dull coloration. Unlike the color produced by pigments, hummingbird iridescence is produced by microscopic feather structures that control how light is reflected. However, it is still unclear how these structural differences are regulated in the body, or whether hormones affect feather formation. To investigate this, feathers were plucked and regrown under different thyroid hormone conditions, including administration of T4 (thyroxine). The feather microstructure was analyzed by measuring barb angle and barbule length from microscope images using ImageJ. Preliminary differences in feather structure were observed after the hormone treatment, including shifts from male-like toward female-like morphology in some feathers. Together, these results indicate that hormones help regulate the development of sexually dimorphic feather structure.

PRESENTER: INCHARA JAGADEESH, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. STEVE CHOI, PHYSICS AND ASTRONOMY
ADDITIONAL CONTRIBUTORS: ELIZA GAZDA, QUINTIN MEYERS, DAVID FAULKNER-KATZ, AND PAUL MALACHUK
PROJECT TITLE: OPTICAL CHARACTERIZATION OF THE KINETIC INDUCTANCE DETECTORS FOR THE CCAT OBSERVATORY

Abstract: The cosmic microwave background (CMB), the remnant light left over from the Big Bang, contains a tremendous amount of information on the formation and evolution of our universe. Measuring its polarization more precisely will allow us to answer, "How did the universe begin?" The best current CMB polarization measurements are limited by uncertainty in our understanding of the thermal dust emission from our galaxy. The CCAT Observatory, a new six-meter telescope under construction in Chile, will observe the sky at submillimeter wavelengths with unprecedented sensitivity, allowing for characterization of the thermal dust at a new precision. This improvement will enable the best constraints on physics that governed the formation of the universe. To conduct these measurements, CCAT will utilize newly developed quantum sensors called kinetic inductance detectors (KIDs). Currently, more than 20,000 KIDs have been fabricated, with the first light planned in 2026. My goal is to characterize the optical properties of these KIDs. I am measuring their "optical efficiency"—a direct quantification of their sensitivity to light. To measure the optical efficiency, we cool the KIDs to cryogenic temperatures below 100 mK and measure their response to input radiation. We use a known model for KIDs and derive an estimate of the optical efficiency. Preliminarily, we report efficiencies between 45% and 60%. These are the first cryogenic measurements of quantum sensors of this kind at UC Riverside. The ongoing work will inform our methods in operating and calibrating the detectors and lead to improved designs in the future.

PRESENTER: ARTEMIS JAHANSOOZ, MATHEMATICS
FACULTY MENTOR: DR. JIA GOU, MATHEMATICS
PROJECT TITLE: MODELING HOST-ALGAE INTERACTION DYNAMICS VIA ODE SYSTEMS.

Abstract: Symbiotic interactions between hosts and algae depend on how algal cells are distributed between host cells and the cavity. However, the mechanisms governing this distribution remain unclear. In this project, I developed and analyzed a system of eight coupled ordinary differential equations to model the dynamics of empty hosts, singly infected hosts (with two types of algal cells), doubly infected hosts, and free algae in the cavity. The model incorporates primary and secondary uptake, intracellular division and degradation, and logistic growth of free algae within the cavity. I investigated how cluster composition varies with different division rates inside the host and the cavity, and examined population-level algal growth dynamics in both environments. Additionally, I analyzed how varying the rates of first and second uptake events affects the composition of infected host clusters. Both the time-dependent dynamics and steady-state behaviors were studied. Methodologically, I carried out parameter sweeps over uptake, division, and degradation rates and compared the resulting trajectories for key summary quantities, including the fraction of mixed versus homogeneous doubly infected hosts and total algal abundance in the cavity. I then characterized long-term outcomes by computing equilibria. These analyses allow me to identify parameter regimes that favor persistence or loss of algae, as well as conditions that promote mixed infections over single-strain dominance. Overall, the model provides a quantitative framework for understanding how cellular-level processes shape host–alga infection structure and predicts testable relationships between rates and symbiont distributions across a broad range of symbioses.

PRESENTER: MILES JOHNSTONE, BIOCHEMISTRY
FACULTY MENTOR: DR. POLLY CAMPBELL; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: HARRISON LIN
PROJECT TITLE: DOES MALE PREFERENCE CONTRIBUTE TO REPRODUCTIVE ISOLATION IN THE CALIFORNIA VOLE, *MICROTUS CALIFORNICUS*?

Abstract: Understanding the underlying mechanisms of speciation is an integral part of evolutionary biology. Speciation is the process by which an ancestral population diverges into reproductively isolated populations due to the development of reproductive barriers. Around 50,000 years ago, the California vole, *Microtus californicus*, diverged into southern and northern lineages, likely due to a physical barrier between the populations that no longer exists. While the lineages co-occur today in a contact zone, there is no evidence of hybridization. Given the evolutionarily recent divergence, lack of gene flow may be due to premating barriers such as assortative mating, which is commonly associated with female choice because female mammals invest more than males in offspring production. Whether males also exhibit mate preference is rarely tested. We used a behavioral assay to test whether female *M. californicus* showed a preference for males of their own lineage. Within a three chamber test apparatus, the female was allowed free reign, with a northern male restricted to one end chamber and a southern male to the other. Videos were scored for positive and negative male-female interactions. We found evidence of both female and male preference for individuals of their own lineage. To further examine the nature of the male preference, the means of same lineage and different lineage interactions were compared. We found that, compared to southern males, northern males were significantly less likely to drive away a northern female. This study provides rare evidence that male preference may contribute to premating barriers in a mammal.

PRESENTER: PEDRAM JOKAR, NEUROSCIENCE
FACULTY MENTOR: DR. EDWARD KORZUS, PSYCHOLOGY
ADDITIONAL CONTRIBUTORS: JORDAN STEINHAUSER, PSYCHOLOGY; KYLENE SHULER, PSYCHOLOGY; AND GREGORY ADAME, NEUROSCIENCE AND BIOCHEMISTRY
PROJECT TITLE: PREFRONTAL NEURONAL DYNAMICS DURING SPATIAL MEMORY CODING AND RETRIEVAL

Abstract: Spatial memory involves encoding and retrieving environmental info for navigation and object localization, crucial for adaptive behavior. Evidence shows that interaction between the prefrontal cortex and hippocampus is vital for this memory. While hippocampal circuitry's role is well established, mechanisms in the prefrontal cortex are less understood. Research by Vieira et al. (2015) suggests that long-term memory encoding in the medial prefrontal cortex complements hippocampal processes and may be part of a neural network essential for discerning spatial differences and guiding behavior during memory retrieval. The dynamics of prefrontal circuitry in spatial memory tasks need further exploration. In this preliminary study, we recorded one-photon calcium imaging in the medial prefrontal cortex of freely behaving mice during an Object Location Task (OLT) to assess prefrontal network dynamics that guide learning and short-term spatial memory retrieval. For behavioral performance assessment, we used automated scoring and analysis. We hypothesized that the network activity underlying exploratory behavior and preference for novelty (specifically, novel object location) would be reflected in prefrontal dynamics, and that distinct neuronal populations would be highly engaged during learning and memory retrieval phases. Preliminary analysis identified discrete neuronal populations within the prefrontal network involved in learning and spatial memory recall. Further investigations are expected to reveal

subtle alterations within the OL population that influence mouse exploratory behavior during the appropriate selection of familiar and novel environmental features.

PRESENTER: LEYLA KARATAHAN, BIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: SPERM NUMBER PER BUNDLE IN SPECIES OF POECILIIDAE

Abstract: Sperm competition, the rivalry of sperm produced from different males to fertilize a female's eggs, is widely present in species of Pociliidae. Poeciliids are livebearers and internal fertilizers. Males produce sperm packed into bundles; delivering sperm this way may improve efficiency of transfer and lead to higher competition success, especially when multiple males inseminate females. However, the number of sperm per bundle is unknown. Previous research revealed that the guppy, *Poecilia reticulata*, has approximately 20,000 sperm per bundle, but few other species have been characterized. We aim to find how many sperm there are per bundle in Poeciliidae species to see if the number of sperm per bundle varies among species and among individuals within species. We proposed to do so with a flow cytometer, which has never been used for this purpose but holds the promise of faster and more accurate quantification of sperm count. We will compare sperm counts across species and to other male reproductive characteristics, such as bundle and sperm morphology and evaluate whether the presence of traits like male courtship behavior or ornamentation affect sperm count. We will also be looking at the influence of female reproductive attributes on sperm count, such as whether or not they have placentation or superfetation. The influence of these male and female traits is of interest because theory predicts that they will affect the magnitude of the role of sperm competition in determining mate choice.

PRESENTER: CARTER KEYWORTH, PLANT BIOLOGY
FACULTY MENTOR: DR. ROBERT JINKERSON, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: COMPARING MUTANT DEVELOPMENTAL PHENOTYPES OF *ARABIDOPSIS THALIANA* AND TOMATO (*SOLANUM LYCOPERSICUM* VAR. MICRO-TOM) AFTER POLY (ADP-RIBOSE) POLYMERASE 2 DISRUPTION

Abstract: Our group recently demonstrated that disruption of *POLY (ADP-RIBOSE) POLYMERASE 2B (PARP2B)* in cherry tomato (*Solanum lycopersicum* cv. Micro-Tom) results in a compact growth phenotype, characterized by a 46% reduction in plant height compared to the wild type (WT). Nuclear PARP proteins are key regulators of cellular stress responses in eukaryotes, yet little is known about their role in regulating development and architecture in plants. In tomato, there are two *PARP2* paralogs, *PARP2A* and *PARP2B*. Both lie on the same chromosome in what appears to be a tandem duplication. *PARP2B* lacks predicted DNA-binding domains required for nuclear localization, suggesting neofunctionalization following duplication and the acquisition of a novel developmental role. In contrast, *Arabidopsis thaliana* contains only a single PARP2 gene, which is homologous to tomato *PARP2A*. This provided a rapid model to test whether disruption of the ancestral *PARP2A*-like gene influences plant architecture. To evaluate whether disruption of *PARP2* produces conserved developmental effects across species, a homozygous *Arabidopsis parp2* T-DNA insertional line was characterized. Height at seven days post-flowering was comparable between genotypes. Interestingly, aboveground biomass (fresh and dry weight) at seven days post-flowering was significantly increased in *Arabidopsis parp2* plants relative to WT, and rosette diameters at bolting were also slightly larger. Together, these results indicate that the *Arabidopsis parp2* mutant does not exhibit the compact growth phenotype observed in tomato *parp2b*

lines, supporting our hypothesis that *PARP2B* may have acquired a novel developmental function in tomato.

Presenter: Dae Kim, Microbiology
Faculty Mentor: Dr. Raymund Papica, University Writing Program
Project Title: *Become Again*

Abstract: Early exposure to tabletop role-playing games shaped my interest in building worlds governed by unique rules, unpredictable consequences, and character agency. As a microbiology major trained to value structure, evidence, and historical context, my project builds on my education. *Become Again* applies a research-informed framework to literary fiction, grounding its narrative in documented realities: plague medicine, late fourteenth-century Burgundian politics, and monastic life during the Anglo-French conflict. Rather than treat fantasy as spectacle, the project uses it as a controlled narrative device to examine sacrifice, agency, and identity under constraint.

The opening chapter follows Aline, a young novitiate confined to a Burgundian abbey during a resurgence of plague. Isolated and frequently disciplined, she tends the dying until a confrontation with nobility leads to imprisonment and a failed escape that leaves her closest companion, Phileine, mortally wounded.
In solitary confinement, Aline encounters a supernatural entity and accepts a pact. She becomes a conduit for the dead, absorbing fragments of memory and skill as their souls pass through her. The fantastical element arises not as spectacle, but as a response to trauma and moral crisis. This chapter introduces a larger novel. As part of her pact, Aline will eventually die and be reborn. Under the terms of her pact, she retains memories of her previous life, and anyone bound to her through love is reborn alongside her, though without memory of their previous lives. Aline alone remembers, trapping her in an increasingly unbearable cycle of tragedy, rebirth, knowledge, and loss.

Presenter: Mia Kim, Biochemistry
Faculty Mentor: Dr. Emma Rova Danelius, Chemistry
Additional Contributor: Lael Cardinal Edwards
Project Title: The Expression and Purification of Adaptor Proteins Crk and CrkL

Abstract: Crk and CrkL are adaptor proteins involved in cell signaling pathways. They function as molecular bridges between proteins, facilitating signaling cascades that regulate cellular processes. These proteins play a significant role in chronic myeloid leukemia (CML), where the SH3N domain of Crk binds to the oncogenic tyrosine kinase Bcr-Abl, promoting increased cell proliferation. The goal of this research was to express and purify the SH3N domains of Crk and CrkL for structural studies and future applications in drug design and cancer research. This was accomplished through overexpression in E. coli cells followed by cobalt-based affinity chromatography. Successful overexpression and purification were confirmed using SDS-PAGE analysis, Western blot, and mass spectrometry. These results lay the groundwork for future studies aimed at crystallizing these proteins and screening potential ligands that could serve as therapeutic agents targeting Crk and CrkL-mediated protein interactions.

PRESENTER: ETHAN KINOSHITA, CHEMISTRY
FACULTY MENTOR: DR. W. HILL HARMAN, CHEMISTRY
ADDITIONAL CONTRIBUTOR: PHILLIP FARIAS
PROJECT TITLE: NEW LOW-VALENT NICKEL COMPLEXES FOR COOPERATIVE CHEMISTRY

Abstract: Low-valent nickel complexes are of interest due to their prominent catalytic activity. These species typically rely on high electron-density nickel centers in tandem with sterically available coordination spheres to facilitate catalysis. Among nickel catalysts, nickel hydride species are particularly interesting due to their ubiquity as hydrogenase intermediates. Furthermore, nickel hydride species are typically thermally unstable, lending to the scarcity of isolated species. Herein, our work focuses on a low-valent anionic unsymmetrical mesityl-phosphine-diboraanthracene nickel hydride coordination complex ($MesB_2P$-NiH), with promising character for catalysis, small molecule activation, and hydrogen storage. This work aims to elucidate the reactive cooperativity between the diboraanthracene (DBA) core and the reduced nickel center in small molecule activation and catalytic reactions. The interconversion between an anionic cyclometalate species and the $MesB_2P$-NiH species under intentional stress sets precedence for hydrogen storage capability.

PRESENTER: JASROOP KLAIR, BIOLOGY
FACULTY MENTOR: DR. CRYSTAL REYNAGA; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: HOW DO THEY RECOVER? COMPLIANT SUBSTRATES EFFECT ON ENERGY RECOVERY IN CANE TOADS

Abstract: Everybody knows frogs can jump, but the physiology and biomechanics behind that seemingly simple movement is anything but simple. It is known that ballistic jumping frog species often use muscle contraction to store energy within their tendons to power fast movements. In this study, we investigated how environmental perturbations (substrate stiffness) can affect an organism's ability to adapt and maintain performance, specifically in cane toads (*Rhinella marina*). In order to test this, five individuals were jumped from three, 3D printed substrates of variable stiffness. Previous studies suggest that in the case of Cuban tree frogs (*Osteopilus septentrionalis*), the compliant substrates disrupt the inertia used to store elastic energy in their tendons and slow down limb extension. *O. septentrionalis* generate four times more jumping power, compared to the power that the muscle alone can produce. This suggests that the tendon contributes significantly to that jumping power, to a greater degree than the muscle. Since cane toads rely more on muscle power to jump, we hypothesized that regardless of how stiff the substrate is, the cane toads would be able to adjust limb extension and recover greater energy from the substrate. We found that unlike the *O. septentrionalis*, the cane toad prior to jumping would stay on the substrate until the point where the substrate would return to its initial position. Thus, the cane toad would recover about 90% of the energy displaced on the substrate, while the *O. septentrionalis* would only recover about 50-60% of the substrate energy.

PRESENTER: NANDHINI KOTHAPALLI, BIOCHEMISTRY
ADDITIONAL PRESENTER: SAMANTHA LUGO, BIOCHEMISTRY
FACULTY MENTOR: DR. SELENE BOBADILLA, BIOCHEMISTRY
PROJECT TITLE: DISCUSSION ACTIVITIES WITH A FOCUS ON COMMUNITY LEARNING

Abstract: STEM (science, technology, engineering, and mathematics) fields are often characterized as highly competitive and inherently difficult, fostering low confidence and sense of belonging (SoB),

particularly among non-STEM students. Prior observations in a large, general education lower-division course serving students across all majors, *BCH010: Introduction to Nutrition*, indicate lower confidence and academic performance in non-STEM students. This study proposes grouping as an intervention to promote confidence, belonging, and improved academic performance. This mixed-methods study is guided by the Student Affective Learning Theory (SALT) framework, which evaluates SoB, science identity and self-efficacy. Does structured grouping of STEM and non-STEM students increase SoB, confidence, and improve performance in BCH 010? In this study, students collaborated in fixed groups on lecture-aligned activities during discussion sections in Fall 2025 and Winter 2026. The groups consisted of four to six STEM and non-STEM students. Thematic analysis of the reflections completed by participants (including an end-of-the-quarter reflection), guided by the SALT framework, examines their experiences with grouping focusing on themes related to increased confidence, SoB, and motivation. Preliminary data from Fall 2025 reveals that approximately 77% of all students (n=34) mention discussion within their final reflections, of which ~54% mention the weekly discussion activities and ~37% mention a discussion-based group project. Findings from this work may inform teaching strategies and classroom experiences regarding structured peer groupings to promote inclusive and collaborative learning environments as well as improved student academic performance, especially in larger-sized general education courses.

PRESENTER: YUVA KRISHNAPILLAI, NEUROSCIENCE
FACULTY MENTOR: DR. MARGARITA CURRÁS-COLLAZO; MOLECULAR, CELL, AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: E. KOZLOVA, D. SWARTZ, Y. ELHAJJAOUI, C. LUNA, S. ALAM, AND A. LAM
PROJECT TITLE: VAGAL DEAFFERENTATION ALTERS METABOLISM AND MITIGATES COGNITIVE IMPAIRMENT IN GULF-WAR ILLNESS MICE

Abstract: Gulf War Illness (GWI) is a chronic condition characterized by neurological and gastrointestinal symptoms, including cognitive deficits, chronic fatigue, neuroinflammation, and gut dysbiosis in ~300,000 GWI Veterans. We tested whether vagal deafferentation of cholecystokinin receptor-containing (CCKAR) vagal afferent neurons (VANs) modulates GWI-associated abnormalities. Male C57BL/6 mice (n≈16/group) received bilateral nodose ganglia injections of either CCK-conjugated saporin neurotoxin (CCK-SAP) or sham BLANK-SAP and exposed to GWI agents (8.9mg/kg PB, 1.3mg/kg PER, 30% DEET, 5min restraint stress) or vehicle plus stress (CON/S), followed by cognitive and metabolic testing at post-treatment days 60, 90, and 190. RNA *in situ* hybridization confirmed vagal deafferentation (reduced *Cckar*-expressing VANs in CON/S+CCK-SAP versus CON/S+BLANK-SAP ($p<0.05$). GWI agents impaired novel object recognition versus CON/S mice; deficits were rescued in GWI+CCK-SAP ($p<0.05$–0.01). Open-field habituation was disrupted in GWI and not restored in GWI+CCK-SAP ($p<0.05$). Vagal deafferentation apparently improved associative learning in GW mice ($p<0.1$). CCK-SAP prevented reduction in cumulative activity in 10d voluntary wheel running (VWR) ($p<0.05$) but not exercise endurance (EE) ($p=0.1$). EchoMRI after VWR reduced fat and lean mass in GWI ($p<0.05$) but not GWI+BLK-SAP mice. In contrast, exercise-induced mobilization of lactate and glucose was reduced in both GWI groups ($p<0.001$-0.0001). Together, these findings support CCKAR-containing VANs as modulators of GWI-like phenotypes and a potential therapeutic target. Supported by DoD grant GW-180072 (MCC) and UCR Student Minigrant (YK).

PRESENTER: RITHI KRISHNARAJ, DATA SCIENCE
FACULTY MENTOR: DR. DANIEL PETRAS, BIOCHEMISTRY
PROJECT TITLE: FBMN-STATS-GUIDE

Abstract: Feature-based molecular networking (FBMN) is a core section of non-targeted metabolomics, yet the difficulty of downstream statistical analysis remains a significant barrier for researchers lacking scripting and data science expertise. To address this, we developed the FBMN-STATS-GUIde, a web application that integrates with GNPS2 workflows, which allows researchers to perform efficient and comprehensive statistical analyses with AI-assisted interpretations. The application implements a complete data cleanup pipeline, including blank removal, missing value imputation, and multiple normalization methods with scaling options (TIC, Center-Scaling). Statistical analysis includes univariate methods (ANOVA, Kruskal-Wallis, and t-tests) and multivariate methods (Principal Coordinate Analysis with PERMANOVA and Random Forest classification). The interface generates intricate visualizations, and provides exportable data tables for integration back into molecular networks through Cytoscape, allowing for feature prioritization and biological interpretation within the GNPS2 environment.
An integrated LLM interprets experimental design and meta-data and suggests statistical results and visualizations, providing efficient interpretations and potential biological relevance.We validated the application using a large-scale analysis of 2,315 marine samples, as the pipeline successfully identified distinct clustering across ecosystem types ($p < 0.001$, $R^2 = 0.1072$). DEET and polyalkylene glycols were found to be the primary drivers of chemical variance in coastal regions. These results replicated findings from previous manual studies, demonstrating the tool's ability to properly identify and contextualize biological markers for metabolomics research. By providing an AI-enhanced interface for complex data analysis of non-targeted metabolomics data, we are able to streamline the process of identifying significant biological markers in our environment.

PRESENTER: LIKHITH VIJAYA KUMAR, NEUROSCIENCE
FACULTY MENTOR: DR. MICHAEL ADAMS, BIOLOGICAL SCIENCES
PROJECT TITLE: ROLE OF ECDYSIS TRIGGERING HORMONE IN *DROSOPHILA* COURTSHIP SUCCESS

Abstract: Ecdysis, the intricate process by which insects shed their exoskeleton, is initiated by ecdysis triggering hormone (ETH) secreted from endocrine Inka cells. While ETH is essential for the successful developmental sequence leading to adulthood, recent evidence indicates that this hormone is repurposed for adult functions, including reproductive physiology and behavior. Prior work has revealed that adult ETH signaling plays a major role in modulating post-copulation courtship inhibition (PCCI). We have found that heat stress appears to create ETH deficiency and reduced courtship success. Furthermore, promotion of Inka cell secretory activity rescues behavior. Using the GAL4/UAS system, we express either CsChrimson or dTRPA1 in Inka cells to evoke ETH release with light or temperature, respectively, following heat-stress exposure. Courtship is quantified with a standard courtship index and ethogram-based scoring of sequential behaviors, complemented by automated tracking to extract velocity and locomotor trajectories measurements. Our findings support the hypothesis that stress reduces successful copulation and that conditional ETH release rescues this phenotype. These studies will help determine if ETH is an essential endocrine hormone for adult male *Drosophila* and motivate future studies involving interconnected hormones such as Juvenile Hormone and Ecdysone.

PRESENTER: ANIKA KUMAR, BIOLOGY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: WHAT IS THE BASIS OF MALE COLORATION IN DOMESTIC GUPPIES?

Abstract: Domestic guppies are famous for being very brightly colored with elongated dorsal and tail fins. *Poecilia wingei* are highly variable in color pattern, but lack the rich body coloration and fancy fins of domestic guppies. *Poecilia wingei* male coloration is primarily controlled by a Y-linked supergene, therefore coloration is passed down exclusively from father to son. With this as a starting point, how is it possible to select for new phenotypes that are so different from the wild ancestors? The cross between a domestic female and a *Poecilia wingei* male produced 100% sons that looked like domestic male guppies. The cross between a *Poecilia wingei* female and a domestic male produced 100% males that looked like a *Poecilia wingei* male, but with the highly elongated dorsal fin of a domestic male. We then performed brother-sister crosses to produce an F2 generation. Each cross produced segregating phenotypes, some of which looked like the grandfather, others of which displayed mixtures of wild-type and domestic phenotypes. We were able to make inferences about the genetic basis of the different color/ornamentation elements from the ratios of each phenotype in the grandchild generation and to identify elements likely derived from the X-chromosome and autosomes.

PRESENTER: VARUN KUMARAVELU; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTORS: DR. JULIA BAILEY-SERRES, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: DR. SYED ADEEL ZAFAR, BOTANY AND PLANT SCIENCES
PROJECT TITLE: CHARACTERIZING DROUGHT-RESPONSIVE TRANSCRIPTION FACTORS DRIVING ROOT PLASTICITY IN RICE

Abstract: Rice is traditionally grown in flooded paddies, which harbor bacteria that are a significant source of greenhouse gas emissions. Transitioning to water-saving techniques like Alternate Wetting and Drying (AWD) reduces greenhouse gases but exposes crops to yield-limiting drought stress. Therefore, improving crop resilience has become a critical objective for establishing global food security. Our approach focuses on generating drought-resilient rice by optimizing xylem architecture, which transports water inside the plant from roots to the aerial plant organs. We hypothesize that an increased number and diameter of root xylem vessels provide increased hydraulic conductivity to maintain water uptake while under stress. Previously, using cell-type-specific gene expression profiling of rice root cells, our group identified a gene-regulatory network controlling xylem development. To validate this network, we generated mutant lines of candidate genes using a CRISPR-Cas9 gene-editing approach. We hypothesize that these transcription factor mutants deficient in the target genes' products exhibit structural changes in the root xylem architecture under water deficit conditions. To test this, we have exposed the wild-type and mutant rice plants to a moderate drought and quantified drought-induced anatomical changes using root cross-sections and confocal microscopy. We observed an altered number and size of root xylem vessels in the mutant roots under drought, along with other changes in the root architecture. This confirms the critical role of these genes in root phenotypic plasticity under drought and provides promising targets to engineer drought-resilient root architecture. Our ongoing gene expression analysis will further uncover the molecular pathways regulated by these genes.

PRESENTER: LYNNEA LE, BIOLOGY
FACULTY MENTOR: DR. AHMED EL-MOGHAZY, MICROBIOLOGY AND PLANT PATHOLOGY
PROJECT TITLE: EVALUATION OF METAL-BASED NANOPARTICLES FROM POMEGRANATE BYPRODUCT AS ANTIMICROBIAL AGENTS FOR FRESH PRODUCE SAFETY

Abstract: The contamination of fresh produce with foodborne pathogens remains a significant public health concern, contributing to outbreaks of illness and economic losses within the food industry. As the demand for sustainable food safety interventions increases, there is a growing need for antimicrobial strategies that reduce reliance on synthetic chemical treatments. Agricultural wastes represent an abundant and underutilized resource rich in bioactive compounds that can serve both as reducing and stabilizing agents for green nanoparticle synthesis. This study focuses on the preparation of Metal-based nanoparticles (MNPs) using pomegranate pomace, a widely available fruit processing byproduct. Bioactive compounds were extracted from pomegranate pomace through a simple, scalable, sonication-assisted aqueous method using distilled water, eliminating the need for hazardous chemical reagents. The resulting extracts are employed in the green synthesis of zinc, copper, and silver nanoparticles. The antimicrobial activity of the synthesized MNPs is evaluated against *Escherichia coli* using agar disk diffusion assays. In addition, potential synergistic effects under light-activated conditions will be examined to determine the influence of photoactivation on antibacterial efficacy. Zones of inhibition will be measured to compare performance across different metal types and light conditions. By converting agricultural waste into value-added antimicrobial nanomaterials, this study demonstrates sustainable, eco-friendly strategies for reducing pathogen cross-contamination on fresh produce, advancing circular bioeconomy principles and enhancing food safety for both industry and consumers.

PRESENTER: MADELYN LEE, ENTOMOLOGY
FACULTY MENTOR: DR. SIMON GROEN, NEMATOLOGY
ADDITIONAL CONTRIBUTORS: TARYN DUNIVANT, BOTANY AND PLANT SCIENCES; OLIVIA THORGERSEN; ABBY SOND; AND TYLER INSKEEP, BOTANY AND PLANT SCIENCES
PROJECT TITLE: MOLECULAR QUANTIFICATION OF ROOT-KNOT NEMATODE INFECTION IN RICE

Abstract: *Meloidogyne incognita* is one of the most pervasive plant-parasitic nematodes, causing severe losses to crop yields worldwide. There are few techniques to quantify nematode infection in the root system; visually counting organisms in an acid fuchsin stained infected root system is the most reliable method, yet research on molecular quantification is currently being explored. By devising a quantitative polymerase chain reaction (qPCR) procedure that can be used to quantify nematode DNA within infected plant tissue, signs of infection can be established early and with increased efficiency. Primers were designed for targeted *M. incognita* amplification in the presence of plant tissue. A dual-DNA extraction protocol was performed on a known quantity of nematodes and uninfected rice cultivar Kitaake root tissue. Through qPCR, we demonstrated DNA of a single nematode could be isolated from rice tissue and quantified. Across varying concentrations of nematodes, our results show that Cq values have a direct correlation with the logarithm of the nematode concentration. In vitro and greenhouse experiments using varying concentration of nematode inoculums were performed to corroborate these results in planta.

PRESENTER: ALAN LI, MECHANICAL ENGINEERING
FACULTY MENTOR: DR. SHAWN WESTERDALE, PHYSICS AND ASTRONOMY
PROJECT TITLE: A CRYOGENIC SYSTEM FOR STABLE ARGON PRODUCTION

Abstract: Liquid argon (LAr) has wide applications in nuclear and particle physics, particularly in dark matter research, where it enables the detection of ionization and scintillation signals while minimizing radioactive background. Doping liquid argon with xenon can enhance ionization and increase photon yield, lowering the energy threshold and increasing signal strength. This amplification of light output enhances detector sensitivity, increasing the likelihood of detecting weak interactions, such as those from potential dark matter candidates. However, the system presents challenges due to the narrow liquefaction temperature range and the potential for xenon to separate from argon or to form ice, which can introduce instabilities. I am researching a cryogenic system designed to increase liquid argon production while maintaining a stable liquefied state to address these challenges. This research involves developing a stable, functional cryogenic condenser to ensure a continuous supply of high-purity liquid argon, optimizing storage conditions, and refining the argon-xenon doping process. Through this research, I aim to advance the capabilities of liquid argon detectors for experiments such as DarkSide-LowMass and contribute to future applications in medical, engineering, and scientific research, including aerospace applications in satellites and rocketry.

PRESENTER: KEENA LIN, COMPUTER SCIENCE
ADDITIONAL PRESENTER: ANANYA SOOD, COMPUTER SCIENCE
FACULTY MENTOR: DR. PATRICIO GALLARDO, MATHEMATICS
PROJECT TITLE: DATA-DRIVEN MATHEMATICAL CONJECTURES GENERATION VIA LLMS

Abstract: In science, finding an interesting and relevant research question to solve is as important as solving it. However, finding a new problem is more of an unstructured process that usually relies on concrete evidence, such as data and other theoretical problems related to it. We describe ongoing work on an LLM-based system that generates mathematical conjectures, that is, potential open problems, for solving. To generate the problems, we use numerical data and known theorems, which act as a context for the LLM to present candidates. Those candidates are then tested against a database to gather evidence.

PRESENTER: OLLIES LIN; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. KARTHIKEYAN CHANDRASEGARAN, ENTOMOLOGY
ADDITIONAL CONTRIBUTOR: BENJAMIN NYMAN
PROJECT TITLE: STANDARDIZATION OF SMARTTRACE® FOR MARK-RELEASE-RECAPTURE STUDIES IN *AEDES AEGYPTI*

Abstract: Mosquitoes are critical disease vectors, and vector control strategies such as the Sterile Insect Technique (SIT) rely on effective marking methods to assess survivorship, dispersion, and mating competitiveness of released irradiated males. Existing marking methods are often only partly effective or incur recurring operational costs, highlighting the need for an efficient, cost-effective alternative. To address this gap, we evaluated SmartTrace®, a polymer-based fluorescent dye, for its suitability as a mosquito marking tool. While prior research has explored its use in *Anopheles* mosquitoes, its performance in other species and resilience under environmental stressors such as sunlight remain poorly understood. Here, we assessed the effects of SmartTrace® on survivorship, fluorescence persistence, detection reliability, and mating performance in *Aedes aegypti*. Comparisons between marked and unmarked individuals were conducted under lab and field conditions. Fluorescence detection was evaluated using a gel doc system, plate reader, and visual identification under UV illumination by untrained volunteers. Mating performance of marked males was evaluated through female blood-feeding, oviposition, and egg hatch rate. The SmartTrace® application did not affect mosquito survivorship or mating outcomes, and fluorescence durability remained stable following weeks of sunlight exposure. Detection reliability is dye-dependent, with red showing reduced detectability compared with yellow-green-marked mosquitoes, which were consistently detected by all three detection methods. These findings suggest that SmartTrace® is a durable and operationally practical marking approach with potential to support SIT monitoring and mosquito movement studies, offering a promising alternative to existing marking strategies.

Presenter: Annabelle Lu; Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Bryan Brown; Molecular, Cell, and Systems Biology
Project Title: Modeling Microbial Modulation of T Follicular Helper Cell Differentiation in HIV-Exposed, Uninfected Infants

Abstract: Each year, more than 1.2 million infants are born globally who have been exposed to HIV (iHEU). Although not living with HIV, iHEU exhibit reduced vaccine responsiveness and increased susceptibility to infectious diseases compared to unexposed infants, indicating underlying immune dysfunction. Emerging evidence suggests altered early-life microbial exposures and gut microbiome composition in iHEU contribute to immune dysregulation, including altered exposure to microbial-derived metabolites capable of shaping immune development. T follicular helper (Tfh) cells are a specialized subset of $CD4^+$ T cells essential for supporting B cell antibody production and long-term humoral immunity. Impaired Tfh differentiation compromises vaccine-induced protection; however, the mechanisms by which microbial metabolites influence early-life Tfh programming remain unclear. Short-chain fatty acids (SCFAs), such as butyrate, modulate mucosal immunity and transcriptional programs involved in T cell differentiation. Notably, butyrate can influence pathways involving Bcl6, a transcription factor repressor critical for maintaining Tfh differentiation and identity. iHEU have been shown to possess lower abundance of Bifidobacteria and other beneficial microbes involved in butyrate production. This study uses a human in vitro model to investigate how butyrate exposure modulates Tfh differentiation. Naive $CD4^+$ T cells are cultured under Tfh-polarizing cytokine conditions with butyrate, and differentiation is assessed using flow cytometry. Preliminary results indicate dose-dependent effects of butyrate on Tfh differentiation, with distinct responses observed across exposure levels. Together, these findings suggest altered Tfh differentiation in response to microbial-derived metabolites and provide insight into how gut microbiome-associated signals influence early immune programming in HEU infants. Supported by UCR Minigrant.

Presenter: Daniella Lu, Microbiology
Faculty Mentors: Dr. Quinn McFrederick, Entomology and Dr. Jason Rothman, Microbiology
Project Title: Urban Flowering Plant Microbiomes in Response to Temporal Variation

Abstract: Urbanization leads to the cultivation of non-native horticultural and weedy plant species, which provide abundant floral resources and may dominate pollinator diets. Flowers are major conduits of microbial transmission, shaping the potential transfer of microbes between pollinators. Studying how floral microbiomes change over seasons may help us understand some of the impacts of global climate change on pollinators and plants. To determine these trends, I monitored urban gardens on and around the University of California, Riverside campus, recording ambient temperatures, humidity, and I conducted pollinator surveys at a specified time once per week. At the same time, I aseptically collected flower samples for culturing on Pollen Extract (PE) media and stored additional samples for further metagenomic sequencing. I counted bacterial Colony Forming Units (CFU), then cultured unique colonies for 16S rRNA gene sequencing to determine identities. As temperatures lowered, CFU counts increased while rising temperatures caused CFU counts to decrease. Urban environments are known as heat islands due to large areas of impervious, heat retaining surfaces. Higher temperatures led to fewer culturable floral microbes, suggesting that climate change may negatively affect floral microbiomes, thereby posing an increased epidemiological risk to plants and pollinators

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

Abstract: 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: MARC MADRID, BIOLOGY
FACULTY MENTOR: DR. MEREDITH VANACKER; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: ESTIMATING SEASONAL GROUP SIZES OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) IN AN URBAN LANDSCAPE FOR PATHOGEN TRANSMISSION ANALYSIS

Abstract: This research examines summer and winter detection patterns and group-size variation in white-tailed deer (*Odocoileus virginianus*) using camera-trap data collected across an urban landscape on Staten Island, a borough of New York City. Images were annotated using Wildlife Insights to count adult males, adult females, and fawns per detection to estimate group size, relative abundance, and group structure dynamics. Spatial analysis conducted in QGIS will estimate the proportion of landcover types within buffers surrounding each camera location. Social group patterns, detection rates, and relative

abundance will be compared across seasons to assess how seasonal shifts in resource availability, vegetation cover, and social behavior influence deer distributions and activity. Summer detections are expected to be dominated by solitary individuals, weak group membership, and small group sizes, particularly among females during parturition and periods of high resource availability, whereas winter detections are predicted to show increased grouping, with females forming large matriarchal groups and males forming smaller, loose bachelor groups. White-tailed deer are recognized as hosts of zoonotic pathogens, including SARS-CoV-2, and non-zoonotic wildlife pathogens, highlighting the importance of understanding behaviors that influence contact rates that can drive pathogen transmission patterns. Characterizing deer social behavior and relative activity will improve seasonal analysis of deer disease data and provide insight into behavioral factors that influence pathogen transmission in urban deer populations.

Presenter: Omeid Majd, Biology
Faculty Mentor: Dr. Matthew Casselman, Chemistry
Project Title: The Impact of Music Ensemble Participation on STEM Students

Abstract: Science, Technology, Engineering, and Mathematics (STEM) undergraduates often manage demanding academic workloads that require strong time management and sustained cognitive effort. At the same time, participation in music ensembles requires additional rehearsals, performances, and emotional commitment. Although music engagement has been linked to mental and academic benefits, little is known about how these effects operate specifically among STEM students, whose schedules and cognitive loads differ from those of the general student population. This study investigates how involvement in UC Riverside music ensembles influences academic performance, time management, stress, and overall well-being among STEM students. The project uses a mixed-methods design that includes an online Qualtrics survey and randomly selected one-on-one interviews. The survey gathers data on demographic background, ensemble experience, academic workload, GPA, perceived stress, and the perceived impact of musical engagement on academic focus and emotional balance. Additionally, in-depth interviews with STEM students and ensemble directors who participate in music provide qualitative insight into the lived experience of balancing the arts and sciences. A comparison group of non-musician STEM students recruited from UC Riverside offers further context for evaluating potential academic or cognitive differences. Quantitative data will be analyzed for trends related to educational outcomes and time management, while thematic coding of interviews will explore motivations, challenges, and interdisciplinary connections. Findings may highlight how musical engagement supports student success and contribute to broader discussions on integrative education. This research aims to inform faculty advising, student support services, and future programming that encourages positive intersections between STEM education and the performing arts.

Presenter: Zaven Manukyan, Biology
Faculty Mentor: Dr. Venugopala Reddy Gonehal, Botany and Plant Sciences
Additional Contributor: Vincent Cerbantez-Bueno, Botany and Plant Sciences
Project Title: Analyzing the Roles of the Spaces Between the Regulatory Regions of *CLV3*

Abstract: In *Arabidopsis*, the CLAVATA (CLV) signaling pathway plays a critical role in regulating stem cell populations in the shoot apical meristem. Specifically, *CLAVATA3 (CLV3)* enables this function by encoding a small peptide that acts as a ligand, maintaining proper meristem size and organization. Because of its well-characterized role in meristem regulation, *CLV3* is a valuable gene to study. The *CLV3*

gene is regulated by the WUSCHEL (WUS) transcription factor, which has been reported to bind to a cis regulatory module (CRM1) at the 3' region. The deletion of this module affects *CLV3* expression. Our lab has identified two additional modules (CRM2 & CRM3), each with distinct structural and sequence features. These modules were selected for study because each contributes differently to the regulation of CLV3 expression, influencing both expression levels and spatial patterning within the meristem. Alterations within these regions could impact *CLV3* expression patterns. To test this hypothesis, we aimed to generate reporter lines with deletions between the CRM1–CRM2 and CRM2–CRM3 regulatory regions. To do this, we used molecular and genetic techniques to generate specific constructs having these modifications. We have successfully confirmed our constructs, and we have used them to transform *Arabidopsis* with *Agrobacterium*. In the next weeks, we are going to select the transformed plants and analyze the effects of the different deletions through confocal microscopy. These results will suggest the importance of specific regions that regulate *CLV3* expression.

PRESENTER: XAVIER MARTINEZ, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. ANDREW GRAY, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTOR: JOHN PERNA, ENVIRONMENTAL SCIENCES
PROJECT TITLE: EXAMINING THE RELATIONSHIP BETWEEN WILDFIRES AND MICROPLASTIC DISTRIBUTION WITHIN THE RIO HONDO RIVER

Abstract: The Rio Hondo River is a tributary Stream within the Los Angeles River (LAR) Watershed. Similarly, to most of LAR's tributaries, its paved and channelized infrastructure affords Rio Hondo high flood control efficiency, though, as an unintended consequence, it also amplifies transport of urban pollutants such as microplastics. Current research observes elevated microplastic distribution within paved urban channels; however, most of the research focuses on conventional wet-season precipitation events, and does not consider abnormal stormflow disturbances such as wildfires. The 2025 Eaton fire contaminated Rio Hondo with a significant amount of wildfire deposition, including ash and debris. This presents an opportunity to examine a potential correlation between wildfire deposition and microplastic transportation during precipitation events. This study examines roughly 80 stormflow samples collected during the post-fire wet season. Organic matter digestion, density separation, filtration separation, and microplastic characterization are underway in order to quantify microplastic abundance. The results will be compared to established regional stormflow datasets, and whether or not wildfire deposition alters microplastic distribution and concentration in urban stormflow will be assessed. This research contributes to a greater understanding of how several disturbances interact to influence pollutant transport within urban watersheds.

PRESENTER: SIDRA MAZHAR, BIOCHEMISTRY
FACULTY MENTOR: DR. SHAWN WESTERDALE, PHYSICS AND ASTRONOMY
ADDITIONAL CONTRIBUTORS: NIKA SHALAMOVA, ANTHONY GOMEZ, AND VLAD ZUEV
PROJECT TITLE: NEUTRON DETECTORS FOR ENHANCED DARK MATTER DETECTION

Abstract: Dark Matter is a form of matter that does not emit or absorb light, yet its gravitational effects are essential to explain the large scale structure of the universe. DarkSide-20k is an experiment that is currently under construction and dedicated for the detection of the leading candidate of dark matter, Weakly Interacting Massive Particles, or WIMPs. However, neutrons mimic the exact signals that dark matter particles (like WIMPs) are expected to produce. Neutron detection is critical to minimize background and false positives in dark matter detection. This project focuses on the development of a

boron-loaded liquid scintillator for efficient neutron detection. Boron-10 is utilized due to its high thermal neutron capture cross-section, making it well suited for neutron identification and can be amplified via Silicon photomultipliers (SiPMs). The scintillator is made with a purified mixture, via vacuum distillation, of trimethyl borate (TMB) as a boron source, pseudocumene (PC) as the solvent, and 2,5-Diphenyloxazole (PPO) as the fluorophore. When ionizing radiation interacts with the scintillator, light is emitted. Therefore, when a neutron enters an effective scintillator, Boron-10 captures the molecule and produces charged particles. Scintillator signals are measured via SiPMs and are tested with a radioactive source, such as Na-22, that emits gamma radiation. This research will contribute to improved background calibration and enhanced sensitivity in the next-generation dark matter searches.

PRESENTER: KAELYN MCADAMS, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. SHAWN WESTERDALE, PHYSICS AND ASTRONOMY
ADDITIONAL CONTRIBUTOR: ANIKA NEMANA
PROJECT TITLE: SUPERNOVA NEUTRINO DETECTION IN DARKSIDE-20K

Abstract: Core-collapse supernovae produce a burst of neutrinos that precedes electromagnetic emission and provides direct insight into stellar collapse dynamics and neutrino physics. Detecting these low-energy neutrinos requires ultra-low background detectors with high sensitivity. DarkSide-20k, a next-generation liquid argon detector designed primarily for dark matter searches, offers the potential to contribute to multi-messenger supernova observations through its sensitivity to electron neutrinos and electron antineutrinos. In this work, we simulate supernova neutrino interactions in the DarkSide-20k detector to evaluate its detection sensitivity and background discrimination capabilities using Monte Carlo methods. Separate simulations are performed for electron neutrinos and electron antineutrinos, allowing for comparison of their expected signal characteristics. This study provides a foundational framework for assessing the detector's role in future supernova detection and highlights its potential contribution to global multi-messenger astronomy efforts.

PRESENTER: MADISON MITSUUCHI; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. SIMON GROEN, NEMATOLOGY
ADDITIONAL CONTRIBUTOR: ANDREA NATALIE ROMERO, BOTANY AND PLANT SCIENCES
PROJECT TITLE: THE EFFECTS OF TOXIC CALIFORNIAN PLANTS ON PARASITIC NEMATODE BEHAVIOR AND SURVIVAL

Abstract: Famous studies on plant-herbivore interactions tend to focus on "pretty" herbivores, such as butterflies. However, in an ecosystem context, these interactions extend to natural enemies at higher trophic levels, involving many other "ugly" players such as entomopathogenic nematodes (EPNs). Previous experiments have demonstrated that plants produce toxins, such as tropane alkaloids and pyrrolizidine alkaloids, that serve as effective defenses against herbivores. However, it was found that some herbivores, such as caterpillars of the tiger moth and hawk moth, can tolerate alkaloids from toxic Californian plants, including the fiddleneck and jimsonweed. There is even evidence that these caterpillars may use the plants' alkaloids as a defense against natural enemies. Yet, tritrophic interactions between toxic plants, herbivores, and natural enemies remain understudied. In this study, we examined how plant alkaloids that are sequestered or excreted by herbivores may directly affect EPN behavior and survival. In one set of experiments, we examined whether EPNs had a repulsion to the waste of caterpillars ("frass") after they ate toxic plants. From this, we found that while frass of some herbivores contained toxins, there was no significant repulsive effect on the EPNs. Following these experiments, we

will conduct toxicity tolerance and fitness assays to examine how much of the plant toxins EPNs can tolerate and what their long-term generational impacts are. From these studies, we hope to better understand the broader interactions of toxic plants, herbivores, and natural enemies.

PRESENTER: LILIA MOGHADDAS GHOLAMI, BIOLOGY
FACULTY MENTOR: DR. MARTIN RICCOMAGNO; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL CONTRIBUTOR: CAMILLE GRONECK; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
PROJECT TITLE: MOLECULAR AND FUNCTIONAL CHARACTERIZATION OF AN UNDERSTUDIED GLYCOSYLTRANSFERASE FAMILY IN CORTICAL LAYERING AND NEURODEVELOPMENT

Abstract: Cadherins are a transmembrane protein superfamily that function as cell surface glycoproteins. Transmembrane O-mannosyltransferase targeting cadherins (Tmtc) family proteins act on cadherins in the endoplasmic reticulum (ER) by addition of O-mannose glycans. These post-translational modifications on cadherin family proteins are hypothesized to facilitate correct folding, cell migration, and mediate proper cell-cell adhesion. Homozygous loss of function of Tmtc family proteins in humans is associated with neurodevelopmental defects such as periventricular heterotopias, cobblestone lissencephaly, and intellectual disability. While we know homozygous loss of function of Tmtc family proteins causes severe defects during neural development, there is a gap in knowledge in the exact molecular function of Tmtc family proteins during neuronal migration and cortical development. This project will examine patterns of Tmtc family expression and identify protein-protein interactors, both *in vitro* and *in vivo*. To identify specific interactors with Tmtc family proteins *in vitro*, we will transfect cells with a plasmid encoding a TurboID fusion protein. TurboID is a biotin ligase that covalently modifies nearby proteins, which can then be enriched and identified via mass spectrometry. We will also verify proper localization of the fusion protein to the ER via immunocytochemistry and confocal microscopy. In the future, we will explore the necessity of identified protein-protein interactors in cell migration dynamics and neural development. This project aims to explore an understudied protein to better our understanding of the molecular mechanisms underlying neurodevelopmental disorders.

PRESENTER: SHIRAZ MOGUL; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. NICOLE ZUR NIEDEN; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL CONTRIBUTORS: PIUNIK BABAKHANINS, THOMAS SPAETER, CHRIS MICHAEL GATDULA, AND RUMAAN CHEEMA
PROJECT TITLE: ASSESSING THE TERATOGENIC POTENTIAL OF STATINS ON OSTEOGENESIS USING HUMAN EMBRYONIC STEM CELLS

Abstract: Of the many birth defects that affect the population, congenital skeletal malformations including craniofacial defects like cleft palates and lips make up a significant portion, posing major health concerns. Although initially prescribed to manage hypercholesterolemia by lowering bad cholesterol, statins remain one of the potential environmental contributors, working by inhibiting the hydroxymethylglutaryl-CoA (HMG-CoA) reductase enzyme which is essential in the cholesterol biosynthesis pathway. Even though statins are highly effective for managing hypercholesterolemia and reducing cardiovascular disease risk, prior studies indicate that they may adversely affect embryonic development by altering cholesterol-dependent signaling pathways, most notably the Sonic Hedgehog pathway. This pathway plays a pivotal role in cranial neural crest cell migration, tissue morphogenesis, and skeletal pattern formation. Preliminary research from our lab has demonstrated reduced osteogenic differentiation capacity following exposure to Simvastatin and Pravastatin, both low intensity forms of the

drug. RNA-sequencing results further validate these findings by highlighting the misregulation of genes and pathways crucial to embryonic bone development, spe cifically structures derived from neural crest cell progenitors. Building on these findings, we seek to systematically characterize the developmental toxicity of other higher intensity statins. Using the Embryonic Stem Cell Test (EST), we assess their effects on cell survival and osteogenic differentiation in vitro and through quantitative endpoint analyses identify concentrations that produce a 50% reduction in cell viability (IC50) and differentiation potential (ID50). By determining which statins most strongly impair osteogenesis, this study aims to support safer medication practices during pregnancy and advance understanding of statin-associated teratogenic risk.

Presenter: Mariana Moreno, Chemical Engineering
Faculty Mentor: Dr. Mark Ibekwe, Environmental Sciences
Additional Contributor: Zheng Li
Project Title: Bioaccumulation of PFAS in Earthworms and the Effects of PFAS on Soil Enzyme Activity

Abstract: Per- and polyfluoroalkyl substances (PFAS) are synthetic chemicals nicknamed "forever chemicals" due to their resistance to degradation. These compounds seep into soils from industrial and municipal sources, raising ecological concerns about their persistence and detrimental effects on soil health. This study examines the persistence of PFAS (perfluorooctanesulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), and perfluorobutanoic acid (PFBA)) in soil and potential bioaccumulation in animals using earthworms as an indicator organism. Soil samples were spiked with 100 ng/g of the PFAS mixture, and samples were taken from day 0, 6, and 21 to get data for short and long-term persistence of PFAS. Liquid Chromatography-Mass Spectrometry (LC-MS/MS) analysis was used to quantify PFAS concentrations in both soil and earthworms, as well as soil enzyme assays to determine changes in soil enzyme activities for each period. Results showed that beta-glucosaminidase activities were higher on day 21 with treatments containing worms, while phosphomonoesterase enzyme activities were higher during day 6 in treatments with worms. Moreover, PFOS and PFOA have slightly higher bioaccumulation factors at day 21 than PFBS and PFBA. These findings highlight the ecological risk posed by PFAS in terrestrial food webs and the value of earthworms as key engineers in soil remediation.

Presenter: Noe Mote, Economics
Faculty Mentor: Dr. Patricio Gallardo, Mathematics
Project Title: On the Structure of Lattice Triangles with Integer Coordinates

Abstract: A lattice triangle is a triangle T whose vertices have integer coordinates. Two important characteristics associated with them are the number of boundary points, b(T), and the number of interior points, i(T), with integer coordinates lying within or on the boundary of the triangle. We describe ongoing work, based on the research paper *On Ehrhart Polynomials Of Lattice Triangles* by Hofscheier, Nill, and Öberg, that characterizes the geometric structure of the pairs (b(T), i(T)) that arise from lattice triangles. In particular, we discuss the number of distinct lattice triangles with a fixed admissible pair (b(T), i(T)), as well as an explicit characterization of the lattice triangles that can appear.

PRESENTER: YASER NAJI, BIOCHEMISTRY
FACULTY MENTOR: DR. SEÁN O'LEARY, BIOCHEMISTRY
PROJECT TITLE: INVESTIGATING PHOSPHO-eIF4E DYNAMICS: SINGLE-MOLECULE ANALYSIS OF ONCOGENE mRNA SELECTIVITY IN TRANSLATION INITIATION

Abstract: Cancer cells selectively translate oncogene mRNAs that promote tumor growth, in part through dysregulation of translation initiation. The eukaryotic translation initiation factor 4E (eIF4E), which binds to the mRNA 5′ cap to initiate translation, plays a key role in determining mRNA selectivity during this process. The phosphorylation of eIF4E is strongly associated with cancer progression, though its mechanistic effects on mRNA binding remain unclear. This study aimed to uncover how phosphorylation alters eIF4E's selectivity during translation initiation, both independently and within the physiologically relevant eIF4F complex, which includes eIF4G, a scaffolding protein, and eIF4A, an RNA helicase that unwinds RNA for translation. Single-molecule FRET was used to measure binding kinetics between capped mRNAs and purified, fluorescently labeled human eIF4E in its phosphorylated and unphosphorylated states. Results showed that phospho-eIF4E significantly increased the association rate between capped oncogene mRNAs and phospho-eIF4E compared to its unphosphorylated form, indicating enhanced cap recognition at the single-molecule level. This enhanced association suggests that phosphorylation modulated eIF4E to promote conformational or interaction changes that favor faster and more stable recognition of oncogene mRNAs. Interestingly, when phospho-eIF4E operated within the eIF4F complex, the association rate decreased relative to phospho-eIF4E alone, suggesting that interactions within the complex modulate or stabilize binding differently under physiological conditions. These findings provide insight into how phosphorylation modulates eIF4E's selectivity during translation initiation. Understanding this modulation reveals how cancer cells exploit translational machinery and highlights phosphorylation-dependent regulation of eIF4E as a potential therapeutic target for disrupting oncogene protein synthesis and advancing cancer treatments.

PRESENTER: SHIORI NAKAYA, EARTH AND PLANETARY SCIENCES
FACULTY MENTOR: DR. HEATHER FORD, EARTH AND PLANETARY SCIENCES
PROJECT TITLE: DETERMINING THE ORIGINS OF POVERTY HILLS WITH GRAVITY MODELING

Abstract: The origin of the Poverty Hills in Owens Valley is debated due in part to their unique location within the valley, as well as the mixture of rock compositions present within. Three distinct models exist to explain the origin of Poverty Hills, including e (1) landslide emplacement, (2) tectonic uplift/fault block, and (3) a "flower" structure combining complex tectonic uplift formed from strike-slip faulting. Previous gravity and magnetic modeling conducted by Rose et al. (2021) suggests that Poverty Hills may be the result of tectonic uplift. However, Bishop and Clements (2006) evaluated the rock compositions and geologic units and argued that a large detachment landslide was the most likely source for Poverty Hills. We expand upon Rose et al. (2021)'s research by utilizing NOAA seismic station datasets to improve upon their gravity modeling with GravMag and Python coding. By understanding the origins of Poverty Hills, geoscientists can better mitigate possible natural hazards for populations that live in Owens Valley. Results from the gravity modeling are still pending with results to be presented at the research conference.

PRESENTER: RYAN NAM, BIOLOGY
FACULTY MENTOR: DR. ERIN RANKIN, ENTOMOLOGY
ADDITIONAL CONTRIBUTOR: MOLLY BARBER
PROJECT TITLE: EFFICIENCY OF HOUSEHOLD REMEDIES IN MANAGING APHID POPULATIONS

Abstract: Aphids are recognized as a destructive force in horticulture. Their rapid reproduction rate allows for fast colonization which is taxing on plant longevity. The efficacy of aphid control on the ornamental Rose Mallow (*Hibiscus moscheutos*) depends upon the composition of the organic pesticide applied. This study, inspired by home gardener recipes, saw the testing of four different solutions of household ingredients: dish soap, vegetable oil, tomato leaves, and neem oil. The pesticide composed of damaged tomato leaves proved to be detrimental to overall plant health while providing very little defense against aphids. The other 2 solutions containing neem and a vegetable oil-soap blend yielded mixed results. In the end, we determined that the dish soap mixture was the most effective in dispatching aphids.

PRESENTER: BRYAN NGUYEN, BIOLOGY
FACULTY MENTOR: DR. LUCIANO COSME, ENTOMOLOGY
PROJECT TITLE: DENGUE VECTOR COMPETENCE VARIANTS ACROSS GLOBAL *AEDES AEGYPTI* POPULATIONS

Abstract: Dengue is the most common mosquito-borne viral disease worldwide, with an estimated 390 million infections annually. The primary vector, *Aedes aegypti*, varies in its ability to transmit the dengue virus, a trait known as vector competence. Candidate single-nucleotide polymorphisms (SNPs) previously identified through a genome-wide association study of experimentally infected *Ae. aegypti* were used to investigate whether these variants show geographic patterns consistent with dengue transmission. Using a publicly available whole-genome dataset comprising 1,206 genomes from 73 global populations, variants were called with the nf-core/sarek pipeline and the AaegL5 reference genome. Populations were then classified into those from regions with documented dengue outbreaks and those without, based on historical records from the GIDEON database. Allele frequencies at candidate loci were compared between the two groups using R.

Candidate SNPs showing significantly different allele frequencies between dengue-endemic and non-endemic populations may reflect selection on vector competence traits in natural *Ae. aegypti* populations. These loci could represent causal variants or be in linkage disequilibrium with functional mutations that influence mosquito susceptibility to dengue virus. This population-level validation of experimentally identified candidates could help prioritize variants for functional studies and inform vector surveillance by identifying genetic markers of high-risk mosquito populations.

PRESENTER: ETHAN NGUYEN, BIOLOGY
FACULTY MENTOR: DR. KATE OSTEVIK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: BRENNAN SILVA
PROJECT TITLE: REPRODUCTIVE ISOLATION BETWEEN SISTER SPECIES IN *CLARKIA*, SECTION *MYXOCARPA*

Abstract: Speciation, the emergence of new species, is a significant catalyst for biodiversity. Describing the mechanisms that permit two closely related species to remain reproductively isolated from one another is essential to understanding how they can coexist while still maintaining their species identity.

One way species can avoid hybridization is by occupying different ecological niches. *Clarkia virgata* and *Clarkia australis*, sister species in the *Myxocarpa* clade, are found in the Sierra Nevada Mountains of Northern California. Both species are diploid (2n=10), but differ in their chromosomal arrangements, which may serve as a postzygotic barrier leading to hybrid infertility and inviability. Another factor, ecological differences, must also be considered because it may function as a prezygotic barrier that hinders their ability to hybridize. In this experiment, I will conduct morphological and phenological analyses to identify factors that may influence reproductive isolation between the two species. More specifically, I will quantify the germination success rate, flowering time, flowering duration, flower size, and the number of flowers of each sister species. To do this, I will prepare a total of 40 maternal lines, with 20 from each species. At the end of my experiment, I predict that there will be differences in flowering duration and timing between *C. virgata* and *C. australis*, which may serve as temporal prezygotic barriers, although further investigation will be needed to identify the correlation between these temporal differences and reproductive isolation

Presenter: Kyle Nguyen, Bioengineering
Faculty Mentor: Dr. Emma Rova Danelius, Chemistry
Additional Contributor: Måns Eriksson
Project Title: NMR Ensemble Analysis of Romidepsin

Abstract: Human proteome is undruggable by conventional small-molecule drugs. To combat this, large and complex macrocycles have gained significant research interest due to their ability to modulate flat and featureless binding sites. Due to their inherent structural flexibility, many macrocycles behave like molecular chameleons, enabling them to change conformation in response to the environment, resulting in both increased cell permeability and effective target binding. Romidepsin is a bicyclic depsipeptide macrocycle and functions as an inhibitor of histone deacetylases (HDACs), enzymes that downregulate gene expression. The upregulation of HDACs can lead to excessive gene silencing, thereby promoting the maintenance of the anti-apoptotic state commonly found in cancer cells. Romidepsin is a molecule of interest for nuclear magnetic resonance (NMR) analysis due to its unique depsipeptide structure, consisting of both amide and ester linkages arranged in a bicyclic structure. This structure provides conformational rigidity, while allowing dynamic structural behavior in solution.
Here, we present our work on the solution-state conformational behavior of romidepsin in polar and apolar solutions using NMR spectroscopy. Through NMR analysis, NOE-derived distances are used to deconvolute a theoretical ensemble to the actual solution ensemble of romidepsin under the different solvent conditions, providing insight into how its unique bicyclic depsipeptide structure changes its conformations in relation to the solvent polarity.

Presenter: Katharine Pan, Earth and Planetary Sciences
Faculty Mentor: Dr. Christopher Clark; Cell, Molecular, and Developmental Biology
Project Title: Effects of Environmental Temperature on Feeding Behavior, Flight Activity, and Body Temperatures in Anna's Hummingbirds

Abstract: Anna’s hummingbirds inhabit a wide climatic range and exhibit strong short- and long-term routines. They dissipate heat through use of flying muscles and variance in feather density, where environmental conditions strongly affect areas of low density. In addition, torpor is used to reduce metabolic rates in cold temperatures. To determine whether changes in daily aviary temperature affect energy expenditure, we investigated how flight, feeding, and torpor body temperature in Anna’s hummingbirds fluctuated in correlation to different aviary temperatures. We used two pairs of hummingbirds housed outside, each containing one male and one female, and observed their energy expenditure through multiple methods such as daily records of food consumption. Regularly recorded videos showed the amount of time spent flying within an hour, demonstrating the activity levels of the birds in the morning. Lastly, body temperature measurements were obtained using a thermal camera, both one hour before sunrise and one hour after sunset, to determine whether the birds were conserving energy through torpor. Through time series data from November through December of 2024 and February through July of 2025, we are able to analyze trends in these factors in accordance with local daily high and low temperatures. On colder days, data indicates increased flight and an average increased food consumption of about 3 mL or 4.911 kJ based on sugar content. This implies long-term changes in behavior within this species as a result of climate change – specifically, rising temperatures could shape an environment in which these hummingbirds live relatively sedentarily.

PRESENTER: JENNIFER PARK, EARTH AND PLANETARY SCIENCES
FACULTY MENTOR: DR. EDWARD SCHWIETERMAN, EARTH AND PLANETARY SCIENCES
PROJECT TITLE: MODELING ATMOSPHERIC BIOSIGNATURES AROUND HABITABLE WORLDS OBSERVATORY TARGET STARS

Abstract: The detectability of exoplanetary biosignatures such as methane (CH_4) is heavily influenced by the host star's ultraviolet (UV) radiation, which drives atmospheric photolysis and chemical reactions. While planets orbiting K-dwarf stars are potential targets for direct imaging due to lower UV-driven CH_4 destruction, UV activity varies significantly between different stars. To address this, I constructed comprehensive panchromatic (multi-wavelength) spectra for five Habitable Worlds Observatory (HWO) target stars by integrating the PHOENIX model with archival Hubble and Chandra data. Using ATMOS, a 1D photochemistry-climate code, I simulated Earth-like planets orbiting these target stars at varying distances from the host star and varying fluxes of CH_4, N_2O, and CO. Using the SMART radiative transfer model, I generated realistic UV-to-near-infrared planetary spectra to mimic potential HWO observational capabilities. Preliminary results show a strong O_2– CH_4 disequilibrium activity for K-dwarf GL 892, a key indicator of potential biological activity that would otherwise be neutralized by chemical reactions. Ongoing simulations of the remainder of the four stars (Kappa1 Ceti, Chi1 Orionis, GL-620A, GL-311) will further clarify the effects of varying stellar radiation on the detection and survivability of key biosignatures. These findings will help prioritize ideal targets for future missions like HWO.

PRESENTER: MAILEY PHAM, BIOCHEMISTRY
ADDITIONAL PRESENTER: CATALINA RODRIGUEZ, BIOCHEMISTRY
FACULTY MENTOR: DR. GREGOR BLAHA, BIOCHEMISTRY
ADDITIONAL CONTRIBUTOR: JONATHAN PHILLIPS
PROJECT TITLE: FROM "GOOD ENOUGH" TO QUANTIFIED: IMPROVING UNDERGRADUATE MICROPIPETTING WITH DELIBERATE PRACTICE.

Abstract: Micropipetting underpins most experiments in biochemistry and molecular biology labs. However, in undergraduate education, students are rarely given structured practice to master the skill, and mastery is often judged by students' perceived pipetting proficiency. Lack of pipetting proficiency can result in inaccurate pipetting, which adds avoidable uncertainty to measurements. This can erode students' confidence in experimental results, limiting their participation in collaborative work and their contributions to shared datasets. Here we present a deliberate-practice routine suitable for undergraduate laboratories and research settings. It employs gravimetric and spectrophotometric assays to rapidly assess pipetting precision and accuracy. An initial implementation of the practice routine was conducted with College of Natural & Agricultural Sciences (CNAS) undergraduate students here at UCR. The students' baseline precision and accuracy were measured gravimetrically and spectrophotometrically. Students then engaged in deliberate practice via a gravimetric practice routine, and they entered gravimetric data into a spreadsheet that calculated the precision and accuracy of pipetting. At the end of the practice period, the students' pipetting precision and accuracy were reassessed using the same criteria as during the initial evaluation. Interviews conducted with the students before and after their practice revealed students' perceptions of their micropipetting performance and their understanding of its broader impact on research. The results of this initial implementation indicate that this approach enables quick, measurable gains in micropipetting performance and provides students with immediate, data-driven feedback. Students reported feeling more proficient in micropipetting after the practice but also reported that errors in the balance, rather than pipetting, largely contributed to their data's uncertainty.

Presenter: Anthony Phu Cuong Phan, Biology
Faculty Mentor: Dr. Meng Chen, Botany and Plant Sciences
Project Title: Phenotypic Characterization of a T-DNA Insertion Mutant of the PEP Component PAP14/pTAC18

Abstract: The plastid-encoded RNA polymerase (PEP) is responsible for transcribing photosynthesis-associated genes in chloroplasts. Among the plastid-encoded core and nuclear-coded peripheral subunits, Plastid-encoded RNA polymerase-Associated Protein 14/Plastid Transcriptionally Active 18 (PAP14/pTAC18) has been identified as a stable and uniform component of PEP. However, the phenotype of a PAP14 knockout mutant has not yet been experimentally characterized. The purpose of this experiment is to characterize the genotype and phenotype of a PAP14/pTAC18 transfer DNA (T-DNA) insertion mutant to determine whether disruption of PAP14 affects chloroplast development. We genotyped and phenotyped a Sequence Indexed T-DNA insertion line, (SALK_132848), where the insertion is located within the exon of PAP14. Additionally, we performed Reverse Transcription quantitative Polymerase Chain Reaction (RT-qPCR) to examine PAP14 transcript levels, as there is a possibility that T-DNA insertions do not completely terminate PAP14 expression. Based on the insertion site, the mutant was predicted to exhibit an albino or yellowish phenotype. In contrast, our results showed that chloroplast greening was not severely impaired. Alternatively, PAP14 may function redundantly with other PAP proteins to stabilize the PEP complex, such that its loss reduces PEP assembly without causing a complete collapse of chloroplast function. This study establishes a homozygous PAP14 T-DNA insertion mutant and provides the first phenotypic analysis of this line, laying the foundation for further investigation into the functional role of PAP14 in PEP assembly and chloroplast development.

Presenter: Jessica Phan, Biology
Faculty Mentor: Dr. Natalie Holt; Evolution, Ecology, and Organismal Biology
Additional Contributors: Allyn Nguyen and Kyle Leong
Project Title: Physiological Mechanisms of Sustained Force in Southern Alligator Lizards (*E. multicarinata*)

Abstract: The southern alligator lizard (*Elgaria multicarinata*) exhibits a prolonged mate-holding behavior in which males grip onto the female's head for extended periods, up to 48 hours. This unusual behavior requires specialized physiological properties of the jaw muscles that allow prolonged

maintenance. Previous research has identified a phenomenon known as sustained force in these muscles, characterized by incomplete relaxation between repeated contractions. However, it remains unclear whether sustained force is unique to the jaw muscles and what the physiological mechanism responsible for sustained force is. Here, we compared peak force, relaxation rate, and sustained force in the jaw adductor muscle and the gastrocnemius, a locomotor muscle, during repeated submaximal contractions in an *in situ* preparation that preserved muscle blood supply. We then increased the time between contractions in the jaw muscle to determine whether sustained force is due to slowing of relaxation processes.

There was a significant effect of muscle on sustained force ($p < 0.001$). The gastrocnemius muscles fully relaxed between contractions, showing no sustained force, while sustained force was consistently observed only in the jaw muscles. Relaxation was significantly lower in the jaw muscles compared to the gastrocnemius ($p < 0.01$). When additional time was given between jaw muscle contractions, sustained force significantly declined ($p < 0.001$) and was lost. Together, these results suggest that sustained force production is a specialization for mate-holding in the jaw muscles and that it arises due to slowing of relaxation processes rather than the engagement of a passive force holding mechanism.

Presenter: Sanya Puri, Neuroscience
Faculty Mentor: Dr. Edward Zagha; Molecular, Cell, and Systems Biology
Additional Contributor: Kushneet Dhami
Project Title: Optogenetic Disruption of M1-S1 Feedback During Learned Stimulus Selection

Abstract: Financial strain is recognized as a social determinant of health, particularly among college students facing rising tuition costs, debt burdens, housing instability, and food insecurity (Broton & Goldrick-Rab, 2018). Chronic financial stress may contribute to dysregulation of stress-response systems and cumulative biological risk, increasing vulnerability to cardiometabolic dysfunction, including hypertension and adiposity (Kivimäki & Steptoe, 2018). Few studies have examined associations between validated measures of financial stress and objectively measured cardiometabolic markers in diverse undergraduate populations. This study examines whether self-reported financial stress is independently associated with cardiometabolic health among young adult college students. We will analyze cross-sectional data from 1,230 students who participated in the 3E Study: Economic and Educational Contributors to Emerging Adults' Oral and Cardiometabolic Health. Participants were first-year, second-year, and recently transferred undergraduate students aged 18–24 who completed a survey and an in-person health assessment from September 2023 to February 2026. Financial stress was measured using the validated 14-item Financial Stress Scale (Northern et al., 2010). Cardiometabolic outcomes include objectively measured body mass index (BMI), and systolic and diastolic blood pressures. Multivariable linear and logistic regression models will assess associations between financial stress and cardiometabolic outcomes, adjusting for demographic characteristics, socioeconomic indicators, and health behaviors (e.g., tobacco and alcohol use). We expect higher financial stress to be associated with elevated BMI and blood pressure, independent of socioeconomic measures. Our findings will contribute to understanding how economic stress during early adulthood may shape cardiometabolic health and inform integrated campus-based interventions targeting financial well-being and physical health

Presenter: Amirreza Rahimi Baghabrishami, Neuroscience
Faculty Mentor: Dr. Katayoon Dehesh, Botany and Plant Sciences
Project Title: Fatty-Acid Condensation Capacity Shapes Post-Embryonic Leaf Cellular Architecture

Abstract: In plants, environmental stress disrupts key metabolic hubs within chloroplasts, including the methylerythritol phosphate (MEP) pathway, which synthesizes isoprenoid precursors essential for growth and adaptive responses. Perturbation of this pathway generates plastid-derived retrograde signals that reprogram nuclear gene expression and cellular development. Using an Arabidopsis genetic model with impaired MEP pathway function (HDS-silenced; HDSi), we previously observed an increased fatty acid saturation, suggesting a link between isoprenoid metabolism and plastidial lipid homeostasis.

To examine whether lipid metabolic capacity modulates developmental outputs associated with MEP dysfunction, we engineered HDSi plants to overexpress either the plastidial condensing enzyme β-ketoacyl-ACP synthase II (KASII), responsible for condensation of 16:0-ACP to 18:0-ACP, or the stearoyl-ACP Δ9-desaturase SSI2, which converts 18:0-ACP to 18:1-ACP. Confocal imaging of cotyledons and first true leaves revealed comparable mesophyll tissue in HDSi and HDSi-SSI2 plants. In contrast, HDSi-KASII lines displayed pronounced mesophyll disorganization not altered cellular architecture. To determine whether these defects originated during embryogenesis or arose later in development, we examined embryonic tissue organization and oil body distribution. Embryonic structures and oil bodies were indistinguishable among genotypes, suggesting that the observed phenotypes do not originate during embryogenesis but instead emerge during post-embryonic leaf development.

Together, these findings suggest that plastidial metabolic status, particularly fatty acid condensation capacity, modulates leaf cell architecture downstream of MEP pathway disruption, revealing a functional link between isoprenoid biosynthesis, lipid composition, and mesophyll organization.

Presenter: Aarnav Reddy, Biology
Faculty Mentor: Dr. Margarita Currás-Collazo; Molecular, Cell, and Systems Biology
Project Title: Rescuing ASD Behavior Through Chemogenetic Excitation of Hypothalamic Oxytocin Neurons in an Environmental Mouse Model of Autism

Abstract: Autism Spectrum Disorder (**ASD**) affects 1 in 31 children and is characterized by deficits in two core behavioral domains, social communication and repetitive behavior. Prior work from our lab has demonstrated that developmental exposure to a class of flame retardants, polybrominated diphenyl ethers (**PBDEs**), reduces social recognition memory (SRM) and depletes the social neuropeptide oxytocin (OXT) in mouse hypothalamus. Here, we tested whether chemogenetic excitation of hypothalamic OXT signaling would rescue SRM deficits in PBDE exposed mice.

Offspring maternally exposed to DE-71 (0.1 mg/kg/day) from gestation through weaning underwent bilateral paraventricular nucleus (**PVH**) microinjections of an adeno-associated virus containing an excitatory DREADD receptor, hM3D(Gq), under control of an OXT promoter fused with mCherry reporter [$AAV_{1/2}$OXTpr-hM3Dq:mCherry] or Sham [OXTpr-mCherry]. On target injection, OXT-neuron specific expression efficiency and cFOS activation in response to DREADD ligand Clozapine-N-oxide (CNO; 3 mg/kg) were assessed via immunohistochemistry. OXT and mCherry colabeling in PVH was 80% and 88% in DREADD and Sham mice, respectively. CNO but not vehicle increased plasma OXT in

DREADD but not sham mice (*p* < 0.01, n = 11-18).

Post-op SRM in DE-71 DREADD but not sham was significantly improved by CNO but not vehicle (*p* < 0.05-0.01, n = 4-8/group). Similar results were obtained in *Fmr1*$^{-/-}$, an established monogenetic ASD mouse model (p<.05, n=3-6) These findings demonstrate environmental toxicants may produce ASD by disrupting hypothalamic OXT. Supported by NIH F31 (EK) and UCR Minigrant (AR).

PRESENTER: AMELIA REUTER; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. DAVID NELSON, BOTANY AND PLANT SCIENCES
PROJECT TITLE: INVESTIGATING THE MOLECULAR BASIS OF PROTEIN-PROTEIN INTERACTIONS OF NUTRIENT SENSOR PROTEINS IN *ARABIDOPSIS THALIANA*

Abstract: It is imperative for plant growth to sense and respond to environmental nutrient levels. One way this is accomplished is through proteins that sense specific molecules and alter cellular metabolism, for example, ACT domains are protein structures that function as sensors by binding small molecules involved in regulation of enzymatic activity. For example, ACT Domain Repeat (ACR) proteins in *Arabidopsis thaliana* have been proposed to be involved in nutrient sensing. ACR9 and ACR11 are characterized as being involved in the glucose signaling pathway and nitrogen assimilation in the chloroplast, respectively. Arabidopsis cytosolic ACR proteins consist of 2 or 4 ACT domains. ACT 1 and 3 putatively provide an interface for dimerization, whereas ACT 2 and 4 form a ligand-binding pocket. ACRs are homologous to mammalian CASTOR (CYTOSOLIC ARGININE SENSOR FOR MTORC1) (CASTOR1) proteins, which regulates the master regulator of protein synthesis and metabolism, mTOR, in an arginine-dependent manner. This inhibition relies on CASTOR1 homodimerization or heterodimerization with a close homologue, CASTOR2. Similarly, we predict that ACRs can dimerize, bind small molecules, and regulate protein partners in response to the presence or absence of small molecules. We have found that ACR3, ACR5, and ACR8 show selective interactions with other members of the ACR protein family. I am investigating the molecular basis of dimer formation among plant ACR proteins through a combination of protein structural analysis, site-directed mutagenesis, and protein-protein interaction assays. This work will help engineer monomeric ACR proteins to better understand how dimerization affects ACR function.

PRESENTER: SAHAR REVAH; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. DAVID NELSON, BOTANY AND PLANT SCIENCES
PROJECT TITLE: INVESTIGATING THE ROLE OF STRIGOLACTONE PLANT HORMONES IN FLORAL TRANSITION

Abstract: Strigolactones (SLs) are a diverse class of beta-carotene-derived plant hormones that modulate plant development under nutrient stress. For example, SLs inhibit shoot branching under low phosphate, allowing the plant to dedicate resources to other essential functions. Recently, SLs were implicated in the regulation of floral transition in the model plant species, *Arabidopsis thaliana*. In these studies, plant mutants unable to perceive SLs (insensitive) or synthesize SLs (deficient) exhibited accelerated floral transition. However, previous work in our lab did not corroborate these findings. The former studies initiated experiments from seed directly in soil, while we evaluated seedlings grown on plant-growth media plates and then transplanted into soil. Therefore, we hypothesized that SL-insensitivity or deficiency may affect seedling establishment in soil. To test our hypothesis, we compared the effect of seed versus seedling transplantation on flowering phenotypes in SL mutants. Additionally, we evaluated the effect of SL-

deficiency on the gene expression of *FLOWERING LOCUS T (FT),* which promotes floral transition. We found that seed transplantation resulted in an increased time to flowering and more rosette leaves compared to seedling transplantation, irrespective of genotype. However, we did not find a significant time-to-flowering phenotype associated with SL-insensitivity or SL-deficiency in either growth condition. Finally, *FT* was not upregulated in SL-deficient mutants compared to wild type. Taken together, time to floral transition is likely influenced by transplantation stress and is mostly independent of SLs. These results suggest caution should be taken when evaluating early plant development phenotypes after seedling transplantation into soil.

PRESENTER: JAIME REVELES, BIOLOGY
ADDITIONAL PRESENTER: KLARISSE ALLYSSA DAYRIT, BIOCHEMISTRY
FACULTY MENTOR: DR. DAVID REZNICK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: LIKE FATHER LIKE SON: COLOR PATTERN VARIATION CONTRIBUTED BY Y-LINKAGES

Male color patterns show faithful transmission within a patriline as noted by the studies done on wild populations of *Poecilia reticulata* (Potter et al 2023). Male color patterns are also subject to intense sexual selection and directional selection due to predation pressure (Kemp et al 2018). Males with rare color patterns are not only more likely to survive, but are more favored by female populations. Between high and low predation populations, coloration has shown varying results. We hypothesize that maternal genetic contribution to male color patterns is under directional selection due to predation pressure. A crossing experiment where crosses were made between wild populations of guppies (high and low predation), and F1 progeny resulting from these crosses were used to investigate our hypothesis. The Colormesh method was used to score the male color patterns (Valvo et al 2021). Colormesh is able to maintain a continuous measure of color at specific sample points eliminating the need for a clearly defined pattern to identify and quantify color pattern variation. Initial findings utilizing Colormesh have concluded that color pattern variation is upheld by Y-linkage contribution and overall presents high polymorphism in high and low predation populations.

PRESENTER: MAYLIN REYES, BOTANY AND PLANT SCIENCES
FACULTY MENTOR: DR. PHILIPPE ROLSHAUSEN, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: MARTIN PUEBLA, BOTANY AND PLANT SCIENCES
PROJECT TITLE: USING DSRNA TO INHIBIT GROWTH OF *F. OXYSPORUM*

Abstract: *Fusarium oxysporum* is a soil-borne fungal pathogen that causes disease in many crops. *Fusarium oxysporum* can infect grafted vines in nurseries during propagation causing decline and death of young vines in vineyards. There are no control methods for this disease. Double-stranded RNA (dsRNA) can be used for spray-induced gene silencing (SIGS) which offers a targeted, environmentally friendly approach for pathogen control by inhibiting the expression of essential fungal genes. This study aims to evaluate the efficacy of dsRNA targeting CYP51A and CYP51B, key genes involved in the fungal cell wall ergosterol biosynthesis, In-vitro assays were conducted in wells containing fungal spores treated with dsRNA to assess germination inhibition and in petri plates containing culture medium treated with dsRNA to measure the radial growth of the mycelium. Following in-vitro evaluation, successful dsRNA treatments will be tested in-plants to determine their ability to reduce infection. The methods for the in-vitro evaluation will be done by inoculating a model plant system with spores, using the same treatments in the germination-inhibition assay. Following inoculation, necrotic lesions will be measured in length radially to examine the efficacy of dsRNA in-planta. The goal of this study is to provide a proof of

concept for SIGS-based biocontrol strategies as an alternative to chemical fungicides and advance sustainable practices to manage fungal disease.

PRESENTER: EMELY RODRIGUEZ MALDONADO, BIOCHEMISTRY
ADDITIONAL PRESENTER: ELIZARIO PEREZ, III; PSYCHOLOGY
FACULTY MENTOR: DR. SELENE BOBADILLA, BIOCHEMISTRY
PROJECT TITLE: IMPROVING DIET QUALITY THROUGH EDUCATION: A PRE-AND POST-INTERVENTION STUDY OF COLLEGE STUDENTS

Abstract: Good nutrition is essential for staying healthy–physically, mentally, and emotionally. Yet, despite the importance of diet, many Americans struggle with unhealthy eating habits. Of importance, the prevalence of diet-related chronic disease in the US is at its all-time high, with cardiovascular disease, cancer, and diabetes at the top ten causes of death. This study examines whether nutrition education that emphasizes evidence-based nutrition recommendations helps students improve their dietary habits. We hypothesize that students enrolled in BCH010 Introduction to Nutrition will make healthier food choices and be more aware of their well-being after having taken the class. To investigate this, we used a validated Likert-scale nutrition habits survey where students estimated their dietary intake of the five food groups in Winter 2026. Students were also asked to report their physical activity and alcohol consumption patterns to investigate if better dietary habits also improves other lifestyle habits. Students completed the same survey before the course began and after it ended. Diet quality was approximated using the Healthy Eating Index (HEI), which provided a standardized measure of how closely students' reported eating patterns aligned with the dietary guidelines. Incorporating HEI scores allowed the study to quantify changes in overall nutritional quality before and after the course. We plan to use a T-Test to compare the pre- and post-scores and address whether this course can make a difference in how students eat and how they think about their overall health.

PRESENTER: GERMAN RODRIGUEZ, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. LINDSAY MCCULLOCH, ENVIRONMENTAL SCIENCES
PROJECT TITLE: FERTILIZER TREATMENTS AND ITS EFFECTS ON BIOGEOCHEMICAL CYCLING AND UNDERSTANDING THE NITROGEN PARADOX

Abstract: Plants need essential soil nutrients, like nitrogen and phosphorus, for biological processes. Some plants form a mutualistic relationship with nitrogen-fixing bacteria that allows these plants to access atmospheric nitrogen; This is energetically expensive. One hypothesis is that these nitrogen-fixing plants are using fixed nitrogen to invest in phosphorus acquisition strategies. We ran a meta-analysis to find relevant papers to extract root and soil phosphatase activity data for nitrogen-fixing and non-nitrogen-fixing species that received fertilizer treatments and calculated Log Response Ratios (LnRR). In total, we extracted data from 65 papers, which included data from 195 unique plant species found globally. We also included papers without fertilizer treatments as long as they included both nitrogen-fixers and non-nitrogen-fixers and enzymatic activity for comparisons. The roots and soil of non-nitrogen-fixing species had higher phosphatase activity (160 and 887 umol g^{-1} hr^{-1}, respectively) compared to phosphatase activity in roots (64.5 umol g^{-1} hr^{-1}) and soil (190 umol g^{-1} hr^{-1}) of nitrogen-fixers. Preliminarily, we also found nitrogen-fixers have little phosphatase response to nitrogen fertilization in their roots (0.017) and surrounding soil (-0.006) compared to the positive root phosphatase response (0.232) and negative soil phosphatase response (-0.380) of non-nitrogen-fixers. Unlike we predicted, nitrogen fertilizer did not influence phosphatase activity in nitrogen-fixers. This may be because nitrogen-fixers have access to their own nitrogen source to synthesize enzymes. Studying the plasticity of different plant functional types (nitrogen-fixers versus non-fixers) in their acquisition strategies will improve our understanding of biogeochemical cycling under environmental change.

PRESENTER: JANCRIZTO RUIDAS, BIOCHEMISTRY
FACULTY MENTOR: DR. TIMOTHY SU, CHEMISTRY
PROJECT TITLE: SYNTHESIS OF GERMANIUM ADAMANTANE

Abstract: This presentation describes the synthesis, characterization, and optical properties of germanium adamantane, a molecular analog of crystalline germanium's diamond cubic unit cell. We used a bottom-up synthetic approach to access a strained tricyclic oligogermane via rational Ge-Ge catenation that accounts for the sensitive nature of Ge-Ge sigma bonds. Treatment of this strained structure with the Lewis acid trityl tetrakis(pentafluorophenyl)borate initiates a cascade of Wagner-Meerwein bond shifts that end with germa-adamantane as a thermodynamic sink. UV/Vis spectroscopy shows that germa-adamantane has a red-shifted absorption band onset compared to sila-adamantane, which parallels the optical properties observed between crystalline germanium and silicon. These findings present germa-adamantane as a viable model for further probing the conductive and photophysical properties of germanium at the molecular scale, facilitating the development of next-generation semiconductor materials

PRESENTER: SHAAN SABNANI, BIOLOGY
FACULTY MENTOR: DR. ALAN BRELSFORD; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTORS: MAJD ABOUZAKI, ALEXANDER GRIZZELL, AND ASHLEY MCKNIGHT
PROJECT TITLE: WEIGHING THE ACCURACY OF LOW-COVERAGE GENOME ANALYSES USING DOWNSAMPLING

Abstract: Whole genome sequencing (WGS) enables biologists to trace the evolutionary history of species and populations and identify regions of the genome experiencing natural selection. However, sequencing entire genomes can be highly expensive, resulting in substantial costs in the hundreds of thousands of dollars for large sample sizes of organisms with more expansive genomes. A more practical and cost-effective alternative is to sequence the genome to lower depth, using a process called low-coverage whole genome sequencing (lcWGS). The extent to which analyses designed for high-coverage genome data produce accurate results when applied to lcWGS is controversial and largely untested. To delineate the sequence depth thresholds where standard methods of analysis produce consistent results, we reanalyzed published whole-genome sequence data from 106 flies of four species in the Drosophila yakuba group, which were sequenced to an average depth of 16x. The data were then downsampled to a depth of 10x, 5x, 2x, and 1x. We carried out genotype calling on the original and downsampled data, and filtered each set of genotype calls with one restrictive and one permissive set of filtering parameters. Finally, we analyzed population structure using PCA, Admixture, FST and expected heterozygosity, and compared the results of these analyses on downsampled datasets to our original non-downsampled data.

PRESENTER: GUADALUPE SANCHEZ, ENVIRONMENTAL SCIENCES
FACULTY MENTOR: DR. FRANCESCA HOPKINS, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTOR: RYAN SENDEJAS
PROJECT TITLE: WILDFIRES IN THE INLAND DESERTS

Abstract: Climate change is expected to increase wildfire impacts in California's Inland Deserts. The Inland Deserts region has been less impacted by wildfires than other California terrains, as grassland and forests are more susceptible to fire than native desert vegetation. However, understanding the risks of wildfires going forward is important due to shifts in climate and vegetation seen in recent decades. Wildfires in this region could exacerbate existing vulnerabilities, including housing, health impacts, native plant communities, and air quality. This paper focuses on the following questions:

1. How have wildfire frequency and intensity, measured as burned area, changed in the Inland Deserts?

2. Where are wildfires burning with respect to population centers?

3. How are wildfires correlated with temperature and precipitation?

Wildfire data from CALFIRE was used to observe wildfire trends from 1950 to 2024. Wildfires have been increasing in size and frequency between the 20th and 21st centuries. Population density was gathered from the US Census and was overlaid with wildfire data to find populated areas that are at high fire risk. High temperature and variable precipitation level are correlated to increasing fire risk, likely by extending the wildfire season and increasing the fuel load. Our findings will be incorporated into the Inland Deserts regional report of the 5th California Climate Change Assessment. The community and fire trends will support planning efforts in areas where wildfire risk and social vulnerabilities intersect.

PRESENTER: FABELLA SARWONO, BIOLOGY
FACULTY MENTOR: DR. JOSEPH GENEREUX, CHEMISTRY
ADDITIONAL CONTRIBUTOR: JASMINE CASTELLANOS, MICROBIOLOGY
PROJECT TITLE: IDENTIFYING A PROTEASE THAT CLEAVES TRANSTHYRETIN TO PROTECT CELLS FROM STRESS

Abstract: The endoplasmic reticulum (ER) is an essential organelle in eukaryotic cells that aids in protein folding. However, mutations and environmental toxins can overwhelm and stress the ER, leading to mislocalized proteins that fail to fold. Our lab found that transthyretin (TTR) protein gets its signal sequence partially cleaved under ER stress conditions, which makes mistargeted TTR less aggregation- and degradation-prone. The partial cleaving of the signal sequence seems to protect the cell from stress when ER import is disrupted. The protease that is responsible for the cleaving is still unknown. Hence, the aim of this project is to determine the specific proteases that are responsible for partially cleaving the TTR signal sequence using CRISPR screening. We will use HEK293 cells transfected with TTR fused to inducible caspase-9 (iCasp9), a drug-activated apoptosis switch used for selection. Further, small guide RNAs (sgRNAs) that will knock out the genes that are responsible for a selected library of protease will be introduced to the transfected cells for the screening. If the specific protease remains active, TTR is cleaved and iCasp9 dimerization triggers apoptosis. In contrast, knockout of the responsible protease prevents cleavage, only the intact isoform of TTR will remain, allowing it to be degraded and cells to

survive. Surviving cells will reveal candidate proteases required for TTR trimming. Once the protease is identified through CRISPR screening, we will validate the results through knockout and rescue experiments and determine how broadly this pathway contributes to cellular proteostasis.

PRESENTER: SARAH SERRANO, BIOLOGY
FACULTY MENTOR: DR. DAWN NAGEL, BOTANY AND PLANT SCIENCES
PROJECT TITLE: IDENTIFYING PROTEIN COMPLEXES INVOLVED IN CLOCK-CONTROLLED HEAT RESPONSES

Abstract: The circadian clock is an internal mechanism that regulates how plants adapt to their environment, including response to temperature stress. The clock regulates several genes at the transcriptional (RNA) and translational (protein) levels. Clock-regulated proteins have distinct roles and how these proteins interact with each other is important in determining their functional role. For example, the composition of protein complexes and protein-protein interactions can change in response to environmental stresses such as heat. This research aims to identify the proteins that interact with clock and clock-controlled proteins such as CCA1 and other transcription factors. These selected genes have significantly altered expression in response to heat stress, however, their role in heat stress responses is not known. We will use Proximity Labeling Mass Spectrometry (PL-MS) to identify interactors with the proteins of interest. To perform PL-MS, we will use a multisite cloning approach to create constructs with the protein of interest (bait protein) and an enzyme that attaches biotin to proteins in near proximity (biotin ligase), tagging them as potential interactors. These constructs will be transformed into the model plant *Arabidopsis thaliana*. Successfully transformed plants will undergo heat stress treatments at different times of day and the biotinylated proteins will be isolated using affinity purification. Then, we will use MS to identify the interacting proteins specific to heat response, through comparison with plants kept in ambient conditions. This research will contribute to understanding the molecular mechanisms of plant responses to heat stress.

PRESENTER: ANIKA SETH, NEUROSCIENCE
ADDITIONAL PRESENTER: BRANDON CHOI, MATHEMATICS
FACULTY MENTOR: DR. RICHARD HOOLEY, CHEMISTRY
ADDITIONAL CONTRIBUTOR: DR. ARMAN GARCIA, CHEMISTRY
PROJECT TITLE: THE DEVELOPMENT OF CATIONIC MACROCYCLES TOWARDS PFAS RECOGNITION IN WATER

Abstract: Water soluble macrocycles can be effective tools for molecular recognition in water. Challenges in aqueous molecular recognition include solubility, selectivity, and synthesis of receptors. A particular set of targets, such as anions, can be difficult to target due to solvation by water. In an effort to bind anions in water, we have developed water soluble cationic macrocycles. This is an extension of current work, which utilizes commercially available dihalides to synthesize imidazolium based macrocycles that have previously been shown to bind large biologically relevant anions. By varying the functional groups of the receptors, we should expect multiple different binding interactions with anions, such as bicarbonate (HCO_3^-) and/or per- and polyfluoroalkyl substances (PFAS), also commonly referred to as "forever chemicals." Within the last several decades, the prevalence and levels of PFAS in the environment and humans have been measured at alarming levels, with potentially strong negative impacts on human health. This project investigates the synthesis and purification of a new imidazolium based macrocycle featuring two alcohols to probe anion binding. We intend to use this new macrocycle for indicator displacement assay (IDA). We

have utilized high-performance liquid chromatography (HPLC) to purify, isolate, and characterize our desired products. Preliminary tests with perfluorooctanoic acid (PFOA) indicate that the macrocycle binds with PFOA in water to produce a solid precipitate, which may provide an avenue towards water purification and extraction of PFAS.

PRESENTER: ARYAN SHAH, BIOLOGY
FACULTY MENTORS: DR. DEVINDER SANDHU, BOTANY AND PLANT SCIENCES AND DR. DANIEL ASHWORTH, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTOR: DR. JIAHUI HU, ENVIRONMENTAL SCIENCES
PROJECT TITLE: GENETIC VARIATION OF SPINACH CULTIVARS UNDER EXPOSURE TO PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Abstract: Per- and polyfluoroalkyl substances (PFAS) are persistent chemicals that contaminate water and soils. PFAS are a major public health concern, as exposure has been associated with increased cancer risk and other adverse health outcomes. Leafy vegetables are especially important in this context because they are consumed directly, creating a pathway by which PFAS in irrigation water or contaminated soils can reach the edible leaves. This study focused on whether various spinach genotypes and cultivars differ in their ability to accumulate PFAS in leaf tissue and what genetic pathways may contribute to that variation.

Across multiple PFAS compounds tested, spinach genotypes showed observable differences in leaf PFAS exposure. In our dataset, ten spinach genotypes exhibited large genotype-dependent variation, with different cultivars consistently accumulating varying extreme concentrations. The overall fresh biomass was reduced in PFAS-treated plants, which supports PFAS acting as a physiological stressor under treatment controls that inhibit growth when partitioned into leaf tissue.

In relation to biological mechanisms, we examined gene categories most plausibly linked to PFAS-associated stress and detoxification responses. These findings show that genetic variation influences PFAS accumulation in spinach leaves, specifically for supporting roles for stress-response pathways. Notably, heat shock protein (HSP) and glutathione peroxidase (GPX)-related expression patterns were strongly correlated with PFAS accumulation trends, suggesting these genes are important components in regulating PFAS-related responses across genotypes. Identifying genes linked to high or low exposure can explain cultivar differences and support strategies to reduce PFAS entry into the food chain, with implications for human health.

PRESENTER: LIMAL SHAJI, BIOENGINEERING
FACULTY MENTOR: DR. SAMUEL MANN, CHEMISTRY
PROJECT TITLE: *DE NOVO* DESIGN AND CHARACTERIZATION OF 6-COORDINATE TYR/HIS HEME BINDING PROTEINS

Abstract: The (bCcP)/MauG superfamily is an understudied family of diheme cytochrome c peroxidase enzymes that stabilize an unusual bis-Fe(IV) intermediate. Many questions remain on how these proteins function and stabilize their high valent intermediates. Upon reaction with H_2O_2, a member of the MauG superfamily, MbnH, forms a bis-Fe(IV) intermediate species that has previously only been detected in only two other enzymes. MbnH has a di-heme binding site that includes an unusual Tyr/His axial ligand set. Investigating how Tyr/His axially ligated heme can support the stabilization of a high valent

intermediate may offer insights into how di-heme high valent species are stabilized in proteins This unusual binding site motif has never been integrated into a de novo scaffold, thus designing a protein that contains this motif will give us insight and control otherwise not seen when probing the natural system. Achieving this required creating a computational design pipeline that integrated several advanced protein design tools including RFdiffusion for backbone generation, ProteinMPNN/LigandMPNN for sequence design and optimization, and structural prediction tools such as AlphaFold3. Designs were then expressed in *E. coli*, and purified with affinity and size exclusion chromatography. Once purified, UV-vis spectroscopy confirmed heme incorporation within our proteins, while SEC confirmed the capture of monomeric proteins. This work highlights the power of using computational protein design to study previously challenging protein systems to gain insight into rare high valent systems while advancing our understanding in *de novo* protein design.

PRESENTER: DANIELLA SHAKIROVA, MATHEMATICS
FACULTY MENTOR: DR. SITING LIU, MATHEMATICS
PROJECT TITLE: LEARNING INTENTIONAL WALK STRATEGIES: FROM SYNTHETIC SIMULATION TO REAL DATA

Abstract: Studying the strategic optimality of the intentional walk (IBB) in baseball using a data-driven, in-game decision model. Rather than modeling full-game dynamics, we focus on a single decision point defined by the number of outs and the batting order position, assuming bases are empty prior to the decision. Using 2024 Major League Baseball data, we construct two synthetic teams drawn from top-performing American and National League teams. For each hitter, we compute empirical per-plate appearance outcome probabilities for singles, doubles, home runs, walks, and outs. These probabilities define a Markovian continuation model that evaluates expected runs from the decision state until the end of the inning. We compare the expected run consequences of two defensive actions: pitching to the current batter or issuing an intentional walk and facing the on-deck hitter with a runner on first. The resulting decision is expressed as the difference in expected continuation value between the two actions. This framework allows us to isolate the effect of lineup protection and how the offensive strength shifts the IBB boundary. Computational experiments demonstrate that intentional walks are optimal only when the current batter's run-generating threat sufficiently exceeds both the base advancement cost and the continuation value of the on-deck hitter. When strong protection follows a high-threat batter, the model frequently predicts pitching to be optimal,even against elite hitters. These results provide a quantitative characterization of lineup protection and clarify the conditions under which intentional walks minimize expected runs in an inning-level decision framework.

PRESENTER: PRANAV SHANKAR, BIOLOGY
FACULTY MENTOR: DR. VENUGOPALA REDDY GONEHAL, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: VINCENT CERBANTEZ-BUENO, BOTANY AND PLANT SCIENCES
PROJECT TITLE: TOWARDS THE UNDERSTANDING OF SAM REGULATORY MECHANISMS THROUGH CLV3-RNAI LINES

Abstract: The shoot apical meristem (SAM) is a region that consists of stem cells maintained by regulatory pathways that include a feedback loop between CLAVATA3 (CLV3) peptide and the WUSCHEL transcription factor (WUS). *WUS* is expressed in the inner meristem layers, and WUS protein migrates to the outer layers and activates *CLV3* by binding to its cis-regulatory elements. CLV3 then is secreted as a signaling peptide that represses *WUS* expression in the inner layers of the SAM, maintaining a stem cell pool. Disrupting the feedback loop results in changes in SAM organization. Among other effects, the clv3-2 loss-of-function mutant causes expanded *WUS* expression, resulting in a wider SAM due to increased stem cell proliferation. To better understand this and other mechanisms that CLV3 potentially controls, we used inducible RNA interference (RNAi) lines. While *CLV3-RNAi* lines have been previously studied, we generated new inducible *CLV3-RNAi* lines using the pOpOff2 vector system, which allows efficient and controlled gene suppression. Using molecular and genetic techniques, we were able to produce the *CLV3-RNAi* constructs and transformant lines. Our preliminary results show that these lines produce enlarged meristems, suggesting *CLV3* repression. These new lines can be used in future experiments to understand *WUS* behavior and other regulatory mechanisms.

PRESENTER: VINEET SHARMA; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
ADDITIONAL PRESENTER: RYLEN STEINBUCH, BIOLOGY
FACULTY MENTOR: DR. BAI-LIAN LARRY LI, BOTANY AND PLANT SCIENCES
PROJECT TITLE: INVISIBLE PARTICLES, PLANETARY CONSEQUENCES: MICROPLASTICS AS PHYSIOLOGICAL MODULATORS OF PHYTOPLANKTON PRODUCTIVITY AND THE MARINE CARBON PUMP

Abstract: Microplastic (MP) pollution has emerged as a systemic regulator of biological metabolism, with consequences scaling from cellular physiology to global biogeochemical cycles. This synthesis examines how MPs modulate phytoplankton productivity through direct physiological disruption and indirect trophic-microbial feedbacks, fundamentally altering the efficacy of the biological carbon pump (BCP). Evidence indicates that MPs diminish photosynthetic efficiency and impair nutrient stoichiometry in primary producers, thereby suppressing carbon fixation at the base of aquatic food webs. These disruptions are amplified via trophic transfer; zooplankton inhabiting MP-rich environments exhibit reduced grazing rates, lower fecundity, and increased mortality, which collectively attenuate the vertical export of organic matter.

Simultaneously, the leaching of MP-derived dissolved organic carbon (DOC) reshapes microbial assemblages, favoring heterotrophic respiration and accelerating the atmospheric release of CO_2 and CH_4. Furthermore, the formation of "marine plastic snow"—hetero-aggregates of MPs and organic detritus—alters the density and sinking velocity of particulate organic carbon (POC), compromising sequestration efficiency in deep-ocean reservoirs. By integrating cross-ecosystem evidence from marine and wetland environments, we propose a mechanistic framework that characterizes MPs as "metabolic modulators" capable of reprogramming global carbon flux pathways. This shift from viewing MPs as inert physical contaminants to active metabolic drivers necessitates a re-evaluation of plastic pollution within the context of planetary climate feedbacks and long-term ecosystem resilience.

PRESENTER: PADDY SHEILS, BIOPHYSICS
FACULTY MENTOR: DR. VENUGOPALA REDDY GONEHAL, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: VINCENT CERBANTEZ-BUENO, BOTANY AND PLANT SCIENCES
PROJECT TITLE: USING CONFOCAL IMAGING TO UNDERSTAND SHOOT APICAL MERISTEM MAINTENANCE IN *ARABIDOPSIS*

Abstract: The *Arabidopsis thaliana* shoot apical meristem (SAM) is a specialized population of stem cells at the plant shoot tip, a small tissue that continuously generates new above-ground organs throughout the plant's life. Maintaining the SAM requires a precise balance between stem cell renewal and differentiation, controlled by the feedback loop between CLV3 and the WUS protein, among other

factors. To investigate this regulatory system, one of the many techniques utilized is high-resolution three-dimensional confocal microscopy to visualize intact meristems. Successful imaging required careful dissection and mounting procedures to isolate only the SAM region, preserving tissue architecture and fluorescence localization while enabling accurate structural and molecular analysis. Through confocal imaging, data was collected on several key features critical for understanding SAM maintenance. These data include the analysis of different genetic manipulations on CLV3 regulatory region in wild type and clv3-2 mutant background. Furthermore, different GFP reporter lines were analyzed to generate data related to WUS protein distribution. Simultaneously, the use of confocal microscopy helped to visualize SAM infrastructure with the observation of plasmodesmata and cell membrane reporter lines. Together, these image-based observations provided visual evidence that supports ongoing and future genetic and developmental studies in our lab. Additionally, these observations aided us in generating useful genetic tools to understand the structure and regulation of SAM maintenance.

PRESENTER: RHEA SHETTIGAR, POLITICAL SCIENCE
FACULTY MENTORS: DR. FRANCESCA HOPKINS, ENVIRONMENTAL SCIENCES AND DR. JEREMY BUSACCA, POLITICAL SCIENCE
PROJECT TITLE: DIGESTING A GREENER FUTURE? THE EFFECTS OF POLICY ON DAIRY DIGESTER ADOPTION

Abstract: Methane is more powerful than carbon dioxide as a greenhouse gas. While this greenhouse gas is less abundant in our atmosphere, its potency makes it a key driver of the climate crisis. While methane has various sources, my research will focus on methane from dairy farms. When cow manure is processed in an oxygen-free environment, it emits copious amounts of methane into our atmosphere. When cow manure is, alternatively, processed in an anaerobic digester, it captures the methane before it can go into our atmosphere; thereby reducing methane emissions while converting the organic waste into an effective biofuel. Given that anaerobic digesters are a relatively new technological development, state-level policy adoption of this technology has been uneven. In the coming months, I plan to use peer-reviewed articles on the subjects, the AgSTAR database, and various legislative tracking databases to conduct research on environmental policy and its impact on dairy digester adoption across the top-10 dairy-producing U.S. states. Based on some preliminary research, I anticipate that I will find the percentage of dairy digesters to be higher in states that mandate adoption. Furthermore, I anticipate that I will find the percentage of dairy digesters to be higher in states with a Democratic-controlled state legislature. The results of my research will help policy experts better understand which policies incentivize digester adoption and implementation.

PRESENTER: VALERIA SIMONYAN, BIOLOGY
FACULTY MENTOR: DR. ERIN WILSON-RANKIN, ENTOMOLOGY
PROJECT TITLE: FEEDING BEHAVIORS OF GRAY BIRD GRASSHOPPERS AND PAINTED LADY CATERPILLARS ON COMMON NATIVE CALIFORNIA PLANT SPECIES

Abstract: Many native plants in California participate in a complex network of interactions between pollinators and herbivores. With pollinators, plants maintain a mutualistic relationship, exchanging floral resources to promote reproduction. In contrast, herbivores introduce an antagonistic relationship. Herbivorous tissue damage may induce plant defense mechanisms, like the release of toxins. However, our understanding of whether herbivores adapt to such defense mechanisms or develop a preference for specific plants is limited. In our study, we use three distinct plant species (*Malacothamnus fasciculatus,*

Salvia 'Bee's Bliss,' and *Scrophularia californica*) to assess: (1) whether gray bird grasshoppers and painted lady caterpillars have a feeding preference and (2) how much natural feeding damage is caused over time.

We set up study blocks in mesh cages containing three individual plant stems and an herbivore. We separated each study block into two spatial arrangements: (clumped vs. distanced) and tested herbivory levels based on the position of the plant stems. For the clumped arrangement, we placed water picks in the center of the cage and for the distanced arrangement we distributed the stems in a triangle at a distance of 9cm apart. We measured the initial leaf area using the app, LeafByte. For grasshoppers, we introduced a single juvenile grasshopper for 2 days and monitored the level of feeding damage. To assess natural feeding damage of caterpillars, we introduced a single leaf to a caterpillar and monitored the area consumed over 2 days. We then compared leaf damage across plant species and spatial treatment for each herbivore species.

PRESENTER: MASSIH SOLHJOU, BIOLOGY
ADDITIONAL PRESENTER: ALLAN MATTHEW, BIOENGINEERING
FACULTY MENTOR: DR. JOSHUA HARTMAN, CHEMISTRY
PROJECT TITLE: LEVERAGING AI FOR MASTERY GRADING IN LARGE-ENROLLMENT GENERAL CHEMISTRY

Abstract: Traditional assessment in large-enrollment STEM courses often emphasizes high-stakes testing, which can contribute to student anxiety and surface-level learning. This study details the development and implementation of a mastery learning model within a large-enrollment General Chemistry sequence. To facilitate this model, we utilized generative AI and a team of undergraduate research students to refine extensive problem banks within the Learning Management System (LMS). This infrastructure supported a "second-chance" testing framework, allowing students to demonstrate proficiency through multiple attempts. To support students between successive exam attempts, we integrated asynchronous instructional resources and interactive chemistry courseware based on evidence-based learning design principles. The impact of this mastery-based approach was assessed through a study involving over 500 students. Quantitative analysis revealed that combining second-chance testing with interactive courseware improved student performance on common midterm exams by approximately two letter grades compared to traditional formats. Qualitative data gathered from student reflections indicated that the mastery learning environment significantly reduced testing anxiety and fostered a growth mindset. Furthermore, students reported that the structure encouraged a more proactive and resilient approach to their education. This research demonstrates that leveraging AI to manage mastery-based grading can create more equitable and effective learning environments in high-capacity chemistry courses, providing a scalable solution for improving student success and retention in foundational STEM education.

PRESENTER: ABBY SOND, BIOLOGY
FACULTY MENTOR: DR. JULIA BAILEY-SERRES, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: DR. GARO AKMAKJIAN, BOTANY AND PLANT SCIENCES
PROJECT TITLE: ARBUSCULAR MYCORRHIZAL FUNGI SYMBIOSIS IN RICE: THE ROLE OF CLE PEPTIDES

Abstract: Arbuscular mycorrhizal fungi (AMF) form symbiotic associations with 80% of land plants and play a major role in plant nutrient uptake. AMF provide the plant host with nutrients such as inorganic

phosphate and nitrogen whilst the host provides organic carbon. Small signaling peptides encoded by *CLAVATA3/EMBRYO SURROUNDING REGION (CLE)* genes have been implicated in regulating this symbiotic interaction. This study examines the potential significance of a *CLE* gene, designated *CLEam1*, in influencing AMF colonization in rice. The CLEam1 peptide is hypothesized to be important for AMF symbiosis as the mRNA encoding it was found to be induced and translated upon colonization. CRISPR-Cas9 was used to generate loss-of-function mutants of the targeted *CLEam1* gene. DNA sequence analysis identified mutations predicted to produce truncated peptides. Mutant and wild-type rice plants were compared under mycorrhizal and non-mycorrhizal conditions by quantifying the *CLEam1* mRNA level by qRT-PCR and examination of AMF structural development within the root. In addition, a construct to express a *CLEam1*-fluorescent protein fusion is being developed to analyze protein expression patterns by comparison with a fluorescent reporter monitoring promoter activity. This will allow for assessment of regulation at both transcriptional and translational levels. Understanding how *CLEam1* may regulate AM symbiosis can provide opportunities for developing crops without enhanced symbiosis to improve nutrient uptake and reduce reliance on fertilizers.

PRESENTER: DEVIN SWARTZ, BIOLOGY
FACULTY MENTOR: DR. MARGARITA CURRÁS-COLLAZO; MOLECULAR, CELL, AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: ELENA KOZLOVA, YUVA KRISHNAPILLAI, YUSEF ELHAJJAOUI, SAMHITA BALAKRISHNAN, SARAH SUTJIPTO, AND CRYSTAL LUNA
PROJECT TITLE: EFFECTS OF VAGAL DEAFFERENTATION SURGERY ON COGNITIVE DEFICIT PRODUCED BY GULF WAR AGENTS IN A MOUSE MODEL

Abstract: Gulf War Illness (GWI) is a chronic condition affecting roughly ⅓ of veterans from the 1991 Persian Gulf War. Its symptoms range from cognitive/mood abnormalities to brain and gut inflammation, suggesting a gut-brain link. Prophylactic treatment with pyridostigmine bromide (PB), a reversible acetylcholinesterase inhibitor, dermal pesticide permethrin (PER), insecticide (DEET), and combat-induced stress, are the likely causes of GWI, but there is no known effective treatment. In our GWI mouse model, GW mice are exposed to GW agents and restraint stress, and controls receive vehicle and stress (CON/S). We hypothesized that selectively ablating gut-originating vagal-afferent neurons (VANs) using bilateral intra-nodose ganglion (NG) injections of CCK-saporin (CCK-SAP), but not sham treatment (BLK-SAP), would improve cognitive outcomes and hippocampal neuroinflammation. CCK-SAP treatment rescued deficits in novel object recognition (NOR) in GW mice. Specifically, exploration of novel objects after a 30-min retention period was significantly greater than that of familiar objects in CON/S ($p<.01$) and GW CCK-SAP ($p<.01$), but not GW BLK-SAP mice ($p>.05$), with similar 24h-period results. Immunofluorescence experiments performed on hippocampal CA1 sections showed an increase in the astrocyte marker, glial fibrillary acidic protein (GFAP), in GW BLK-SAP, but not GW CCK-SAP, vs CON/S, indicating proinflammatory astrogliosis. Other experiments are underway to measure neuroinflammatory measures such as hippocampal microglial Iba1 and brain IL-6 levels. Our findings suggest that vagal deafferentation rescues NOR impairments and the proinflammatory brain environment in GWI. Hopefully, our gut-brain study will open the door to novel clinical interventions, beyond GWI

PRESENTER: LAVANAYA SWATCH, BIOLOGY
FACULTY MENTOR: DR. ERIC BAREFOOT, EARTH AND PLANETARY SCIENCES
PROJECT TITLE: DUST EMISSION POTENTIAL OF THE ALAMO RIVER DELTA AT THE SALTON SEA

Abstract: The Salton Sea in Southern California is experiencing rapid shoreline retreat due to decreasing agricultural water use and inflows from the rivers contributing water and sediment to the Salton Sea; herein we focus on the Alamo River and its delta. The newly exposed playa surfaces emit windblown dust, with important public health and ecological implications. Dust emissions from dry lakebeds depend strongly on the sediment constituting the surface, such as grain size, soil moisture, and surface crust properties. The exposed playa at the Salton Sea is heterogeneous, and the relative dust emission potential of different surface types (playa, dunes, barnacle hash, etc.) remains insufficiently quantified. We address this knowledge gap by evaluating how proximity to the Alamo River delta affects the dust emissivity of the surface relative to other exposed playa surfaces. By measuring the grain size distribution of sediments collected from the Alamo River delta we determine the relative PM10 emissivity of each different surface type. We map the extent of each surface type around the Alamo River delta to identify spatial associations between emissive surfaces and the river channels. By identifying how the Alamo River sediment contributes to dust emissions, we provide insight into sediment-specific dust generation mechanisms at the Salton Sea. These findings will inform mitigation strategies aimed at reducing airborne particulate matter and protecting vulnerable communities. More broadly, this research contributes to understanding dust production in drying lakes worldwide, where accelerating shoreline increases risks to public health.

PRESENTER: MABEL TAN, BIOLOGY
FACULTY MENTOR: DR. FEDOR KARGINOV; MOLECULAR, CELL, AND SYSTEMS BIOLOGY
PROJECT TITLE: INVESTIGATING THE INTERACTION PARTNERS OF THE RNA ENDONUCLEASE ENDOU IN MOUSE THYMOCYTES

Abstract: Your genes consist of DNA which is transcribed into RNA and translated into protein, which makes you a functional organism. Many important processes inside the cell, like regulation of gene expression, are partly controlled by interactions of RNA-binding proteins (RBPs) with various RNAs, but many RBPs are not fully understood. Endonuclease poly(U) specific (EndoU) is a highly conserved RBP across species. Previous research indicates that EndoU is expressed in cells with high turnover rates, highlighting its possible role in apoptosis (programmed cell death). It is also expressed in thymocyte cells, the precursor to mature T cells and a key component of the mammalian immune system. To understand more about EndoU's role, we aim to identify what proteins EndoU interacts with. We will use a mouse thymocyte cell line and a novel proximity-based protein interaction detection method called APEX2. APEX2, once genetically fused to EndoU, will biotinylate nearby proteins, ie. those it interacts with. Two constructs were synthesized and introduced into thymocytes: EndoU-APEX2 and EndoU-mCherry for fluorescent microscopy. Next steps include isolating biotinylated proteins from the EndoU-APEX2 thymocyte line and identifying them via mass spectrometry. APEX2 results combined with fluorescent microscopy will also inform the cellular localization of EndoU. This project aims to illuminate EndoU's function and the mechanisms behind it, thereby setting the foundation for further research, which is especially important considering its role in the immune system and our lack of knowledge. In the long term, we hope to inform novel treatments for conditions like autoimmune diseases and cancer.

PRESENTER: SHIJIA TANG, BIOLOGY
FACULTY MENTOR: DR. KATE OSTEVIK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
ADDITIONAL CONTRIBUTOR: S. GANGOTHRI; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: TESTING HYBRID VIABILITY AS A POST-ZYGOTIC REPRODUCTIVE BARRIER BETWEEN SOUTHERN CALIFORNIA *PENSTEMON* SPECIES

Abstract: Hybridization is the process by which two distinct species reproduce to form hybrids. Despite hybridization being common across the plant kingdom, there are several reproductive barriers that play an important role in maintaining species boundaries, one of them being hybrid viability. Hybrid viability is a post-zygotic reproductive barrier that indicates a hybrid offspring's ability to mature into a healthy adult and potentially reproduce. In this study, we aim to understand hybrid viability as a potential reproductive barrier among three species of the genus *Penstemon*: *P. clevelandii, P. spectabilis*, and *P. centranthifolius*, which are known to naturally hybridize with each other. We used F1 hybrids that were generated in the greenhouse by crossing each *Penstemon* species. There were 6 interspecific cross types and 3 intraspecific crosses. We used 15 seeds from a maximum of 30 individuals per cross type for the germination experiment. The seeds were treated with gibberellic acid for 24 hours and planted within a single day. The germination took place under controlled lab and greenhouse conditions. Overall, the interspecific crosses with the mother species *P. spectabilis* showed the most successful germination, while interspecific crosses with the mother species *P. centranthifolius* had the least germination success. Interspecific crosses with the mother species, *P. clevelandii*, had moderate levels of germination success. Overall, our study highlights the role of the maternal parent in influencing the levels of hybrid viability and emphasizes the importance of hybrid viability as an important reproductive barrier between species.

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

Abstract: 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: BENJAMIN TAYLOR, BIOCHEMISTRY
FACULTY MENTOR: DR. DANIEL PETRAS, BIOCHEMISTRY
ADDITIONAL CONTRIBUTORS: KAMBRIA PHILLIPS, KAROLINE STEUER-LODD, LORENZ BULALACAO, TILMAN SCHRAMM, JORGE SALAZAR, AND ANDRE CORTES
PROJECT TITLE: THE SOURDOUGH MICROBIOME AS A MODEL SYSTEM TO STUDY MICROBIAL INTERACTIONS

Abstract: The sourdough microbiome is a well-characterized and globally utilized microbial community, making it an ideal model system for investigating microbial ecology. Containing primarily the *Lactobacillus* species and yeast, sourdough exhibits a stable community structure in which microbes contribute to flavor development, preservation, and antifungal activity. Due to its stability and ease of manipulation, we use the sourdough microbiome as a controlled experimental "sandbox" to examine microbial interactions and to validate different functional metabolomics techniques that have been established in our laboratory. Individual microbial strains were isolated and assembled into a defined synthetic community (SynCom) that represents the native sourdough microbiome. Targeted perturbations of the SynCom, including strain drop-out experiments, were used to assess the roles of individual community members in shaping interaction dynamics. Strain–strain interactions were initially assessed using cross-streaking assays, allowing direct observation of variations of positive and negative interactions between isolates. These qualitative interaction patterns guided further investigation of metabolite-mediated mechanisms. The metabolome was characterized using non-targeted liquid chromatography–tandem mass spectrometry (LC–MS/MS) to link metabolite exchange with observed interaction phenotypes. Bioactivity assays using strain-derived extracts revealed antimicrobial activity in two of eleven isolated strains, which highlighted functional diversity within the microbiome. Together, this work demonstrates how combining cross-streaking assays with metabolomics enables systematic investigation of cross-strain interactions and provides a tractable framework for studying microbial ecology and training students in multi-omics research approaches.

PRESENTER: ELIZABETH TENG, BIOLOGY
FACULTY MENTOR: DR. YING-HSUAN LIN, ENVIRONMENTAL SCIENCES
PROJECT TITLE: INVESTIGATING THE REACTIVITY AND POTENTIAL TOXICITY OF PER- AND POLYFLUOROALKYL ALDEHYDES THROUGH GLUTATHIONE ASSAY

Abstract: Per- and polyfluoroalkyl substances (PFAS) comprise a complex class of manmade fluorinated emerging contaminants of concern. Fluorotelomere alcohols (FTOHs) are a subclass encompassing the highest concentration of gas-phase PFAS in air and oxidize in the atmosphere to produce intermediate perfluoroaldehydes (PFAL) and fluorotelomer aldehydes (FTAL). Previous research has shown that FTOHs can be biotransformed into electrophilic compounds, such as the aldehydes, in liver cells and has attributed the resulting toxicity to the formation of adducts with nucleophiles like glutathione (GSH). This research will investigate the reactivity and potential toxicity of selected PFALs and FTALs in human lung cells (BEAS-2B). To analyze reactivity with GSH, PFALs and FTALs with different chain lengths were individually incubated with GSH for two hours, and 5,5'-dithiobis(2-nitrobenzoic acid) (DTNB) was added to react with free GSH to calculate mass-normalized GSH consumption rates. The measured rates will be compared to the calculated global electrophilicity values. Additionally, this study will compare GSH consumption to 24-hour LC50 values in BEAS-2B lung cells. These results will quantify reactivity toward GSH and provide insight into the role of electrophilicity in the observed toxicity in lung cells. We expect to identify 1,2-addition adducts formed between the aldehydes and GSH using mass spectrometry and hypothesize that mass-normalized GSH consumption will positively correlate with calculated global electrophilicity and LC50s. The results will quantify reactivity towards GSH, examine the role of electrophilicity in the observed toxicity towards lung cells, and identify adducts to be used as potential biomarkers of exposure in cells.

PRESENTER: YU TIAN, BIOLOGY
FACULTY MENTOR: DR. KATE OSTEVIK; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: THE EFFECT OF SEED AGE AND SIZE ON GERMINATION SUCCESS ACROSS DUNE AND NON-DUNE ECOTYPES OF *HELIANTHUS PETIOLARIS*

Abstract: Seed germination represents a critical stage in plant life cycles and determines whether seeds successfully transition to seedlings. Seed size and age may influence this process, but whether ecotypic differences influence germination remains unclear. The objective of this study was to examine how seed age and size relate to germination success in *Helianthus petiolaris* across dune and non-dune ecotypes, and whether ecotype explains additional variation beyond these factors. Seeds were collected from ten populations within Great Sand Dune National Park during two collection years (2015 and 2025). Seed mass was measured using an analytical balance, and area and feret diameter were quantified from standardized images. Germination was assessed in Petri dish assays, and mixed-effects models were used to evaluate predictors of germination success, with population included as a random effect. Results showed that germination was higher in seeds collected in 2025 than in 2015. Germination rate also increased with seed mass, suggesting a benefit associated with greater stored reserves. In contrast, ecotype showed weak or no effect on germination success, once seed traits and seed age were accounted for. Overall, these findings indicate that aging and seed mass play key roles in germination success in *Helianthus petiolaris*, whereas ecotype contributes little additional variation.

PRESENTER: EMMA TRAN, ENVIRONMENTAL ENGINEERING
FACULTY MENTOR: DR. FRANCESCA HOPKINS, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTOR: JULIANA GUERRA, ENVIRONMENTAL SCIENCES
PROJECT TITLE: METHANE ENHANCEMENT IDENTIFICATION AND SOURCE ANALYSIS AT UC RIVERSIDE

Abstract: As the impending doom of climate change looms, the IPCC has identified methane (CH_4) reductions as vital to remaining under 1.5°C of increased global temperature. Because of human activity, and dense, complex infrastructure, urban areas are critical locations of concern for CH_4 reductions. Understanding CH_4 sources in cities is essential to developing effective and efficient climate mitigation strategies. While natural gas leaks were historically assumed to be the dominant source of CH_4, recent findings state that wastewater infrastructure plays a larger role. Building on prior UCR research findings and working with UCR Facilities through the Living Lab program, this study investigates CH_4 sources across UCR. We hypothesize that sewage infrastructure is a significant source of CH_4 emissions at UCR. We further hypothesize that storm drains are not a major contributor relative to sewer systems. In addition, we propose that collaborating directly with UCR Facilities will improve communication of findings and support CH_4 mitigation efforts. We conducted in situ CH_4 measurements across UCR using a LI-COR LI-7810 Trace Gas Analyzer and a RIGID microCD-100 combustible gas detector. Surveys focused on sewer lines, storm drains, and areas near natural gas infrastructure to identify methane enhancements and attribute CH_4 sources. Preliminary results indicate that elevated CH_4 concentrations are frequently associated with sewage infrastructure, supporting the hypothesis that wastewater systems are an important source of CH_4. These findings highlight the importance of improving wastewater systems to

help urban CH_4 mitigation strategies and demonstrate the value of researcher-stakeholder partnerships in advancing climate solutions.

PRESENTER: JOCELYN TRAN; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DANIELLE WHITE, CUREL
ADDITIONAL CONTRIBUTOR: DR. YASEMIN IREPOGLU CARRERAS, POLITICAL SCIENCE
PROJECT TITLE: EDUCATION INEQUITY AND COMMUNITY WELLNESS AT HORTON'S KIDS

This internship, completed through the University of California Washington Center (UCDC) program, involved a dual-role engagement in non-profit development and community programs at Horton's Kids in Southeast Washington, D.C. While my "Reducing Poverty and Inequality" coursework provided a theoretical vocabulary for third worldality and structural violence, my time in Anacostia offered a profound, humanizing perspective on how these forces impact predominantly Black youth. As a Girls Who Code lead, I developed an eight-week curriculum to foster technical literacy, while learning to serve as a supportive advocate for students navigating the treacherous trap of systemic neglect. Beyond the classroom, I assisted at the organization's distribution center, connecting residents with essential resources for housing, employment, and nutrition. These interactions highlighted that the disparities in education and health within the nation's capital are not accidental, but are products of deeply embedded structural violence. Supporting the Development team through donor research further taught me the necessity of sustainable funding in maintaining these vital community lifelines. By briefly sharing in the daily realities of Southeast Washington, D.C., I realized that academic knowledge finds its highest purpose when used to advocate for the dignity and well-being of others. This presentation argues that effective advocacy must move beyond clinical observation to embrace a deeply human commitment to the rights and professional aspirations of those living in marginalized communities.

PRESENTER: KATHERINE TRAN, BIOLOGY
FACULTY MENTOR: DR. ZHENYU JIA, BOTANY AND PLANT SCIENCES
PROJECT TITLE: COMPREHENSIVE ANTIOXIDANT CAPACITY SCREENING OF POMEGRANATE GERMPLASM USING DPPH RADICAL SCAVENGING ASSAYS

Abstract: Pomegranates (*Punica granatum*) are among the fruits with the highest antioxidant content, surpassing red wine and green tea in free radical scavenging. This potent antioxidant activity comes mainly from hydrolyzable tannins and anthocyanins, naturally occurring in pomegranate fruit, which offer cardiovascular benefits, anti-inflammatory properties, and potential cancer prevention. The demand for functional foods has increased pomegranate juice sales, with the global market projected to reach $28 billion by 2028. However, California's pomegranate industry largely depends on the popular 'Wonderful' cultivar, which may not have the best antioxidant capacity. The University of California, Riverside, holds a diverse collection of 35 pomegranate accessions from regions known for their traditional selection of juice quality. These accessions show significant genetic diversity, yet comprehensive antioxidant profiling remains lacking. My project aims to evaluate and characterize the antioxidant potential of these varieties.

DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging represents the gold standard for evaluating antioxidant capacity. DPPH's purple color fades proportionally to antioxidant concentration, allowing quantitative spectrophotometric measurement. This directly measures the ability of juice antioxidants to neutralize free radicals—the fundamental mechanism underlying pomegranate health benefits.

Hypothesis: Pomegranate accessions will show significant variation in antioxidant capacity, some with superior profiles warranting prioritization for commercial development and breeding.
Objectives: (1) Extract juice from 35 accessions at harvest maturity; (2) Quantify radical scavenging using DPPH with multiple dilutions to generate dose-response curves; (3) Calculate percent inhibition and IC_{50} values (concentration providing 50% radical scavenging); (4) Rank accessions based on antioxidant capacity; (5) Provide breeding program recommendations prioritizing elite accessions.

PRESENTER: STEVEN TRAN, BIOCHEMISTRY
FACULTY MENTOR: DR. KERRY MAUCK, ENTOMOLOGY
PROJECT TITLE: ESCAPING THE HEAT: EVIDENCE THAT POTATO PSYLLIDS (*BACTERICERA COCKERELLI*) SPEND THEIR SUMMER ON PINE TREES

Abstract: The potato psyllid *(Bactericera cockerelli*, Hemiptera: Triozidae) is a considerable agricultural pest in solanaceous crops (Solanales: Solanaceae, e.g. tomatoes, peppers, potatoes). This psyllid is a vector for *Candidatus Liberibacter solanacearum* (CLso), a plant pathogen that causes disease in solanaceous crops through stunted growth and reduced yield. In the United States, there are four distinct haplotypes named after their initial collection sites: Western, Northwestern, Central and more recently Southwestern, with each haplotype having different host preferences and CLso associations. Much is still unknown of the migration pattern of the Southwestern haplotype, but this desert-region associated haplotype likely moves between wild Solanaceae (nightshades) and solanaceous crops as seasons change. During summer 2024, we discovered potato psyllids on pine trees on Mount Whitney in the Sierra Nevada mountains of California. To understand which the haplotype these potato psyllids derives from, these potato psyllids were collected off the pine trees and haplotyped using mitochondrial oxidase I through polymerase chain reaction (PCR), Sanger sequencing and NCBI BLAST. They were found to be of Southwestern haplotype, confirming their use of conifers as "shelter plants" for moisture and nutrition during the summer when native or cultivated Solanaceae are unavailable. The efforts in this project are a small aspect of a larger study to understand the effects of potato psyllid migration on CLso transmission patterns. Differences in migration and plant preferences among the four haplotypes may lead to future speciation within potato psyllids, creating more opportunities for new CLso variants and transmission.

PRESENTER: THEODORE TRAN, MICROBIOLOGY
FACULTY MENTORS: DR. JACK EICHLER, CHEMISTRY AND DR. LUCY DELANEY; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: EXPLORING THE EFFECTS OF VISUAL STORYTELLING IN A STEM CLASSROOM

Abstract: The next generation of STEM starts in the classroom. It is extremely important that the scientists of the future have a strong background before engaging with the most pressing problems of the scientific community. These STEM classes however can be perceived as difficult by many undergraduate students. The content can be dense and dry at times. Being asked to regurgitate a high amount of said content may not be the most exciting or effective way to learn about the world of science. This study looks at a possible alternative in the form of a visual learning intervention. An introductory biology course discussion was chosen to explore this method. In this study, the students were encouraged to create storytelling videos that explained a topic in a narrative sense. These students chose a specific unit to produce their educational videos on. After recording their projects, all the students take a quiz to determine how much of the information they retained. Their scores are compared to a previous unit where they took a quiz after learning through traditional methods. These traditional methods are the standard

lecture and reading the textbook to memorize. The results from both quizzes do not show any large differentials between the scores of the traditional and experimental methods. However, the students did find enjoyment in their creations. With more practice and time, it is plausible that these visual narrative methods could improve a STEM student's retention rate. It could also help them contextualize the often dense or dry curriculum.

PRESENTER: KAITLYN VENATOR, BIOCHEMISTRY
FACULTY MENTOR: DR. POLLY CAMPBELL; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: MEIOTIC DRIVERS AND THEIR INFLUENCE ON X CHROMOSOME EXCLUSION FROM THE MALE GERMLINE IN THE CREEPING VOLE, *MICROTUS OREGONI*

Abstract: Meiotic drivers are selfish genetic elements that manipulate transmission during meiosis such that the chromosome that carries the driver is transmitted to over 50% to offspring. This can lead to reduced fertility or viability. Most species that display drive in wild populations quickly evolve suppressors, effectively restoring Mendelian inheritance. The creeping vole (*Microtus oregoni*) has an uncommon sex determination system with no Y chromosome and two distinct X chromosomes: a maternally transmitted X (Xm) and a male-limited X (Xp). Female *M. oregoni* have a single copy of Xm in somatic cells (Xm0) whereas male somatic cells have both Xm and Xp. However, Xm is excluded from the male germline and males only transmit Xp. The fact that males do not transmit Xm postulates a history of drive on this chromosome, now suppressed by exclusion from the germline. In other systems with drivers, suppression can be incomplete. The goal of this study is to determine whether this is the case in *M. oregoni*. Specifically, is Xm ever transmitted through males? If so, XmXm individuals should exist. Xm and Xp carry the same genes but multicopy genes are in higher copy numbers on Xp. Therefore, the copy number should be intermediate in XmXm individuals relative to Xm0 and XmXp. I used a qPCR copy number assay to test for XmXm individuals in a *M. oregoni* lab population. Results suggest that, if XmXm individuals exist, they are very rare. This study contributes to understanding of a unique mammalian sex chromosome system.

PRESENTER: DHANISH VENIGALLA, NEUROSCIENCE
FACULTY MENTOR: DR. THEODORE GARLAND; EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY
PROJECT TITLE: DOES EARLY-LIFE EXPOSURE TO NON-NUTRITIVE SWEETENERS HAVE ANY LONG-TERM EFFECTS?

Abstract: Obesity affects approximately 100 million U.S. adults (42%) and 15 million children (19.7%) (Bryan et al. 2021). Although sugar-sweetened foods and beverages are often implicated as major contributors (Malik and Hu 2022), the use of artificial or non-nutritive sweeteners (NNSs) as low-calorie alternatives has increased substantially. Between 1999 and 2012, NNS consumption in children rose from 8.7% to 25.1% (Sylvetsky et al. 2017). However, the long-term health consequences of chronic NNS exposure during development remain unclear, with some studies suggesting associations with increased obesity risk (Frazier et al. 2008; Palatnik et al. 2020; Tsan et al. 2022). The High Runner (HR) mouse selection experiment, ongoing for nearly 30 years and spanning ~100 generations, includes four replicate lines selectively bred for high voluntary wheel running and four non-selected Control (C) lines. HR mice run 2.5–3 times more revolutions per day than Controls (Careau et al. 2013) and differ in multiple traits, including body mass, adiposity, food intake, aerobic capacity, and organ size. For example, HR mice are smaller, leaner, have increased home-cage activity when housed without wheels, have increased food consumption, higher VO2max during forced exercise, and larger brains and hearts. In this study, juvenile

female HR and Control mice were exposed for three weeks post-weaning to one of four drinking solutions: tap water, sucrose, sucralose, or saccharin. After an 8-week washout period (all mice had tap water), mice underwent behavioral and locomotor testing, including the marble burying and open-field assays, to assess compulsive-like behaviors and emotionality. This work investigates whether early-life exposure to non-nutritive sweeteners produces lasting behavioral effects, and whether responses differ based on genetic background.

PRESENTER: ARYAMAN VERMA, BIOLOGY
ADDITIONAL PRESENTERS: MUZAMMIL IMRAN, BIOLOGICAL SCIENCES AND IVAN ROMERO, BIOLOGY
FACULTY MENTOR: DR. ADAM NORRIS, BIOCHEMISTRY
PROJECT TITLE: DRUG INDUCED STRESS SIGNALING RESCUES RNA DYSREGULATION IN *C. ELEGANS*

Abstract: Floxurdine (FuDR) and 5-FU (Fluorouracil) are nucleotide analogues commonly used as anti-cancer medications. In the nematode worm *C. elegans* they are used for lifespan assays as they prevent progeny formation. We found that these same compounds rescue degenerative phenotypes associated with RNA dysregulation in *C. elegans*. To explore these mechanisms, we used GFP reporters to quantify the expression of genes affected by these two drugs. RNA-seq analysis revealed upregulation of several stress-response genes, including numr-1. Using GFP reporters, we observed strain-, dose-, and time-dependent induction of Numr-1, with strongest expression worms exposed to these drugs for 24 hours at intermediate concentrations (12.5–25 µM). Expression was primarily intestinal, and untreated controls remained near baseline. With FuDR, GFP expression peaked at 50 uM, while concentrations above 50 uM caused a significant drop in fluorescence, likely due to overdose disrupting protein function. With 5-FU, the highest tested dose (100 uM) produced the greatest expression. *pgp-8* is a second stress-response gene which exhibited upregulation in response to FuDR in our RNA-Seq data. We observed similar trends for *pgp-8* in response to these drugs, except fora striking difference that 5-FU causes a much larger upregulation of *pgp-8* than FuDR at the same concentration, a phenomenon we aim to explore. Going forward, we will test why different concentrations of similar drugs are ideal for most upregulated expression, as well as which drug metabolites of FuDR and 5-FU are the active metabolites, and whether they are acting through disruption of RNA or DNA.

PRESENTER: ASTON VU, NEUROSCIENCE
FACULTY MENTOR: DR. TODD FIACCO; MOLECULAR, CELL, AND SYSTEMS BIOLOGY
ADDITIONAL CONTRIBUTORS: SANDHYA SRIRAM, KAIRA CARSTENS, AND CHRISSY LOPEZ
PROJECT TITLE: ASTROCYTE REGULATION OF EXTRACELLULAR SPACE DYNAMICS THROUGH NEUROMODULATION AND ION HOMEOSTASIS DURING SLEEP-WAKE STATE TRANSITION

Abstract: Previous literature demonstrates that astrocytes actively regulate neuronal excitability and behavioral states in response to neuromodulation and control of extracellular ion homeostasis. We hypothesize that during wakefulness, neuromodulators such as norepinephrine (NE), the dynamics of which are tightly coupled to the sleep-wake cycle and increase during arousal, in combination with elevated extracellular potassium (K+) causes astrocytes to swell, the extracellular space (ECS) to shrink, and facilitate the awake state. However, direct astrocyte volume responses to these signals have never been shown.

Using real-time confocal volume imaging, this study focuses on astrocyte volume dynamics in response to changes in extracellular K+ concentration and NE exposure to better understand astrocyte-mediated

regulation of sleep-wake state transitions. Astrocyte volume was measured under varying K+ conditions to simulate activity-dependent ionic changes during the sleep-wake cycle, both in the presence and absence of NE. Preliminary findings demonstrate that elevated extracellular K+ induces astrocyte swelling, while diminished K+ in the range that occurs during sleep induces astrocyte shrinking, consistent with astrocyte-mediated ECS regulation. Additionally, NE, which is released during the wake state and has been found to elevate extracellular K+, may have an effect on ECS volume. Our results show that there is no short-term direct effect of norepinephrine on astrocyte volume.

These findings support the hypothesis that astrocytes contribute to sleep-wake regulation by dynamically controlling ECS volume in response to ionic and neuromodulatory cues. Understanding how astrocytes respond to K+ and NE provides insight into cellular mechanisms underlying neuromodulation, consciousness, brain state transitions, and ECS regulation.

Presenter: Mahathi Vurimi, Neuroscience
Additional Presenter: Grace Su; Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Meng Chen, Botany and Plant Sciences
Additional Contributor: Dr. De Fan, Botany and Plant Sciences
Project Title: How do Plants Adapt to the Warming Climate? Identifying Genetic Regulators of Thermoresponsive Growth

Abstract: Climate change profoundly affects human society, particularly crop productivity. Improving crop adaptation requires understanding how plants perceive and respond to warming environments. Thermoresponsive phenotypic plasticity enables plants to adjust growth and development in response to modest increases in ambient temperature, a process known as thermomorphogenesis. However, the molecular mechanisms underlying this developmental plasticity remain incompletely understood. Here, we use *Arabidopsis thaliana* as a model system, in which a temperature increase from 21 to 27°C promotes hypocotyl elongation, to investigate how plants perceive and transduce temperature signals. To identify key signaling components, we performed a forward genetic screen using an EMS-mutagenized population of over 2,000 independent lines. Seedlings were grown at 27°C and screened for temperature-insensitive mutants with impaired hypocotyl elongation. We isolated 13 mutants exhibiting strong defects in thermoresponsive growth, suggesting that the mutated genes are essential for temperature signaling. Ongoing whole-genome sequencing, combined with genetic mapping and allele validation, will enable precise identification of the causal mutations. This work uncovers novel regulators of thermoresponsive growth and provides a foundation for understanding plant temperature adaptation and future crop improvement.

Presenter: Grace Wang, Chemistry
Faculty Mentor: Dr. Timothy Su, Chemistry
Project Title: Switchable Rhodamines for Molecular Electronics

Abstract: Single molecule electronics represents the limit of miniaturization in electronic devices, where individual molecules serve as the switching elements in circuits. This project investigates rhodamines, a class of molecules widely used as bioimaging fluorophores, and their use as molecular switches. Specifically, in this study, we install thioanisole end groups onto a rhodamine scaffold to study rhodamines in scanning tunneling microscopy- break junction (STEM-BJ) measurements. We are able to show that trifluoroacetic acid (TFA) can be used to switch between an insulating OFF state and a conducting ON state with an ON/OFF conductance ratio of 46, which is among the highest reported switching factors for chemically responsive single-molecule junctions today. Usage of triethyl amine allows us to demonstrate reversible acid/base switching over three cycles and we are also able to drive switching with lithium ion and sonication stimuli. This work establishes rhodamines as an exciting new platform for designing functional molecular electronics.

PRESENTER: KENNEDY WHITE, ENTOMOLOGY
FACULTY MENTOR: DR. KARTHIKEYAN CHANDRASEGARAN, ENTOMOLOGY
ADDITIONAL CONTRIBUTOR: JOSEPH AKOLGO, ENTOMOLOGY
PROJECT TITLE: SALT RESIDUE INFLUENCES OVIPOSITION BEHAVIOR IN *AEDES AEGYPTI*

Abstract: *Aedes aegypti* are mosquitoes that transmit diseases such as yellow fever and have expanded their range in California over the past decade. Their success in urban environments is partly attributed to plasticity in oviposition behavior, as females lay eggs in small, transient water sources that periodically dry and refill. Mosquito control professionals often observe eggs deposited above the waterline in dry, discarded containers, coinciding with a salt residue left after evaporation. This observation raises the question of whether females actively respond to salt-line cues when selecting oviposition sites, or whether eggs are simply laid above the water surface and later exposed as water evaporates.

To test this, I placed 10 blood-fed females into each of 21 cages. Seven cages contained oviposition cups with a salt line at the 50 mL mark, seven contained cups with a salt line at the 100 mL mark, and 7 contained control oviposition cups without salt lines. Eggs laid were quantified in the water, on the salt line, and on untreated glass. Females deposited significantly more eggs on the salt line than in the water or on glass in both salt-line treatments, and control cups received significantly fewer eggs overall, suggesting that salt-line cues influence oviposition behavior.

Future directions include behavioral choice assays to test whether females actively orient toward salt lines, followed by manipulations of salt chemistry to identify the sensory drivers of oviposition preference. We will then quantify egg hatch rates and offspring survival to determine whether oviposition preferences translate into fitness advantages.

PRESENTER: EVIE WILSON, PLANT BIOLOGY
FACULTY MENTOR: DR. CAROLYN RASMUSSEN, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: LINDY ALLSMAN
PROJECT TITLE: PUTATIVE IDENTIFICATION OF *XCL1* GENOTYPES THROUGH PHENOTYPIC ANALYSIS

Abstract: The mechanisms that regulate cell division limit periclinal divisions in the leaf and other organs for optimal plant growth. *Extra Cell Layers1 (Xcl1)* is a semi-dominant mutant found in *Zea mays* (maize) that generates extra cell layers through aberrant periclinal divisions in the protoderm. These extra cell layers lead to increased leaf thickness, less stomatal complexes, and shiny juvenile leaves. This study evaluates the most effective method of identifying the heterozygous (*Xcl1*/+) and homozygous (*Xcl1/Xcl1*) mutant phenotypes. We determined that white striations at the base of the leaf are characteristic of heterozygotes while homozygotes also have striations but are significantly shorter at thirteen weeks old. Furthermore, *Xcl1* homozygotes generate sterile, underdeveloped tassels. Next steps in characterizing the mutant include using confocal microscopy to detect and characterize when and where aberrant divisions occur. Additionally, mutant and heterozygous individuals will be gathered for whole

genome resequencing and bulk segregant analysis to identify the causative lesion in *Xcl1*. Understanding how cells modulate division patterning and timing will provide insight into how and when ectopic divisions occur and could lead to improved crops.

PRESENTER: ADRIAN WOMACK, PHYSICS AND ASTRONOMY
FACULTY MENTOR: DR. FLIP TANEDO, PHYSICS AND ASTRONOMY
PROJECT TITLE: PARTICLE BITES: A VISUAL STORYTELLING APPROACH TO QUANTUM FIELD THEORY

Abstract: Quantum field theory (QFT) is the main theory underpinning particle physics, but its rigorous mathematical formalism presents barriers to understanding for students and the public. Particle Bites is an ongoing science communication project that explains core ideas in QFT through web-based graphical storytelling and illustration. The project focuses on Feynman diagrams, which are pictorial representations of particle interactions, and introduces them through illustrations and visual rules rather than formal derivation. In the pilot episode, the reader enters the "Quantum Casino" and learns the rules of quantum electrodynamics (QED) through a card game in which cards representing particles and interactions are connected according to physical constraints. These rules mirror the structure of valid Feynman diagrams. Animated sequences show how diagrams are constructed and how their structure encodes particle interactions. My work includes creating animated GIFs of Feynman diagrams, designing stylized versions of these diagrams, and helping build the visual and narrative world in which physical laws appear as the rules of a card game governed by the Cosmic Dealer. Future episodes will introduce additional concepts including spacetime diagrams, momentum conservation, and the structure of the Standard Model. Particle Bites explores how illustration and narrative structure can be used to make abstract theoretical physics more intuitive and engaging.

PRESENTER: CHENZI XIU, STATISTICS
FACULTY MENTOR: DR. YUZHOU CHEN, STATISTICS
PROJECT TITLE: LEVERAGING LARGE LANGUAGE MODELS FOR HOMELESS RESOURCE ACCESSIBILITY

Abstract: Despite the availability of public assistance programs, individuals experiencing homelessness continue to face significant barriers in accessing essential services such as food pantries, temporary shelters, and mental health support. These barriers are often exacerbated by fragmented information systems, outdated databases, and limited digital literacy. This project addresses these challenges by developing an AI-driven platform that leverages large language models (LLMs) to deliver real-time, location-based, and personalized service recommendations.

The system integrates verified service data with geospatial analysis and knowledge graph reasoning to optimize the accuracy and relevance of recommendations. By allowing users to interact in natural language, the platform reduces cognitive and technological barriers commonly associated with traditional government websites and search engines. In addition, the model incorporates continuous updating mechanisms to ensure reliability in dynamic service environments where availability frequently changes.

By combining statistical modeling, natural language processing, and user-centered interface design, this research demonstrates the practical application of artificial intelligence for social good. Ultimately, this project contributes to both the field of data science and public service innovation by proposing a scalable, accessible solution that improves resource navigation for vulnerable populations.

PRESENTER: TARA YASSAMY, CHEMISTRY
FACULTY MENTOR: DR. KATHRYN UHRICH, CHEMISTRY
ADDITIONAL CONTRIBUTORS: MD. RAGIB HASAN AND KHANG NGUYEN
PROJECT TITLE: SYNTHESIS OF SALICYLIC ACID-BASED POLY(ANHYDRIDE-ESTER)S WITH DISTINCT LINKER CHEMISTRIES FOR POTENTIAL AGRICULTURAL APPLICATIONS

Abstract: Salicylic acid-based poly(anhydride-ester)s (SAPAEs) are biodegradable and biocompatible polymers designed to release salicylic acid through different methods of degradation, offering potential applications in medicine, agriculture, and more. Salicylic acid is a well-known bioactive molecule with anti-inflammatory properties. It is also significant for plant growth regulation and stress response. In this work, salicylic acid-based polymers were synthesized using two distinct linker chemistries: adipic acid and glycolic acid. These linkers were selected to study how variations in linker structure influence polymer formation and material properties which is essential for controlled release applications. Corresponding monomers were first synthesized and then polymerized using melt or solution polymerization to produce SAPAEs. The resulting polymers were characterized using NMR, GPC, and IR Spectroscopy to confirm chemical structure, molecular weight, and stability. Differences in linker chemistry are expected to influence polymer hydrophobicity, thermal behavior, and degradation tendencies under a multitude of environmental conditions. Understanding these effects is essential for the design of SAPAEs for environmental delivery systems. Currently, these polymers are being synthesized to study their degradation behavior under controlled exposure to UV radiation (at 35°C), at 35°C, and at room temperature to mimic agricultural settings such as temperature and light.

PRESENTER: YOUSIF YILMAZ; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. VENUGOPALA REDDY GONEHAL, BOTANY AND PLANT SCIENCES
ADDITIONAL CONTRIBUTOR: VINCENT CERBANTEZ-BUENO
PROJECT TITLE: ORTHOLOGOUS ANALYSIS OF *CLV3* EXPRESSION IN TOMATO AND *ARABIDOPSIS*

Abstract: Above ground primary growth in vascular plants is driven by the shoot apical meristem (SAM), where stem cell homeostasis is regulated by the *CLAVATA3* gene (*CLV3*). While the *CLV3* gene is conserved across species, its spatial expression patterns within the SAM vary. In *Arabidopsis thaliana*, *CLV3* is mainly expressed in the top layers (L1 and L2) of the central zone (CZ) of the SAM; however, in other species like *Solanum lycopersicum* (tomato), *CLV3* expression is found in deeper layers (L3). These differences suggest potential divergence in regulatory mechanisms governing meristem maintenance and plant architecture. This study investigates the regulatory variation of *CLV3* by comparing the activity of orthologous sequences from *Arabidopsis* and *S. lycopersicum* within a tomato host. Using *Agrobacterium*-mediated transformation, we aim to generate reporter transgenic *S. lycopersicum* lines carrying either the endogenous *SlCLV3* or the orthologous *AtCLV3* regulatory sequences. Preliminary results suggest that we have transformed tomato cotyledons with both orthologs of *CLV3*. After regeneration-induction, we obtained 17 potential different lines for *SlCLV3*, and genotypic analysis has confirmed successful integration in 6 of them. Conversely, *AtCLV3* lines are still in the vegetative growth phase. Comparative analysis of *CLV3* expression in these reporter lines will provide insight into the divergence of *CLV3*-mediated meristem regulation and its impact on shoot development. These findings will provide critical insights into the divergent evolutionary trajectories of stem cell maintenance in dicotyledonous plants.

PRESENTER: ALISA ZAIDI; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. MARTÍN GARCÍA-CASTRO, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: SANJIDA AKTER
PROJECT TITLE: CRITICAL EFFECT OF ENDOCANNABINOID SYSTEM ACTIVATION DURING GERM LAYER SPECIFICATION IN CHICK EMBRYOS

Abstract: The endocannabinoid (eCB) system consists of lipid molecules-endocannabinoids, their anabolic and catabolic enzymes, and cannabinoid receptors that are well known for their role in neural function, however its components are also expressed in many other tissues where its function remains unexplored. Exposure to phytocannabinoids, compounds that activate eCB receptors, has been associated with limitations in fetal growth and neurodevelopmental impairments. This raises concerns with the recent increase of the drug's strength and broader usage. Despite this, the role of eCB signaling in early human development remains unclear. Using human embryonic stem cells as an in vitro model, our lab has preliminary evidence that the modulation of this system leads to detrimental effects during germ layer specification. To provide an in vivo comparison to our findings, we propose to use chick embryos to examine the expression and functional impact of cannabinoid pathway modulation during early development, as epiblast cells transition into ectoderm, endoderm and mesoderm, specifically focusing on endoderm lineage. First we confirmed expression profiles of CB receptors using in situ hybridization, and then we assessed the role of the eCB system through pharmacological manipulation with synthetic cannabinoids-like agonist WIN55, 212 and antagonists AM4565 and AM630. Phenotypic effects were assessed using immunofluorescence for endodermal markers. Our findings support the idea that activation of the eCB system during early development has a critical effect on germ layer specification. Our work highlights the need to inform women of possible risks associated with CB consumption.

PRESENTER: ANGEL ZARAGOZA, BIOCHEMISTRY
FACULTY MENTOR: DR. EMMA ROVA DANELIUS, CHEMISTRY
ADDITIONAL CONTRIBUTOR: MÅNS ERIKSSON
PROJECT TITLE: SYNTHETIC CHALLENGES OF CYCLO(RLsKDK) AND *N*-METHYLATED ANALOGS

Abstract: Estimates show that over half of all proteins in the human proteome are considered undruggable by small-molecules. Recently, high-molecular weight therapeutics, residing beyond the traditional drug space have been explored for their ability to target flat or featureless binding sites. Peptide therapeutics are at the forefront of emerging therapeutics in drug discovery, however, they generally face significant drawbacks in terms of *in vivo* stability, bioavailability and cell permeability. Cyclization and targeted methylation of the peptide backbone have been observed to increase stability, bioavailability and cell permeability. Cyclo(RLsKDK) is a peptide with the potential to inhibit ADAM8 (a disintegrin and metalloproteinase domain-containing protein 8), a metalloproteinase overexpressed in various cancers and strongly correlated to tumour malignancy. Due to the high polarity of cyclo(RLsKDK), the expected cell permeability would be low. Based on a nuclear magnetic resonance (NMR) ensemble analysis, *N*-methylated analogs of cyclo(RLsKDK) were proposed and designed to improve the cell permeability. We will present our synthetic exploration of these *N*-methylated cyclic peptides. Challenges addressed involve the cyclisation site, on-resin *N*-methylation, purification of the cyclic analog, and low overall nucleophility.

PRESENTER: REFUGIO ZEPEDA, JR.; DATA SCIENCE
FACULTY MENTOR: DR. HOORI AJAMI, ENVIRONMENTAL SCIENCES
ADDITIONAL CONTRIBUTOR: ERIC WINETEER, ENVIRONMENTAL SCIENCES
PROJECT TITLE: QUANTIFYING SPATIAL AND TEMPORAL VARIABILITY OF EVAPOTRANSPIRATION IN THE KAWEAH RIVER WATERSHED, CALIFORNIA

Evapotranspiration (ET) is one of the major components of the water balance, consisting of evaporation from soil and transpiration from plants. Quantifying ET is important as it improves understanding of the water cycle dynamics in relation to climate variability and vegetation types. This is particularly important in mountain watersheds as they are the main source of water supply. Our main research objective is to assess the performance of seven remotely sensed-based ET models within the OpenET API (DisALEXI, eeMETRIC, geeSEBAL, PT-JPL, SIMS, SEEBop, and Ensemble) using data from a sub-watershed of California's Kaweah River watershed with an approximate area of 360 km^2. We used 24 years of monthly data from 2000 to 2024 and statistical and geospatial analysis methods in Python to assess variability. Results revealed that the highest annual ET was in 2016, followed by the largest decline from 2016 to 2022. However, the models disagree on the timing of peak ET. Using MAE and RMSE as performance metrics, PTJPL was the best-performing model, and eeMETRIC was the worst. A mean ET difference greater than 20 mm/yr between eeMETRIC and Ensemble occurred over 9.2% of the area, whereas for the PTJPL-Ensemble comparison, only 0.90% of its area exceeded this threshold. Variability in ET estimations stems from how factors are weighted, such as solar radiation, temperature, humidity, and wind speed, along with different crop variables and ground elevation. Future work will focus on developing a new ensemble ET model to improve ET estimation in the watershed.

School of Business

Presenter: Sweden Agunenye, Computer Science
Faculty Mentor: Dr. Sanjoy Moulik, Business Administration
Additional Contributors: Lance Santana and Iheanyichukwu Kalu-Okere
Project Title: Voice Bloom: An Interactive Platform for Communication

Abstract: AAC stands for Augmented and Alternative Communication. It describes tools and strategies people with communication difficulties use instead of speaking. Most AAC tools rely on static symbol grids, slow navigation, and manual setup, making communication difficult for non-literate and cognitively diverse users. Despite their importance, existing AAC platforms often fall short in critical areas; many have a lack of developmental growth, remain static, and do not scale vocabulary or grammar support as users learn and progress.

Voice Bloom is an innovative AAC system moving beyond static grids by using adaptive AI to support expressive, intuitive communications. The product offers the option to personalize the appearance or word selection to better fit the evolving needs of each user's expanding vocabulary, refining grammar supports, and growing alongside their skills and needs. Our goal is to create a user-friendly, accessible implementation that allows the user to express their wants and needs through an interactive interface.

Our platform presents a unique learning feature through a personable, lifelike figure with which the user can interact with. The project addresses the lack of interactivity often present in other platforms through the avatar; users can simulate a conversation that would include emotive facial expressions and gestures. The inclusion of adaptive responses also allows the user to pick up on new topics of conversation a static tool might not allow for. The tool can allow for exciting breakthroughs in interfacing with differently abled people due to its affordability and would have positive impacts in their everyday lives.

Presenter: Milena Guidotti, Business Administration
Faculty Mentor: Dr. Ye Li, Business Administration
Project Title: Pain of Paying: How College Students Experience Discomfort Across Payment Methods

Abstract: Past research suggests that spending cash is more psychologically painful than using other payment methods because cash is tangible and more salient (Prelec & Loewenstein, 1998). However, with shifts in how cash is viewed and used due to increased digital payments and online shopping, it is unclear whether these classical findings hold true, especially among younger consumers. The purpose of this study is to examine whether the psychological pain of paying differs by payment method (cash, credit, debit) and purchase type (splurge, hedonic, utilitarian), and whether these effects differ from past research. This study measured pain of paying among UCR undergrads (n=832) using a 5-point Likert scale (1 = no pain/discomfort, 5 = very strong pain/discomfort) across three scenarios (splurge, hedonic, utilitarian). We hypothesized that younger consumers would experience less pain of paying when spending cash compared to using credit or debit, and more pain for splurges than hedonic and utilitarian. ANOVA and t-tests found support for both hypotheses. For UCR undergrads, cash was indeed less painful than credit or debit. Utilitarian purchases were also less painful than hedonic or splurge purchases, but there was no interaction between purchase type and payment type. We also measured additional

individual differences, such as employment status, bank apps frequency of use, and tightward-spend thrift tendencies but none proved significant.

PRESENTER: ANGELINA HERNANDEZ, PSYCHOLOGY
FACULTY MENTOR: DR. ELAINE WONG, BUSINESS ADMINISTRATION
PROJECT TITLE: HOW THE PAST AFFECTS THE FUTURE: UPWARD COUNTERFACTUALS, MOTIVATION, AND RISK PREFERENCE

Abstract: Counterfactual thinking occurs when a person thinks about the past and its alternative outcomes. In doing so it helps a person try to figure out whether an alternative course of action in the past could have changed the outcome of the present. Upward counterfactual thinking specifically looks into how a situation from the past could have turned out better. Previous findings have revealed that upward counterfactuals have been known to influence an individual's motivation, but these findings have varied. For example, when considering an upward counterfactual thought, it may motivate someone to want to improve, prompting them to learn from their mistakes. As this helps aid in self-reflection and can help improve future decision-making. However, less is known about how situational factors, such as risk, can influence these thoughts. By utilizing an online, randomly assigned, experimental, self-reported survey on 18+ English speaking individuals and incorporating the situational motivation scale; I can evaluate how upward counterfactuals in a specific perceived risk scenario, low or high risk, can influence an individual's motivation. I predict that, if an individual is in a high-risk scenario and experiences an upward counterfactual thought then motivation will be lower; compared to an upward counterfactual thought in a low risk scenario where motivation would be higher. This can help in figuring out how specific situations, such as taking an exam, may influence these thoughts. Potentially, improving a person's ability to manage similar situations in the future. Especially since people experience varying degrees of risk in everyday life.

PRESENTER: AMRIT JOHAL, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. RICH YUEH, BUSINESS ADMINISTRATION
PROJECT TITLE: INVESTIGATING HOW AI GENERATED SUMMARIES AND PODCASTS INFLUENCE KNOWLEDGE RETENTION AND COMPREHENSION

Abstract: The rapid advancement of artificial intelligence (AI) has introduced new educational tools that personalize the learning experiences. This study investigates the comparative effectiveness of text-based and audio-based AI tools, specifically ChatGPT and NotebookLM, in enhancing learning retention, engagement, and satisfaction. The primary research question explores how these different AI-generated content formats impact comprehension and user preferences. To address this, an experimental study will be conducted where college-student participants engage with AI-generated text summaries (ChatGPT) and AI-generated podcasts (NotebookLM) derived from the same source material. Participants will be divided into a control group with expert-written summaries and two experimental groups that receive either audio or written AI-generated learning materials. Students will then complete quizzes with their summaries to assess retention and comprehension, followed by a delayed assessment to measure knowledge retention over time. Surveys will measure engagement and overall satisfaction with the different types of learning experiences.

This project seeks to provide empirical evidence on the effectiveness of different AI-driven learning methods and their potential applications in education. Additionally, it will explore whether individual learning preferences influence effectiveness. The findings aim to offer valuable insights for educators, developers, and policymakers in optimizing AI-driven educational resources to accommodate diverse learning styles. By leveraging AI technologies, this research contributes to the evolving landscape of digital education and human-AI collaboration in learning environments. The study's results could inform best practices for implementing AI tools in personalized education, ensuring they are designed to maximize learner engagement and knowledge retention across different audiences.

PRESENTER: WELNER ROSALES, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. KYLE INGRAM, MANAGEMENT
PROJECT TITLE: EDUCAÇÃO COMO PRÁTICA DA LIDERANÇA (EDUCATION AS THE PRACTICE OF LEADERSHIP)

Abstract: This study examines how organizational power and managerial control shape workplace experience, with attention to psychological experience at work and ethical responsibility. It draws on Brazilian critical management theory, particularly José Henrique de Faria's Analise *Crítica das Teorias e Práticas Organizacionais* (2007), which is not intended to provide guidance on best managerial conduct but to evoke critical inquiry by diagnosing contradictions and dehumanizing effects embedded in organizational systems. As a diagnostic lens, Faria's critique clarifies how leadership practices can reproduce dehumanization through hierarchy, efficiency demands, and performance-driven relationships. The central research question guiding this study is: How can future U.S. business leaders apply a leadership framework that prioritizes corporate social responsibility alongside financial performance for stakeholders? To address this question, the study uses a qualitative, interpretive comparative methodology. Freire's *Pedagogy of the Oppressed* (1970/2017) and his account of problem-posing education serve as the primary source for analysis. Secondary sources in leadership theory, organizational studies, and business ethics support comparison between leadership norms and Brazilian organizational scholarship that remains underrepresented in English-language research. This study proposes a framework derived from Freire's ideas, *consicentização* leadership, grounded in *conscientização* (critical-consciousness), dialogue, reflection, and praxis. It treats leadership as an educative process that resists oppressive organizational outcomes and can also function as a form of strategic leadership. In that role, it integrates Social Progress Index (SPI) indicators and the UN Sustainable Development Goals (SDGs) alongside financial metrics to guide and evaluate leadership praxis in relation to human dignity, ethical accountability, and sustainable organizational legitimacy.

PRESENTER: KAESHEV SHARMA, BUSINESS ADMINISTRATION
FACULTY MENTOR: DR. RAJ SINGH, BUSINESS ADMINISTRATION
PROJECT TITLE: THE COMPLEXITY AND ETHICAL DILEMMA OF GAMBLING CONCEPTS IN SPORTS VIDEO GAMES

Abstract: Video games have been synonymous with entertainment for years now, which has allowed business companies to ignore their ethical obligations. Companies exploit consumers in order to push the bottom line. While video games are approved by a rating board for in-game content, these boards often overlook the harmful tendencies that these games push, specifically those focused on gambling. Companies employ unethical strategies to manipulate their in-game content and conceal gambling principles, thereby maximizing their profits. This allows them to inflate profits and push predatory practices under the guise of "engaging game content." I have reviewed existing research that includes financial earnings, strategy reports, and consumer responses, centered around two major sports video

game companies, Electronic Arts (EA) and Take-Two Interactive (2K). I also used core Business Ethics and Principles readings to properly determine how and where unethical business strategies are being applied. My project is focused on analyzing these companies' financial and strategy reports to understand how gambling concepts affect company earnings and if they stem from unethical business practices. I used consumer behavior reports to further understand the effect these gambling practices are having on consumers. My project goes very in-depth in order to prove the unethicalness of these sports video game companies, and to attract attention to such malpractice that is being swept under the rug, quietly harming millions of video game enjoyers who are promised safe and ethical content.

PRESENTER: ANJALINE SINGH, SOCIOLOGY
FACULTY MENTOR: DR. JONATHAN LIM, BUSINESS ADMINISTRATION
PROJECT TITLE: BUILDING A BRAND IDENTITY FOR A NONPROFIT ORGANIZATION

Abstract: In January 2025, I witnessed the devastating fires in Los Angeles and the efforts of the community to support those affected. Many people donated clothing with the best intentions, yet much of it was unfit for use. This experience inspired me to imagine a system that could help collect clean, gently used clothing and distribute it to those in need while reducing waste and minimizing harm to the environment. This experience inspired the creation of Kindred. Kindred is a conceptual nonprofit organization designed to provide clean clothing to communities in need, including unhoused individuals, low income families, and natural disaster survivors, while prioritizing sustainability and responsible use of resources. This project focuses on developing the branding for Kindred, including a logo, supporting graphic elements, and a website layout. The website is designed to guide users through volunteering, donating, and engaging with the organization in meaningful ways. The goal of this project is to create a clear and inviting brand identity that communicates Kindred's mission, builds trust, and encourages community participation. The website layout emphasizes usability and accessibility, providing tools for volunteer sign up and structured donation guidance to ensure that only clean, gently used items are distributed. By combining thoughtful branding with an intuitive digital experience, this project seeks to empower both donors and volunteers, and strengthen community engagement.

School of Education

PRESENTER: NAMRATHA KYATHI KADALI, BIOLOGY
FACULTY MENTOR: DR. ROBERT REAM, EDUCATION
ADDITIONAL CONTRIBUTORS: SOFIA MARQUES VIANA ULISSES, OMISHA SANGANI, ALISON COHEN, LINDSAY HOYT, AND BENJAMIN CHAFFEE
PROJECT TITLE: STRUCTURAL BARRIERS AND ATTRITION IN A LONGITUDINAL STUDY OF EMERGING ADULT COLLEGE STUDENTS

Abstract: Longitudinal studies are crucial for understanding social determinants of health among emerging adult college students. However, maintaining participation over time is difficult, especially among students from underrepresented groups who face intersecting structural barriers. How these barriers affect attrition in longitudinal research remains underexplored. This in-progress study investigates whether structural barriers reported in a baseline survey (Wave 1) are associated with nonparticipation in a follow-up survey 6-12 months later (Wave 2) among undergraduates attending two public Hispanic-Serving Institutions. The sample includes 1,094 undergraduates aged 18-24, who participated in the 3E Study: Economic and Educational Contributions to Emerging Adult Cardiometabolic and Oral Health from September 2023 to February 2025. The primary outcome is missing Wave 2 participation. Predictors include food insecurity, housing insecurity, financial stress, employment status, work hours, and commute time, as reported at baseline. Analyses will adjust for race/ethnicity, household income, receipt of financial aid, and first-generation college status. Descriptive statistics will be used to compare Wave 1 demographics by retention status. Logistic regression models will estimate associations between structural barriers and the odds of missing Wave 2. Preliminarily, among the 550 eligible participants for Wave 2, 284 (52%) were retained, and 266 (48%) were missing. This project highlights how structural barriers may shape equity in research participation and underscores the importance of inclusive study designs and engagement strategies. Ensuring representation in research is essential to producing findings that accurately reflect broad student experiences and meaningfully guide interventions and policy.

PRESENTER: ACAZIAH KAWASAKI, CREATIVE WRITING
FACULTY MENTOR: DR. BEGOÑA ECHEVERRIA, EDUCATION
PROJECT TITLE: *APOCRYPHAL DAWN* AND THE VALUE OF THE INDIVIDUAL STORY

Abstract: To explore themes of "ruination" through environmental, social, and emotional lenses, I utilized the science fiction genre to outline and write chapters of a novel titled *Apocryphal Dawn*, which follows a young medic who evacuates survivors from a dying planet. Because so many modern readers witness and are influenced by forms of "ruination" in their lives and must find the determination to persevere to the next day, my novel will reassure readers that their small, individual experiences matter. I called upon the science fiction tenets of highly developed technology and human responses to breakthroughs to craft a plot wherein this dying planet's ecological framework collapses, and other planets leap to organize a rescue effort. I considered the techniques found in science fiction narratives such as the *Star Trek* TV shows and Ann Leckie's novels to engage with topics of community, conviction, and personal autonomy in a fictional world. Though the journey of drafting *Apocryphal Dawn* was riddled with frustrations, I further acknowledge these struggles as a necessary part of the creative process and reflect on how roadblocks in early iterations of a novel lead to resolutions in later drafts. The beating heart of my Honors capstone and the message I strive to offer to my readers is resilience: when the world crumbles, care for others and hold fast.

PRESENTER: SANYA PURI, NEUROSCIENCE
ADDITIONAL PRESENTER: JASMINE AVELINO, BIOCHEMISTRY
FACULTY MENTOR: DR. ROBERT REAM, EDUCATION
ADDITIONAL CONTRIBUTORS: SOFIA MARQUES VIANA ULISSES, OMISHA SANGANI, BENJAMIN W. CHAFFEE, LINDSAY T. HOYT, AND ALISON K. COHEN
PROJECT TITLE: FINANCIAL STRESS AND CARDIOMETABOLIC RISK AMONG YOUNG ADULTS IN COLLEGE

Abstract: Financial strain is recognized as a social determinant of health, particularly among college students facing rising tuition costs, debt burdens, housing instability, and food insecurity (Broton & Goldrick-Rab, 2018). Chronic financial stress may contribute to dysregulation of stress-response systems and cumulative biological risk, increasing vulnerability to cardiometabolic dysfunction, including hypertension and adiposity (Kivimäki & Steptoe, 2018). Few studies have examined associations between validated measures of financial stress and objectively measured cardiometabolic markers in diverse undergraduate populations. This study examines whether self-reported financial stress is independently associated with cardiometabolic health among young adult college students. We will analyze cross-sectional data from 1,230 students who participated in the 3E Study: Economic and Educational Contributors to Emerging Adults' Oral and Cardiometabolic Health. Participants were first-year, second-year, and recently transferred undergraduate students aged 18–24 who completed a survey and an in-person health assessment from September 2023 to February 2026. Financial stress was measured using the validated 14-item Financial Stress Scale (Northern et al., 2010). Cardiometabolic outcomes include objectively measured body mass index (BMI), and systolic and diastolic blood pressures. Multivariable linear and logistic regression models will assess associations between financial stress and cardiometabolic outcomes, adjusting for demographic characteristics, socioeconomic indicators, and health behaviors (e.g., tobacco and alcohol use). We expect higher financial stress to be associated with elevated BMI and blood pressure, independent of socioeconomic measures. Our findings will contribute to understanding how economic stress during early adulthood may shape cardiometabolic health and inform integrated campus-based interventions targeting financial well-being and physical health.

PRESENTER: AUDREY WOMACK, BIOLOGY
FACULTY MENTOR: DR. CATHY LUSSIER, EDUCATION
PROJECT TITLE: ADDRESSING STUDENT RESISTANCE TO INNOVATIVE STEM TEACHING THROUGH INSTRUCTIONAL DESIGN

Abstract: Active learning strategies have been widely shown to improve student engagement, achievement, and equitable participation in undergraduate STEM education, including in the rapidly growing format of online and hybrid instruction. Despite this research, instructors frequently report concerns about a sub-group of students resistant to the implementation of innovative teaching approaches, which can limit adoption and sustained use in their classes. This literature review synthesizes research on the sources of undergraduate student resistance to innovative adapted instruction in STEM courses and examines evidence-based instructional strategies that educators can use to mitigate resistance and better support diverse student learning. Drawing on studies from a variety of STEM content areas (e.g., biology, chemistry, mathematics, and engineering education), the review identifies key contributors to resistance, including students' prior educational experiences, mismatched expectations about teaching and learning, affective responses such as anxiety and fear of failure, and instructional design choices, particularly in online settings. The literature further highlights two instructor strategy responses: explanation and facilitation, as especially effective in reducing resistance and promoting engagement. By explicitly

communicating with these strategies the purpose of active learning activities and actively supporting students during implementation, instructors can foster more inclusive, supportive learning environments. This review underscores that student resistance is neither universal nor inevitable and emphasizes the importance of how to include added intentional instructional design elements with a checklist of evidence-based strategies for improving persistence and equity to bolster undergraduate STEM education achievement.

School of Medicine

Presenter: Marian Abawi, Neuroscience
Faculty Mentor: Dr. Natalie Zlebnik, Biomedical Sciences
Additional Contributor: Brandon Oliver, Neuroscience
Project Title: Effects of aerobic exercise on nicotine relapse in mice

Abstract: Nicotine addiction has been a public health concern for many years, with relapse rate remaining high despite the availability of treatment. Therefore, a greater understanding of the underlying neurobiological mechanisms is crucial to developing successful interventions. Nicotine recruits dopamine release in the brain's reward circuitry, leading to the development of addiction and promoting susceptibility to relapse. Aerobic exercise potently modulates dopamine within this circuitry and may prove to be an effective intervention. This study investigates the therapeutic effects of aerobic exercise on nicotine relapse in mice.

Here, mice were trained to self-administer i.v. nicotine in a rodent model of nicotine relapse. After a 14-day period of nicotine intake, mice underwent a 21-day abstinence period without access to self-administer nicotine, during which they are provided with a homecage running wheel that is either locked or unlocked. Subsequently, nicotine craving or "seeking" is assessed to determine if exercise decreases vulnerability to relapse during extended abstinence. In a separate experiment, withdrawal-mediated disruptions in cognitive performance were assessed during early withdrawal with a probabilistic reversal learning task.

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 suggests that aerobic exercise lowers craving for nicotine during abstinence. Further investigation of behavioral effects during nicotine withdrawal indicated poorer cognitive flexibility. Together, these findings establish the foundation for continued investigation of the dopaminergic mechanisms of the treatment effects of aerobic exercise on nicotine craving during early withdrawal and protracted abstinence.

Presenter: Donna Amaya, Biochemistry
Faculty Mentor: Dr. Erica Heinrich, Biomedical Sciences
Additional Contributor: Abel Vargas
Project Title: Impact of Acetazolamide on Ventilatory Acclimatization to High Altitude

Abstract: Acute exposure to high-altitude hypoxia is physiologically stressful and leads to Acute Mountain Sickness (AMS) in susceptible individuals. The drug Acetazolamide (Diamox) is commonly used to prevent AMS by stimulating increased ventilation to reduce the degree of hypoxemia. However, ventilatory acclimatization to hypoxia is a complex and time-dependent response and the precise effects of Acetazolamide on ventilatory sensitivity to hypoxia and hypercapnia are not well understood. In particular, it remains unclear how Acetazolamide affects the ventilatory recruitment threshold (VRT) and the sensitivity of the body's responses to carbon dioxide and low oxygen during the first days at high altitude. We hypothesized that Acetazolamide treatment would impact ventilatory acclimatization by lowering the VRT and increasing both the hypercapnic ventilatory response (HCVR) and hypoxic ventilatory response (HVR), leading to improvements in blood oxygen levels after ascent. Healthy participants (N=18; 7 men, 11 women) with mean age 27.5 ± 8.6 years were recruited and assigned in a

randomized, double blind manner to take either Acetazolamide or placebo starting 2 days prior to ascent to Barcroft Station (3800 m). Baseline ventilatory parameters as well as VRT, HVR, and HCVR were measured at baseline (before treatment) and after 2 days of acclimatization to high altitude using a rebreathing method. Data analysis is ongoing. This study will clarify the mechanisms by which Acetazolamide influences breathing control during early high-altitude exposure and its role in reducing AMS risk.

PRESENTER: SHREYA AMIN, BIOLOGY
FACULTY MENTOR: DR. ROOPA VIRARAGHAVAN, PEDIATRICS
PROJECT TITLE: PEDIATRIC EXPOSURES TO CANNABIS EDIBLES: KNOWLEDGE, COUNSELING READINESS, AND STORAGE RECOMMENDATIONS AMONG MEDICAL STUDENTS

Abstract: In recent years, there has been a marked increase in accidental cannabis ingestion among young children, coinciding with the growing legalization and accessibility of cannabis products across the United States. These exposures frequently involve cannabis edibles such as gummies, chocolates, or baked goods that are appealing in appearance and often stored in non–child-resistant packaging or within reach of children. As a result, many incidents occur in the home environment, with children unintentionally consuming large doses of tetrahydrocannabinol (THC). Clinical presentations vary widely, ranging from mild symptoms such as lethargy and ataxia to more severe outcomes including respiratory depression, seizures, and the need for intensive care unit (ICU) admission. Despite the increasing frequency and severity of these cases, little is known about how well-prepared future healthcare providers are to recognize, manage, and counsel families about the risks of pediatric cannabis exposure. Medical students represent a critical population in this regard, as they are at a formative stage in their clinical training and education. However, pediatric cannabis ingestion is often underrepresented in medical curricula, potentially contributing to gaps in knowledge that could impact both prevention and treatment. The aim of this study is to evaluate medical students' knowledge, attitudes, and perceived preparedness regarding accidental cannabis ingestion in young children. Findings will help identify educational gaps and inform the development of targeted interventions designed to improve provider awareness and patient counseling. Ultimately, the goal is to reduce the incidence of preventable pediatric cannabis exposures through better-informed clinical practice and education.

PRESENTER: EHSAN ARYAN, BIOCHEMISTRY
FACULTY MENTOR: DR. EMMA WILSON, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: NALA KACHOUR, BIOMEDICAL SCIENCES AND MICHAEL WHITE, BIOMEDICAL SCIENCES
PROJECT TITLE: IFNγ RESISTANT BRADYZOITE REPLICATION

Abstract: Approximately one third of the human population is chronically infected with *Toxoplasma gondii*. Immunocompetent individuals do not display the symptoms of chronic infection; however, parasite cysts can reactivate in individuals that are or become immunocompromised which can be fatal if untreated. It was traditionally known that bradyzoites (slow-replicating parasites) follow the 'brady-tachy' pathway, in which bradyzoites replicate into fast replicating tachyzoites and cause cell lysis. However, our lab, through an ex vivo model of recrudescence, has recently demonstrated that bradyzoites can follow a 'brady-brady' replication pathway where they can replicate to form new bradyzoites and in turn form new cysts. This is thought to help maintain cyst numbers in the infected host. IFN-γ is an essential cytokine required to limit tachyzoite replication by activating cellular effector responses. We hypothesized that to

maintain cyst burden, bradyzoites would be immune to IFN-γ-dependent mechanisms of parasite killing. To test this, astrocytes were infected with newly excysted ME49EW bradyzoites and treated with IFN-γ. The proportion of cells infected and the number of parasites per vacuole were counted to determine the ability of bradyzoites to infect and replicate in the presence of cytokine. As expected, data demonstrate a decrease in the proportion of brady-tachy replicating parasites in IFNγ treated astrocytes however the number of brady vacuoles and the ability for bradyzoites to replicate within these vacuoles was unchanged. Our observations support the hypothesis that there seems to be IFN-γ "resistance" in brady-brady replicating parasites. This project builds upon our previous work by demonstrating that the brady-brady pathway exists in the presence of an immune response. Further study of this pathway may provide implications for therapeutic development targeting the chronic stage.

PRESENTER: SAMARTH BHAT; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. SEEMA TIWARI-WOODRUFF, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: STEPHANIE PETERSON AND MICAH FERI
PROJECT TITLE: SARM1 DIFFERENTIALLY REGULATES CNS INFLAMMATION AND AXONAL INTEGRITY IN A MOUSE MODEL OF MULTIPLE SCLEROSIS

Abstract: Multiple sclerosis (MS) is a chronic autoimmune disease of the central nervous system characterized by inflammatory demyelination and progressive axonal degeneration. While current therapies primarily target peripheral immune dysregulation, they do not prevent irreversible axonal loss. Sterile alpha and Toll/Interleukin receptor motif-containing protein 1 (SARM1) is a NAD^+-consuming enzyme that mediates programmed axon degeneration. Emerging evidence suggests SARM1 may also function as a regulator of immune activation, raising the possibility that its deletion confers neuroprotection while altering inflammatory responses. To investigate this dual role, we examined SAMR1 knockout (SAMR1KO) mice in experimental autoimmune encephalomyelitis (EAE), a murine model of multiple sclerosis. Peripheral immune responses were assessed by a multiplex cytokine analysis of ex vivo splenocyte cultures, and CNS pathology was evaluated by spinal cord immunohistochemistry. Naive SAMR1KO splenocytes exhibited pro-inflammatory cytokine and chemokine release relative to wild-type controls, consistent with the theory that SARM1 suppresses baseline immune activation. However, these differences were attenuated following EAE induction, suggesting context-dependent immune compensation. In contrast, spinal cord IHC revealed increased immune cell infiltration in SARM1KO EAE mice, including enhanced leukocyte and T cell presence and altered myeloid activation states, despite comparable clinical disease severity. Importantly, this heightened CNS inflammation occurred alongside preserved axonal integrity and maintained oligodendrocyte populations. Together these findings support a context-dependent model in which SARM1 promotes axonal degeneration while simultaneously constraining immune activation. Our results underscore the therapeutic complexity of targeting SARM1 in multiple sclerosis, where neuroprotection must be balanced against potential amplification of CNS inflammation.

PRESENTER: AMANDA BOSSOM; MOLECULAR, CELLULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. DECLAN MCCOLE, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: DR. VINICIUS CANALE, BIOMEDICAL SCIENCES
PROJECT TITLE: INTESTINAL EPITHELIAL *PTPN2* MODULATES THE NUMBER OF TUFT AND GOBLET CELLS IN MICE

Abstract: Inflammatory Bowel Disease (IBD) is associated with loss-of-function variants in the Protein Tyrosine Phosphatase non-receptor Type 2 (*PTPN2*) gene. Our group reported that whole-body *Ptpn2*-knockout (KO) mice have decreased numbers and functionality of Paneth cells, and dysregulated gut microbiome, both factors in IBD development. Intestinal epithelial cells (IECs) directly maintain gut microbiome homeostasis, partly by secreting the mucus layer. Thus, *Ptpn2* deletion compromises multiple IEC functions. Here, we investigated whether intrinsic epithelial *Ptpn2* loss impairs the function and differentiation of IEC subtypes *in vitro* and *in vivo*. **Methods:** Small intestinal enteroids were isolated from *Ptpn2* wildtype (WT) and *Ptpn2*-knockout (KO) mice. Moreover, IECs isolated from tamoxifen-inducible epithelial-specific *Ptpn2*-KO mice ($Ptpn2^{\Delta IEC}$) and *Ptpn2* controls ($Ptpn2^{fl/fl}$) were analyzed for IEC subtype gene expression. **Results:** Expression of IEC subtype-associated genes *Lyz1*, *Defa5*, *Defa6*, *Muc2*, *cMAF*, *Sucnr1*, and *Pou2f3* showed no significant difference in *Ptpn2*-WT versus KO enteroids (n = 5). In addition, there was no change in expression of these targets in IECs of $Ptpn2^{\Delta IEC}$ versus $Ptpn2^{fl/fl}$ mice (n > 5). However, immunostaining for tuft (*Dclk1*) and goblet cells (alcian blue) revealed higher numbers of tuft cells in the ileum of $Ptpn2^{\Delta IEC}$ vs. $Ptpn2^{fl/fl}$ mice (n = 6), whereas elevated numbers of colonic goblet cells were found in $Ptpn2^{\Delta IEC}$ vs. controls (n = 8). **Conclusion:** *Ptpn2* deletion does not impact the expression of IEC markers *in vitro*, but does increase the number of tuft and goblet cells *in vivo*. This implies a requirement for non-epithelial cell types in epithelial PTPN2 regulation of IEC differentiation.

PRESENTER: NATHAN BRAR, BIOLOGY
FACULTY MENTOR: DR. MARTÍN GARCÍA-CASTRO, BIOMEDICAL SCIENCES
PROJECT TITLE: THE ROLE OF FOXC1, FOXC2, AND PITX2 IN NEURAL CREST CELL DIFFERENTIATION INTO CORNEAL ENDOTHELIAL CELLS

Abstract: Neural Crest Cells (NCC) are multipotent stem cells that arise from the dorsal side of the neural tube of an embryo, migrate extensively, and generate numerous cell types, including melanocytes, peripheral neurons, and glia, and varied craniofacial derivatives, including bone, cartilage, and eye components of the cornea. Remarkably, there is a huge need for cornea therapeutics. Advancing our understanding of the molecular principles guiding cornea formation is essential to ease this unmet demand. The transcription factors Forkhead Box family FOXC1 and FOXC2, along with PITX2, are expressed during cornea endothelia development, but their specific roles remain ill-defined. Here, using chick embryos, we will characterize their mRNA and protein expression from neural crest precursors to cornea endothelium differentiation and will evaluate the effect of their downregulation through morpholino and/or CRISPRi approaches. Our preliminary evidence suggests that FOXC1 and 2 are co-expressed along with early neural crest markers like Pax7, suggesting that they could play an early role during NC formation. Completion of these studies will expose the requirement of, and delineate the role of these transcription factors during NC and Cornea endothelium formation, exposing possible new diagnostic and therapeutic targets to alleviate the multiple maladies affecting corneal function.

PRESENTER: NINA CAMAISA, BIOLOGY
FACULTY MENTOR: DR. MARCUS KAUL, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: DR. HINA SINGH, BIOMEDICAL SCIENCES
PROJECT TITLE: THE EFFECTS OF HIV AND cART ON GLIAL AND NEURONAL CELLS

Abstract: Human immunodeficiency virus (HIV) infects and compromises the immune system. Individuals with HIV are affected by neurocognitive impairment, altering the brain's ability to think, learn, and remember. Antiretroviral therapies (cART) suppress the replication of the HIV virus, but do not stop the already existing HIV infected cells from negatively affecting the body, including neurocognitive function. This project aims to understand the neurotoxicity effects of glial and neuronal cells that have been exposed to HIV and cART. In order to achieve this, glial and neuronal cells will be treated with cART before and after being inoculated with HIV. Additionally, HIV infected cells will be treated with cART for a set period of time and afterwards the time frame until HIV infection emerges again will be observed. Resurgence of virus will indicate the existence of a viral reservoir. These experiments will be conducted with and without the presence of other stimulants and proteins, such as methamphetamine, Interferon-beta, and Interferon-alpha. The neurotoxicity exerted by infected cells will be quantified and evaluated through microscopic imaging. Monitoring HIV's and cART's neurotoxic effects will help scientists better understand the extent of brain injury and neurodegeneration when devising future treatments for HIV.

PRESENTER: NORMAN CHAKMA; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. MARTÍN GARCÍA-CASTRO, BIOMEDICAL SCIENCES
PROJECT TITLE: INSIGHTS INTO THE FUNCTIONAL ROLE OF TMEM132C DURING *IN-VITRO* CELLULAR MIGRATION.

Abstract: Neural crest (NC) cells are a highly migratory and multipotent cell population that play a central role in early embryonic development. Originating at the neural plate border, NC cells undergo epithelial-to-mesenchymal transition (EMT) and migrate throughout the embryo giving rise to various derivatives. NC induction and migration are controlled by a gene regulatory network integrating signaling inputs and transcription factor effectors. In recent studies with our robust model of human NC cells, we identified the upregulation of TMEM132C, a recently described and poorly investigated transmembrane protein. The domain and motif structures of the TMEM132 family proteins contain appealing putative functions. Specifically, they consist of evolutionary-conserved intracellular and transmembrane domains and motifs associated with amongst other functions, actin cytoskeleton regulation, WNT-signaling modulation, and cell adhesion. Our preliminary data shows that TMEM132C is specifically expressed in the neural folds, where NC cells reside. Furthermore, knockdown approaches demonstrate that TMEM132C is required for NC development. We hypothesize that TMEM132C upregulation during NC development could contribute to cell signaling, EMT, and/or migration. To assess its possible role during migration, we implemented a wound healing assay for HEK-293 cells overexpressing a TMEM132C-Flag tagged (T132C-Flag) construct. Our results suggest that TMEM132C facilitates migratory behavior, exposing a novel target for therapeutic and diagnostic purposes in cancer biology and neurocristopathies alike.

PRESENTER: SHARLYN DONOZA-HERNANDEZ, BIOLOGY
ADDITIONAL PRESENTER: SAMANTHA THAYER-PHAM, BIOLOGY
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: BRANDON OLIVER, NEUROSCIENCE AND JONATHAN MEUSER, CHEMICAL AND ENVIRONMENTAL ENGINEERING
PROJECT TITLE: IMPACT OF AEROBIC EXERCISE ON THE DOPAMINERGIC MECHANISMS OF COCAINE RELAPSE

Cocaine induces the release of dopamine in brain reward pathways, facilitating the development of addiction 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 therapeutic potential of aerobic exercise in mitigating cocaine relapse in mice. To do this, male and female mice are outfitted with chronic brain probes to monitor mesolimbic dopamine release and trained to self-administer intravenous cocaine infusions. The mice are given either a locked or unlocked homecage running wheel during a 21day withdrawal period that follows a 10-day cocaine administration regimen. Following the intervention, mice undergo rigorous behavioral assessments to evaluate their cocaine "seeking" tendencies, providing critical insights into their likelihood of 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. The results indicate that aerobic exercise may reduce cravings for cocaine during the later stages of withdrawal, highlighting the need for further research into dopaminergic mechanisms of non-drug behavioral treatments aimed at lowering relapse rates.

PRESENTER: NICOLE D'SOUZA, NEUROSCIENCE
FACULTY MENTOR: DR. SEEMA TIWARI-WOODRUFF, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: ALYSSA ANDERSON, DR. MICAH FERI, PAUL PHAM, DR. STEPHANIE PETERSON, DR. SUNG HOON KIM, AND DR. JOHN KATZENELLENBOGEN
PROJECT TITLE: THE EFFECT OF MITOCHONDRIA MODIFYING AGENTS ON NEURONAL DYSFUNCTION WITHIN THE CEREBELLUM OF MULTIPLE SCLEROSIS MOUSE MODELS

Abstract: Multiple sclerosis (MS) is characterized by inflammation and demyelination within the central nervous system, and the metabolically active Purkinje cells (PCs) of the cerebellum are particularly vulnerable. Previous studies suggest that reduced mitochondrial function in demyelinated PCs contributes to their degeneration in progressive MS and in experimental autoimmune encephalomyelitis (EAE), a chronic mouse model of MS. A remyelinating estrogen receptor beta ligand, K102, has been shown to significantly enhance mitochondrial function. We hypothesized that treatment with K102 and/or the mitochondrial-modifying agent M1 could provide neuroprotection to PCs during EAE. To test this, mice with EAE were treated at peak disease with vehicle, K102, or M1. Axonal myelination was assessed using immunohistochemistry (IHC), and NanoString RNA analysis was performed using neuropathology and metabolic panels on cerebellar RNA from EAE+vehicle mice compared with EAE+K102–treated mice. Treatment with K102 resulted in a significant increase in myelination, whereas M1 did not produce a similar effect. RNA analysis further revealed significant recovery of mitochondrial and myelin-related gene expression in the presence of K102. Together, these findings suggest that remyelination and

restoration of mitochondrial function by K102 may represent a promising therapeutic strategy for individuals with MS.

PRESENTER: NAYRA ELHAWARY; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. MEERA NAIR, BIOMEDICAL SCIENCES
PROJECT TITLE: INVESTIGATING THE RELATIONSHIP BETWEEN RELMα AND LNCRNA GM47283 IN OBESITY

Abstract: Obesity is a global public health crisis associated with numerous comorbidities, including diabetes and cardiovascular disease. This project investigates the role of the immune protein Resistin-like molecule alpha (RELMα) in the adipose tissue in a preclinical mouse model of diet induced obesity. Previous Nair lab studies have identified increased long noncoding ribonucleic acid (lncRNA) Gm47283 transcripts in adipose macrophages from RELMα-deficient obese mice. Nonetheless, remaining gaps in knowledge include the spatial localization of Gm47283 in the adipose tissue and whether it changes with RELMα deficiency. To test this, female wild-type (WT) and female whole-body RELMα knockout (KO) mice were fed a control diet (CD) or a high-fat diet (HFD). Adipose tissue from these mice underwent two different processes to assess which technique is better for tissue preservation: cryosections in OCT or formalin-fixed paraffinembedded sections (FFPE), followed by in situ hybridization using proprietary RNAscope probes for Gm47283, Hemoglobin, and RELMα messenger ribonucleic acid (mRNA). Our results demonstrate that FFPE sections provided higher quality staining, preserving the architecture of the adipose tissue and demonstrating inflamed crown-like structures indicative of obesity pathogenesis. We demonstrate successful staining for RELMα and Gm47283 within the crown-like structures and are currently quantifying the distribution of the two transcripts in the different groups, with the hypothesis that increased Gm47283 expression will be correlated with increased obesity pathogenesis. Ultimately, this work can advance understanding of molecular pathways and mechanisms relevant to obesity, focusing on immune proteins and novel lncRNAs.

PRESENTER: SARAH FAN, BIOMEDICAL SCIENCES
FACULTY MENTOR: DR. ERICA HEINRICH, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: EILEEN RUEFF
PROJECT TITLE: MECHANISMS OF PLATELET ACTIVATION DURING HYPOXEMIA AT HIGH ALTITUDE

Abstract: This research project aims to investigate the physiological effects of high-altitude (HA) exposure on platelet function and thrombosis. Platelets, also known as thrombocytes, are bone-marrow-derived cells essential for initiating the blood clotting cascade. The study addresses critical questions regarding how hypoxia at high altitudes alters these clotting mechanisms, potentially increasing the risk of thrombotic events. We hypothesized that gene expression for platelet activation and aggregation increases at high altitude. To test this hypothesis, we measured gene and protein expression in peripheral blood, as well as platelet function from blood samples collected from healthy participants at sea level and after 1-3 days at high altitude (3800 m elevation). We identified several genes related to platelet activation that were differentially expressed at high altitude, including several members of the Diacylglycerol kinase (DGK) family, which play a role in transitioning platelets from a quiescent to an activated state. To further evaluate changes in platelet function at high altitude, we will culture platelets in the presence of blood plasma collected from participants at sea level and high altitude to determine if secreted factors in plasma enhance platelet aggregation, measured via Light Transmission Aggregometry (LTA). This work

will provide novel insights into the mechanisms by which hypoxemia may contribute to thrombotic events in clinical pathologies including sepsis and COVID-19.

PRESENTER: GALILEA FLORES, BIOENGINEERING
ADDITIONAL PRESENTERS: TROY MARKS, BIOENGINEERING; ZAIN MIRZA, BIOENGINEERING; KATIE TRI, BIOENGINEERING; NASHMIA SULTANA, BIOENGINEERING; AND CRYSTAL PARTIDA, BIOENGINEERING
FACULTY MENTOR: DR. ROBERT RODRIGUEZ, INTERNAL MEDICINE
PROJECT TITLE: CHRONIC DISEASE ASSESSMENT AND PREVENTION HUB

Abstract: Due to a shortage of primary care providers, rising healthcare costs, and the demands of modern work schedules, there is a growing need in the United States for accessible basic health screenings and digestible medical information. Smaller metropolitan and rural areas are disproportionately affected, as they often rely heavily on public coverage while facing geographic challenges to centralized health care services. In these regions, the percentage of uninsured adults ages 18-64 exceeds the national average of 12.4%, limiting access to preventative and routine care. As a result, many individuals cannot afford healthcare and are at greater risk of worsening preexisting or developing preventable diseases. Routine checkups are often avoided due to both direct medical costs and the disadvantage of lost wages from taking time off work. Our project proposes the development of a Chronic Disease Assessment and Prevention Hub (CDAPH), which performs basic health measurements and provides relevant recommendations for prevention to assist communities with less access to primary care. The device will be a portable and low-cost health kiosk designed to supplement primary care visits across various public settings. The CDAPH will measure weight, height, body mass index (BMI), waist-to-height ratio, vision screening, and blood pressure. Although our device is currently still under testing and development of each component, our future plans include running pilot testing and eventually randomized controlled trials in underserved populations. Ideally, our device will incentivize public interest in medical care through low-cost, convenient access to basic medical assessments and advice.

PRESENTER: WENDY GARCIA, BIOLOGY
FACULTY MENTOR: DR. PETER URESTE, NEUROSCIENCE
PROJECT TITLE: WHAT BARRIERS LIMIT ACCESS TO MENTAL HEALTH SERVICES AMONG LATINX OLDER ADULTS, WHAT FACTORS FACILITATE CARE ENGAGEMENT, AND HOW DO THESE INFLUENCES SHAPE THEIR EVERYDAY EXPERIENCES?

Abstract: Mental health is vital to an individual's emotional and psychological wellbeing. Mental health care is important for coping with life's unpredictability. When thinking of mental health, the age group in which this type of care is common tends to be a younger demographic. However, older adults are often overlooked for this type of care. The elderly LatinX community often tends to view mental health negatively, as several weren't exposed to believing in that type of care growing up. Therefore, this community is a vulnerable population that needs access to this care to improve their wellbeing. The focus of my project is the older adult LatinX community because this community is often underserved for mental health care. Barriers are what make older adults reluctant to seek assistance for mental health; hence, the purpose of this project is to identify the barriers that make this community undertreated. This would be done through a literature review of published articles that explore the barriers and facilitators this community faces. Elders are often pillars of their families and are essential to keep family traditions, history, and wisdom. As a result, it is important to bring awareness to mental health barriers of the LatinX

elderly community to garner support and provide a safe environment for the generations that follow in their footsteps.

PRESENTER: SALMAN HABIB, BIOLOGY
ADDITIONAL PRESENTERS: LAURYN SINGH; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY; WADE MU, BIOLOGY; AND ARIA ABE, BIOLOGY
FACULTY MENTOR: DR. BRANDON BROWN; SOCIAL MEDICINE, POPULATION & PUBLIC HEALTH
PROJECT TITLE: DESIGNING A PEER-LED R'COURSE ON HIV PREVENTION FOR UNDERGRADUATE STUDENTS IN A MEDICALLY UNDERSERVED REGION

Abstract: The HIV epidemic continues to disproportionately affect nearly 14,000 people in the Inland Empire of Southern California. Persistent disparities are shaped by limited prevention, delayed diagnosis, and uneven treatment outcomes, often driven by health literacy gaps, structural barriers, and stigma. Local findings also suggest health literacy matters for outcomes, with comprehensive support programs reaching viral suppression rates of 91.4% compared to the national average of 67%. At the same time, the California Healthy Youth Act requirement ends at Grade 12, with no equivalent expectation in higher education. The objective of this project is to identify a measurable HIV education gap among college-aged students in the Inland Empire and propose a scalable, prevention-oriented intervention. This intervention builds on a prior R'Course that was taught on HIV, but will be reinstated. The R'Course will consist of weekly instruction with interactive Kahoots, guided discussions, short films, guest speakers, and a final presentation. The proposed course covers the history of HIV and AIDS, ART treatment, PrEP and PEP, HIV epidemiology, social determinants of health and access, HIV and LGBTQ+ communities, HIV and women's health, community response, media portrayals of HIV, and new and emerging treatments. Students will complete a pre and post assessment to measure knowledge gained, alongside quizzes and written reflections. Instruction is grounded in Social Learning Theory and peer education, helping students learn from one another and apply prevention knowledge in real decisions. The goal is to strengthen prevention literacy and support students as informed advocates in their communities.

PRESENTER: SAID HERNANDEZ TEQUIDA, NEUROSCIENCE
FACULTY MENTOR: DR. PETER URESTE, PSYCHIATRY AND NEUROSCIENCE
ADDITIONAL CONTRIBUTOR: KATHLEEN CONNER
PROJECT TITLE: THE OTHER SIDE OF THE EQUATION: HEALTHCARE PROVIDERS' BARRIERS TO PROVIDING GENDER-AFFIRMING CARE

Abstract: Rising political fervor has endangered access to gender-affirming care (GAC), particularly for youth, as many transgender patients continue to report dissatisfaction about the perceived lack of cultural competency and inaccessibility of healthcare services. Several recent studies have addressed patient-side barriers to healthcare access, but not many looked at provider-side barriers, with the most recent high-quality study dating back to 2011. To identify current provider-side systemic barriers to raising standards of GAC and potential solutions, semi-structured interviews were conducted with 3 healthcare providers working with young transgender patients, and the data were analyzed thematically to identify the most prominent facilitators and obstacles to providing GAC. While working in a sanctuary state provides some legal protections from out-of-state persecution, many providers were violently targeted by anti-trans activists for providing GAC, resulting in providers leaving the specialty practice, aggravating a shortage worsened by underfunding and a lack of multilingual providers. Additionally, participating providers identified insurance coverage denials and convoluted medication logistics, often driven by the

misclassification of GAC as 'cosmetic,' as major provider-facing barriers to care, exacerbated by often unsupportive parents. The severe lack of provider education on LGBTQ+ and transgender care, and the historical legacy of significant gatekeeping and harm done to transgender patients, were also identified as key factors. Possible solutions discussed include implementing an autonomy-based decision-making care model bypassing the outdated "distress model" centered on arbitrary gatekeeping, adopting single-payer universal healthcare, and expanding LGBTQ+ training for providers, including opportunities for self-reflection regarding gender and sexuality, structural oppression, and implicit bias.

PRESENTER: JENNIFER KAMHOLZ, NEUROSCIENCE
ADDITIONAL PRESENTER: ARSHIA PASSI, BIOCHEMISTRY
FACULTY MENTOR: DR. MARTÍN GARCÍA-CASTRO, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: IRIS ANDRADE AND ARSHIA PASSI
PROJECT TITLE: INVESTIGATING SKI GENE INVOLVEMENT IN NEURAL CREST DEVELOPMENT

Abstract: Neural crest cells (NCCs) are multipotent cells unique to vertebrates that arise early in development. NCCs are significant as they form a wide variety of cells, including melanocytes, craniofacial cartilage, and peripheral nerves; and their faulty development leads to multiple pathologies including craniofacial malformations and cancers like melanoma. An important signaling pathway in NCC development, is the TGF-β/Smad pathway which has been shown to play a crucial part in mammalian development. The TGF-β/Smad pathway determines the dorsal fate of the neural tube and acts as a tumor suppressor via inhibition of proliferation and induction of apoptosis in multiple cell types. As TGF-β is a growth factor, proper modulation to prevent chronic expression is essential to proper function and optimal NCC development. The SKI gene is one such example that acts as an inhibitory modulator in the TGF-β/Smad pathway by preventing Smad phosphorylation and later TGF-β gene activation. In this capstone I plan to evaluate the significance of the SKI gene in avian NCC development. To this end I will determine SKI expression at various stages of chick embryo development through in situ hybridization, and assess its requirement via morpholino knockdown experiments, in combination with immunofluorescence of key NCC markers such as PAX7. My proposal will deepen our understanding of the molecular mechanisms behind NCC formation, which has significant potential for regenerative therapies

PRESENTER: AMY KO, BIOLOGY
FACULTY MENTOR: DR. DANIEL NOVAK; SOCIAL MEDICINE, POPULATION, AND PUBLIC HEALTH
PROJECT TITLE: EVALUATING THE IMPACT OF MARITAL STATUS ON PSYCHIATRIC OUTCOMES IN POST-MASTECTOMY BREAST RECONSTRUCTION: A TRINETX COHORT ANALYSIS

Abstract: Post-mastectomy breast reconstruction is typically associated with better body image and quality of life, but its effect on formal psychiatric diagnoses remains unclear. Previous studies, mainly using symptom scales rather than clinical diagnoses, show mixed psychosocial benefits from reconstruction. Large-scale studies of incident psychiatric outcomes following reconstruction are scarce, with little data on how effects vary across demographic and social factors like age, race/ethnicity, and marital status. Using TriNetX, a nationwide electronic health record database, this retrospective cohort study compares married and unmarried women diagnosed with breast cancer who underwent post-mastectomy breast reconstruction to propensity score-matched controls treated with mastectomy alone. Patients with documented psychiatric diagnoses prior to their index procedure are excluded to isolate new-onset outcomes. Propensity score matching balances key confounders, including age, comorbidities,

and psychiatric history. Primary outcomes include incidence of depression, anxiety disorders, and other psychiatric conditions within five years post-procedure. Subgroup analyses will examine the effect of reconstruction across multiple demographic/social factors (age groups, race/ethnicity, marital status). These findings aim to inform personalized surgical counseling, targeted survivorship care, and future prospective studies using psychological assessments to clarify reconstruction's role in long-term psychiatric health.

Presenter: Akanksha Lakkapragada, Neuroscience
Faculty Mentor: Dr. Andre Obenaus, Biomedical Sciences
Additional Contributors: Brandon Vo, Gustavo A. Gomez, Terese Garcia, Amandine Jullienne, and Paul R. Territo
Project Title: Repeated Concussion is More Severe Than a Single Injury in 8-Month-Old Adult Mice; A Prologue Study for Alzheimer's Disease

Abstract: Emerging reports show concussions may accelerate the risk of Alzheimer's disease and related dementias. Single and repeated concussions can lead to poor cognition and affective disabilities long-term. We aimed to characterize acute vascular and neural perturbations in 8-month-old (8mo) adult C57BL/6J mice exposed to a single or repeated closed-head injury (sCHI or rCHI) or to isoflurane (sham). Male and female mice underwent a sCHI over the left somatosensory cortex. For rCHI, a second concussion was delivered 3 days later to the ipsilateral frontal cortex. Mice were perfusion-fixed one day after the last injury, then underwent ex vivo Magnetic Resonance Imaging (MRI) with T2-weighted imaging (T2WI; to assess edema, and regional volumes) and Susceptibility-Weighted Imaging (SWI, to assess bleeding), to characterize BBB disruption and cerebrovascular perturbations. Neither weight gain, righting time, nor time to explore was affected by CHIs relative to sham controls. Whole-brain volumes also did not change significantly across groups, and while T2 Relaxation was not different between sCHI and shams, it was significantly increased in the 3d-rCHI group. Interestingly, T2 values were often lower in the ipsilateral somatosensory cortex compared to the uninjured contralateral hemisphere. Finally, SWI indicated ~30% bleeding in sCHI mice, and ~7% in rCHIs. Thus, rCHI at 8 months of age increases brain edema relative to sCHI, and vascular perturbations may contribute to tissue-level changes visible on MRI. This is the first step towards assessing how repeated concussions and associated vascular alterations may result in long-term progressive ADRD symptomology in adults.

<u>Funding</u>: NIH NINDS 1RF1NS1380 (AO/PT)

Presenter: Christopher Lautfy, Psychology
Additional Presenter: Jasmin Gill; Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Natalie Zlebnik, Biomedical Sciences
Additional Contributor: Brandon Oliver, Neuroscience
Project Title: Striatal Dopamine Encodes Reward Uncertainty During Reversal Learning

Abstract: Behavioral flexibility requires updating actions when reward contingencies change, a process disrupted in addiction and reflected in impaired reversal learning. Drugs of misuse alter midbrain dopamine projections to the striatum, circuits critical for adaptive decision-making. Yet, how striatal dopamine guides flexible behavior across reward structures remains unclear. To address this gap, we employed a probabilistic reversal learning (PRL) task that quantifies acquisition and reversal under deterministic and uncertain reward conditions. We hypothesized that dopaminergic signaling scales with

reward uncertainty during early learning, with greater dopamine release under probabilistic schedules. Dopamine was measured using in vivo fiber photometry in freely behaving mice, with optical fibers implanted in the dorsolateral striatum (DLS) and nucleus accumbens (NAc) to record dopamine release via the genetically encoded dopamine biosensor GrabDA during PRL. Animals completed acquisition and reversal phases across multiple reward schedules (100:0, 90:10, 80:20, 70:30; reward:non-reward probabilities), enabling within-session measurement of dopamine dynamics. Within-session analyses of phasic DLS and NAc dopamine release revealed systematic modulation by task phase and reward probability. Between probability conditions, dopamine followed a hierarchical pattern (70:30 > 80:20 > 90:10 > 100:0), indicating stronger signaling under greater uncertainty. These findings indicate that early learning under uncertainty, rather than contingency switching alone, strongly shapes striatal dopamine dynamics. This pattern provides a mechanistic framework for understanding how uncertainty-weighted dopamine signaling may bias exploratory decision-making, a process that becomes dysregulated in addiction and contributes to persistent engagement with unpredictable reward outcomes.

Presenter: Anh Le, Biology
Faculty Mentor: Dr. Andre Obenaus, Biomedical Sciences
Additional Contributors: Amandine Jullienne and Preston Nguyen
Project Title: Longitudinal Brain Maturation In hAβKI Mice Reveals Sex-Specific Cortical Differences

Abstract:
Objectives: The MODEL-AD consortium (model-ad.org) develops new mouse models of Alzheimer’s disease (AD) that are more reflective of sporadic AD than currently available models. A humanized amyloid beta knock-in (hAβKI) mouse has been developed and is used as a base model onto which risk alleles for AD can be added. Here, we characterized age- and sex-dependent changes in hAβKI mice using high resolution neuroimaging of whole brain and regional volumes relative to age and sex matched C57BL/6J (WT) mice.

Methods: In this longitudinal study, male and female WT and hAβKI mice (N=5-6 per group) were scanned in vivo by MRI (T2-weighted imaging) at 6, 12, and 18 months at 9.4T. Whole brain and regional volumes were derived at each age using a modified Australian Mouse Brain Mapping Consortium (AMBMC) brain atlas.

Results: Whole brain volumes significantly increased between 6 and 18 months in all groups. At 6 months, female hAβKI mice had significantly smaller cerebrum volumes compared to the female WT, with no other genotype-dependent differences at 12 or 18 months. Cortical analysis revealed that male hAβKI mice had significantly reduced volumes in the anterior cingulate and parietal cortex regions at 12 months relative to WT males.

Conclusions: Sex-specific differences in brain volume trajectories were observed with male hAβKI mice exhibiting age-dependent cortical alterations despite increasing whole brain volumes. The pre-frontal and parietal region involvement supports early cortical implications in AD.

Funding: NIH NIA 1U54AG054349 (PI LaFerla, Tenner)

PRESENTER: ANNIE LE, BIOLOGY
FACULTY MENTORS: DR. TIMOTHY SIMON, BIOMEDICAL SCIENCES AND DR. ANDRE OBENAUS, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: ALAN THAI, MYA NGUYEN, AND PETE HEINZELMAN
PROJECT TITLE: ACE2 TREATMENT IMPROVES NEUROVASCULAR MORPHOLOGY AND FUNCTION AFTER MTBI: FUNCTIONAL ULTRASOUND IMAGING AND ULTRASOUND LOCALIZATION MICROSCOPY

Abstract: Traumatic brain injury (TBI) elicits an impaired cerebral vasculature leading to compromised blood flow depriving the brain of needed oxygen and nutrients. Mild TBI (mTBI) leads to impaired neurovascular coupling and damaged angioarchitecture with days of injury. Angiotensin-converting enzyme II (ACE2)-modulating drugs have been used to alleviate vascular pathologies due to their vasodilatory and anti-inflammatory effects. The ability of ACE2 to blunt neurovascular perturbations after TBI is not well understood. The current study examined the impact of ACE2 treatment in a rodent model of mTBI. Adult male mice (2 mo) were exposed to a mild closed head injury (CHI) and received daily ACE2 administration for four consecutive days. On day five, all mice underwent high-resolution in-vivo functional ultrasound imaging (fUSI) and ultrasound localization microscopy (ULM). fUSI enables dynamic observation of cerebral blood flow and volumes, while ULM provides high-precision mapping of microvascular architecture. Whisker stimulation was performed to assess cerebrovascular function and to visualize cerebral blood volume changes as an indirect measure of neuronal activity. ACE2 treatment in CHI mice enhanced neurovascular coupling and increased vessel branch length compared to the vehicle treated CHI mice. ACE2 decreased vein density with no observable differences in artery density. Notably, ACE2 treatment in CHI mice led to divergent artery and vein velocities that were not observed in the vehicle treated mice. In summary, ACE2 treatment alleviated TBI-induced cerebrovascular deficits. This study provides promising evidence for ACE2 modulation to treat TBI and use of fUSI/ULM to monitor treatment effects.

PRESENTER: JIA LEE, BIOLOGY
ADDITIONAL PRESENTER: VIKASINI KUPPA, NEUROSCIENCE
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
PROJECT TITLE: DISTINCT CUE AND REWARD ENCODING BY D1- AND D2-EXPRESSING MEDIUM SPINY NEURONS IN THE NUCLEUS ACCUMBENS

Abstract: The nucleus accumbens (NAc), a major target of dopamine in the mesolimbic reward pathway, is a critical interface for decision making, as it integrates reward-predictive cues with action execution. Within the NAc, medium spiny neurons (MSNs) are classified into two populations defined by dopamine receptor expression: D1R- and D2R-expressing MSNs. These populations receive overlapping glutamatergic and dopaminergic inputs but differ in neuromodulatory sensitivity. D1Rs are excitatory and D2R are inhibitory g-coupled protein receptors, ultimately creating opposing downstream effects, respectively, in the mesolimbic pathway. Therefore, these populations may support distinct contributions to reward-motivated behavior. However, how D1- and D2-MSNs in the NAc encode reward-predictive cues and rewards during learning remains unclear. Rather than encoding reward-related events in an opposing manner, recent work suggests that D2-MSNs respond to reward-related cues scale with learning, while D1-MSN activity remains unchanged across learning. To address this, we evaluated population activity of D1- and D2-MSNs in the NAc during a variable time-out operant task. During this task, a cue light signals the forthcoming onset of lever availability; the subject must then press the lever to receive a sucrose reward, followed by a variable inter-trial interval. Using cre-dependent GCaMP in D1-Cre and A2A-Cre (D2R proxy) mice paired with fiber photometry, cell type-specific calcium activity was aligned

to cue and reward-related events. Our pilot study will offer insight into how NAc D1- and D2-MSNs differentially encode cue and reward events across learning, including whether population level calcium dynamics are stable or if they evolve with task proficiency.

PRESENTER: JACEN LOPEZ, NEUROSCIENCE
FACULTY MENTORS: DR. MEERA NAIR, BIOMEDICAL SCIENCES AND DR. DJURDJICA COSS, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: DR. REBECCA E. RUGGIERO-RUFF
PROJECT TITLE: PERIPHERAL MONOCYTIC PROTEIN, RELMα, INFLUENCES BRAIN IMMUNE CELLS

Abstract: Obesity is a driver of chronic peripheral inflammation and neuroinflammation, with consequences on physiology. Obesity is associated with glia cell, astrocyte and microglia, activation in the arcuate nucleus of the hypothalamus (ARC), a brain region vital for physiological processes including thermoregulation, energy homeostasis, and reproduction. Resistin-like molecule alpha (RELMα) is a macrophage-secreted protein that has been reported by the Nair laboratory to regulate peripheral inflammation and to confer protection against obesity - mediated inflammation. Given that peripheral inflammation that involves macrophage activation in the obese adipose tissue, may cause hypothalamic neuroinflammation, and that RELMα is protective against inflammation, we postulated that RELMα plays a role in activation of astrocytes and microglia. To test this, we used mice deficient in RELMα (RELMα knockout KO) and a diet-induced obesity model. To assess astrocyte and microglial responses, we used fluorescent microscopy with specific antibodies to label astrocytes or microglia. Through confocal imaging with spatial and morphological analyses of glia in the ARC, we determined that the lack of RELMα altered spatial distribution and morphology. Astrocyte–microglia interactions are increasingly recognized as bidirectional and, in some cases, compensatory during neuroinflammation. Accordingly, a primary objective of this study is to elucidate dynamic and potentially compensatory interactions between astrocytes and microglia during hypothalamic inflammation in obesity, and to evaluate RELMα as a candidate mediator of this glial crosstalk. Clarifying these mechanisms may provide insight into neuroimmune regulation of metabolism and inform therapeutic strategies for obesity-related central nervous system dysfunction

PRESENTER: MATTHEW LUNA; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. SCOTT PEGAN, BIOMEDICAL SCIENCES
PROJECT TITLE: UTILIZING BIOLAYER INTERFEROMETRY TO IDENTIFY BROAD-SPECTRUM POTENTIAL OF NON-NEUTRALIZING MONOCLONAL ANTIBODIES TARGETING CRIMEAN-CONGO HEMORRHAGIC FEVER NUCLEOCAPSID-PROTEIN

Abstract: Crimean-Congo hemorrhagic fever virus (CCHFV) is a negative-sense RNA virus of the family *Nairoviridae* that is vectored via the *Hyalomma* tick. CCHFV has a wide distribution throughout Africa, Asia, the Middle East, and parts of Europe. The World Health Organization has listed this tick-borne virus on its priority pathogen list for emerging infectious disease research due to severe hemorrhagic disease with fatality rates reaching up to 40% and no approved therapeutics or vaccines. CCHFV's tripartite genome encodes the nucleocapsid protein (NP) in the small (S) segment. NP encapsulates viral RNA and plays key roles in genome replication, assembly, and modulation of host immune responses. NP is an attractive therapeutic target due to its high abundance, strong immunogenicity, and greater sequence conservation compared to its structural glycoprotein counterparts. Recent studies have found that non-neutralizing anti-NP monoclonal antibodies (mAbs) can confer

protection in mice against lethal CCHFV challenge. Here, we investigate the broad-spectrum capabilities of select monoclonal antibodies (mAb) isolated from human survivors and mice. This included employing Biolayer interferometry (BLI) to measure the antibodies against NPs from CCHFV strains that represent the biodiversity of the virus. Overall, this study aims to advance candidate mAbs for future structural characterization and epitope mapping. These findings will support future therapeutic and vaccine development to address the urgent need for effective CCHFV countermeasures.

PRESENTER: SAHITHI MALIREDDY, NEUROSCIENCE
FACULTY MENTOR: DR. ROBERT RODRIGUEZ, INTERNAL MEDICINE
ADDITIONAL CONTRIBUTORS: ALEXANDRA EFTIMIE, SHAOKUI GE, CHRISTOPHER ALVAREZ, JESUS TORRES, BRIAN CHINNOCK, MICHAEL GOTTLIEB, VIJAYA ARUN KUMAR, KRISTIN L. RISING, EFRAT ROSENZWEIG KEAN, AND DR. STEPHANIE EUCKER
PROJECT TITLE: GAPS IN KNOWLEDGE, RECEIPT, AND ACCEPTANCE OF MEASLES, MUMPS, RUBELLA VACCINES IN A NATIONAL SAMPLE OF EMERGENCY DEPARTMENT PATIENTS

Abstract: Background: Measles cases are increasing in the U.S., raising concern about gaps in adult measles, mumps, and rubella (MMR) vaccination, which is poorly captured by current surveillance. Emergency departments (EDs) act as safety-nets for underserved populations and can help identify gaps in adult MMR uptake. We assessed adult MMR up-to-date status, knowledge, and willingness to receive vaccination in the ED, nationally.

Methods: We conducted a cross-sectional survey of adults aged 18–64 at ten U.S. EDs from April–December 2024. Participants completed a structured survey assessing MMR knowledge, self-reported vaccination status, reasons for non-receipt, and willingness to receive MMR in the ED. Outcomes were summarized as proportions with 95% confidence intervals (CIs). Multivariable logistic regression identified factors associated with not being up to date and willingness to accept vaccination.

Results: Among 2,456 participants, 25.0% (95% CI 23.3–26.7%) had not heard of the MMR vaccine, and 44.0% (42.5–46.4%) were not up to date. Factors associated with being unvaccinated included male sex (OR 2.21 [1.84–2.66]), African American (non-Hispanic) race (OR 2.27 [1.75–2.96]), Hispanic ethnicity (OR 1.98 [1.49–2.62]), non-English speakers (OR 1.53 [1.12–2.09]), and lack of primary care access (OR 1.25 [1.01–1.58]). Among those not up to date, 36.5% (33.6–39.4%) were willing to receive MMR vaccine if offered in the ED.

Conclusions: Substantial gaps in adult MMR vaccination persist, especially among underserved populations. ED-based strategies might support targeted vaccine education and delivery during periods of increased transmission.

PRESENTER: FUAD MALKI, BIOLOGY
FACULTY MENTOR: DR. DECLAN MCCOLE, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: DR. VINICIUS CANALE, BIOMEDICAL SCIENCES
PROJECT TITLE: IDENTIFYING DONOR IMMUNE CELLS IN THE INTESTINAL MUCOSA OF CHIMERIC RECIPIENT MICE BY IMMUNOFLUORESCENCE

Abstract: Competitive congenic bone marrow transplantation (BMT) is a valuable approach to test how genetic factors influence immune cell development and function. Flow cytometry reliably measures donor

and host immune populations, but it lacks spatial information on cell localization and interactions within tissues. In the intestine, conventional immunofluorescence on formalin-fixed tissue can fail with flow-validated antibodies because crosslinking induced by fixation often masks membrane epitopes, and antigen retrieval can damage targets. To address this limitation, we developed an immunofluorescence workflow to detect CD45 isoforms (CD45.1 and CD45.2) in fresh-frozen intestinal tissue, enabling in situ tracking of donor- and recipient-derived immune cells after competitive congenic BMT. This approach preserves tissue structure and allows the mapping of donor and recipient immune cells within the intestinal mucosa in defined compartments, enabling assessment of spatial distribution, co-localization, and proximity within shared environments that cannot be identified by flow cytometry alone. Isoform-specific staining in the control spleen and intestinal samples was confirmed using anti-CD45.1 and anti-CD45.2 antibodies, and an overlapping CD45.1/2 signal was observed in heterozygous cells. In recipient chimeric mice, we detected CD45.1 (WT donor), CD45.1/2 (KO donor), and CD45.2 (recipient) immune cells in both the colon and the small intestine mucosa. We also used an image-processing strategy (channel splitting, colocalization, and subtraction) in FIJI to separate multichannel images and support downstream counting of immune cell localization and interactions. This method complements flow cytometry by adding tissue-level context to immune chimerism studies in the gut.

Presenter: Nandini Mannem, Neuroscience
Faculty Mentor: Dr. Emma Wilson, Biomedical Sciences
Additional Contributors: Arzu Ulu and Jose Martin
Project Title: Hyperglycemia Prevents Control of *Toxoplasma gondii* and Leads to Fatal Pathology in a Murine Model of Type II Diabetes

Abstract: Type II diabetes (T2D) is a rising health burden in the United States; these patients are immune compromised and susceptible to multiple infections. Several studies have identified an association of diabetic patients with increased risk of infection with the protozoa, *Toxoplasma gondii. Toxoplasma gondii*, a highly prevalent parasite infecting a third of the global population, is capable of causing severe disease or death upon immunity failure. Given the prevalence of T2D and toxoplasmosis, we investigated the susceptibility of leptin receptor-deficient *db/db* mice that exhibit insulin resistance, making it a suitable model of T2D. In comparison to wild-type controls, *db/db* mice revealed a smaller post-infection weight loss, but maintained significantly higher circulating glucose levels. To better understand the immune response during acute infection, we measured IFNγ levels and found a significant reduction in the production of IFN-g in *db/db* mice compared to WT. Despite overall enhanced peripheral glucose concentrations in *db/db* mice, no significant difference in glucose concentrations was noted in the brain and parasite burden was low but equivalent between WT and *db/db* mice. To determine which components of the immune response are defective during *T. gondii* infection of *db/db* mice, we will measure IL-12 by ELISA and analyze neutrophil and NK responses, key aspects of the innate immune response. We will also determine if there is a direct effect on T cell IFN-g production, an important effector anti-parasitic response by adaptive immune cells.

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

Abstract: 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.

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. To address this, we examined in vivo expression in chicken embryos at the 6-somite stage and analyzed NMP explants at the same stage to assess the dynamic acquisition of Pax7.

Following incubation, explants co-expressing $Pax7^+/Bra^+$ $Pax7^+/Sox2^+$ were observed, providing an intriguing challenge to the traditional neuroectodermal hypothesis, and suggesting a possible path involving mesoderm/Bra^+ progenitors generating $Pax7^+$ NCCs. Further research will incorporate other NCC markers, and explore requirements of Bra^+ in Pax7 expression and NCC formation. These findings could reshape our understanding of the diversity of NCC formation and be used for treating associated pathologies.

PRESENTER: DHRUV PATHAK; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. ANDRE OBENAUS, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: SOPHIA GALLEGUILLOS AND DANA CREASMAN
PROJECT TITLE: THE ANALYSIS OF THE BLOOD-BRAIN BARRIER IN TRAUMATIC BRAIN INJURY MICE AND SEX ASSOCIATED DIFFERENCES.

Abstract: Traumatic brain injuries (TBI) impact an estimated 69 million individuals each year. TBI leads to dysfunction of the cerebrovascular system and gaining a better understanding will provide critical insights into sex differences that may occur during recovery, thereby leading to development of future therapeutic strategies. To identify differences in blood-barrier-breakdown (BBB) leakage in male and female mice after controlled cortical impact (CCI), a model of traumatic brain injury (TBI). Using dynamic susceptibility contrast (DSC) magnetic resonance imaging (MRI) we assessed BBB leakage at baseline (no injury) and over the next 60 days post-injury (dpi). Our goal is to determine if there are sex differences in BBB leak and the time course of recovery. T2 MRI scans of mice were used to define lesion volumes. DSC utilized a T1 scan prior (T1pre) and a T1 scan post (T1post) after Gadolinium injection. All data were processed for BBB leakage by digital subtraction of T1post-T1pre using JIM software (Xinapse Inc). Hemispheric regions of interest extracted hyperintense pixels for BBB volume assessments. Female mice receiving a TBI demonstrated significantly increased BBB leakage on the ipsilateral hemisphere at 7dpi and 60dpi compared to age and time-point matched sham mice. TBI results

in damage to the vasculature, that attempts to recover but ultimately is not sustained. The BBB leakage at 7d may reflect angiogenic processes while the increase in BBB leakage at 60dpi related to loss of vasculature that we have previously reported. Females may be more vulnerable to these perturbations.

Funding: NIH NINDS R01 NS121246

PRESENTER: OMAIR RANA; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. SCOTT PEGAN, BIOMEDICAL SCIENCES
PROJECT TITLE: UTILIZING X-RAY CRYSTALLOGRAPHY AS A GUIDE TO UNRAVEL MOLECULAR DRIVERS BETWEEN THE OTU VIRULENCE FACTOR FROM EMERGING THREAT PACIFIC COAST NAIROVIRUS AND SPECIES ISG15

Abstract: In recent years, Tamdy orthonairovirus virus species have emerged globally, posing a threat to human health. Of particular concern in the United States is the Pacific-Coast Tick nairovirus (PCTN). This virus has been identified in a tick species widely distributed across the West Coast known to harbor human pathogens. Like other orthonairoviruses, PCTN is a negative-sense, single-stranded RNA virus within the Nairoviridae family and contains a conserved immune-evasion mechanism known as a viral homologue of the ovarian tumor protease domain (OTU). These viral OTUs are known to suppress host immune responses by reversing post-translational modifications made by ubiquitin (Ub), which exists in various linkages, and the species-specific modifier interferon stimulated gene 15 (ISG15). Recently, *in vitro* assays highlighted PCTN OTU possessing a robust human deISGylase activity, shattering previous dogma surrounding the distribution of deISGylase activity regarding nairovirus vOTUs. Biolayer interferometry (BLI) studies also identified high binding affinity toward specific species' ISG15 proteins. While Ub is highly conserved across species, ISG15 exhibits much greater genetic variability. Therefore, elucidating the molecular interactions between the PCTN OTU and preferred species' ISG15 reveals insights that could serve as a basis to predicting potential hosts for these pathogens. To better characterize these molecular interactions, under the mentorship of Dr. Scott Pegan and Ph.D. candidate David Gonzalez, I will perform X-ray crystallographic studies to capture bound complexes of PCTN wild-type OTU with relevant ISG15 proteins from *S. scrofa*, *G. japonicus*, and *M. pentadactyla*. In summary, this work aims to enhance biosurveillance methodologies and prevent future pandemics.

PRESENTER: JEEVAN RAO, NEUROSCIENCE
ADDITIONAL PRESENTERS: ANTHONY NGUYEN, BIOCHEMISTRY; MALAK AWWAD, BIOLOGY; AND DANIEL RODRIGUEZ, NEUROSCIENCE
FACULTY MENTOR: DR. BRANDON BROWN; SOCIAL MEDICINE, POPULATION & PUBLIC HEALTH
PROJECT TITLE: FROM TRAILBLAZERS TO SUPERHEROES: A GRAPHIC NOVEL INTERVENTION FOR HIV EDUCATION AMONG YOUNG ADULTS IN RIVERSIDE COUNTY

Abstract: Human Immunodeficiency Virus (HIV) remains a significant public health challenge, with over 11,000 individuals living with HIV in Riverside County, California. Local epidemiological data from 2024 revealed that individuals under age 39 accounted for 63% of new diagnoses, with those aged 20 to 29 experiencing the fastest increase. Structural inequities and stigma limit care engagement among LGBTQ+ communities and minority populations, underscoring the need for culturally responsive health literacy interventions. Despite interest in innovative strategies, limited research has examined the effectiveness of comic-based narratives in HIV education. To address this discrepancy, our team developed a superhero-based graphic novel centered on HIV. The comic portrays diverse HIV trailblazers

as superheroes, including Hector Xtravaganza, Keith Haring, and Marsha P. Johnson, to humanize scientific progress and normalize conversations surrounding testing, prevention, and Undetectable = Untransmittable (U=U). Our plan is to utilize the graphic novel as a tool to educate youth on HIV. The intervention will be evaluated using a survey design based on the Health Belief Model to assess knowledge, attitudes, and perceptions of HIV. This study is currently pending IRB approval and will be piloted with a small sample of college-aged students at the University of California, Riverside. The full study will expand to include Riverside County youth aged 13 to 25, recruited from schools and community centers. Future directions include broader use of the graphic novel outside of Riverside County, creating a Spanish-language edition of the novel, and incorporating historical figures in the HIV field from additional cultural backgrounds.

PRESENTER: LEENA REHMAN, PSYCHOLOGY
FACULTY MENTOR: DR. ANN CHENEY, MEDICINE
PROJECT TITLE: EVALUATING A CLINICAL RESEARCH PATHWAY FOR PHYSICIAN WORKFORCE DEVELOPMENT IN INLAND SOUTHERN CALIFORNIA

Abstract: The Eisenhower Medical Research Associate Program is a pathway program to address the physician shortage in Inland Southern California with a focus on the Coachella Valley. By offering clinical research experience, the program aims to create clinical and research opportunities for undergraduate pre-medical students to develop their competency in clinical research increasing their readiness and competitiveness for medical school entrance with the long-term goal to contribute to regional workforce development. A longitudinal analysis of the 2025–26 and 2026–27 cohorts will be conducted. Using a pre- and post-test study design, changes in students' clinical research competencies and scholarly and research activities will be assessed. Participants' submission of medical school applications will be tracked and their satisfaction with the program will be assessed. We anticipate improved competency in entry-level clinical research skills and increased number of scholarly and research activities with more presentations and publications on their CVs from the start to end of the program year. We also expect participants to report greater readiness for medical school and career advancement. Findings will highlight the importance of pathway programs in workforce development in underserved areas. This could inform broader efforts to address regional physician shortages through clinical research pathway programs.

PRESENTER: MALIHA RICHARDS, BIOCHEMISTRY
FACULTY MENTOR: DR. ANITA GUPTA, BIOMEDICAL SCIENCES
PROJECT TITLE: MOMRX: MAPPING OVERDOSE IN MOTHERS FOR RISK & RECOVERY

Abstract: Opioid overdose has increasingly become a large factor in maternal mortality. Incidents involving postpartum women, who are often considered within high-risk categories, typically are not treated as a priority. There is no denying that opioid use is a difficult problem to tackle, but to solve the problem of maternal mortality, more research is needed. This study will focus on measuring the frequency of postpartum opioid overdose to quantify the 'overdose proxy indicator' with opioid overdose reversal drug naloxone. By analyzing how often naloxone is dispensed, the study seeks to determine the number of overdoses as well as identify the most at-risk demographic based on delivery methods among the postpartum population. The research will utilize TriNetX, an electronic medical record data platform, which collects data from multiple healthcare organizations. This approach will make it possible to analyze changes over time alongside potential risk factors for postpartum opioid overdose. The results will allow

stakeholders to manage and minimize opioid consumption in postpartum women and help drive robust action to caregivers disproportionately prone to an overdose aiming at enabling timely intervention.

Presenter: Siddharth Shanbhag, Biology
Faculty Mentor: Dr. Jaclyn Floyd, Medicine
Project Title: Utilization of Point of Care Ultrasound (POCUS) in Confirming and Managing a Morel-Lavallee Lesion (MLL) in the Emergency Department Setting: A Case Report

Abstract: Morel-Lavallee lesions (MLLs) are closed, soft tissue degloving injuries that occur when shearing forces separate the subcutaneous tissue from the underlying fascia. This creates a potential space for hemolymphatic fluid accumulation. MLL's are frequently under-reported and often misdiagnosed as hematomas or abscesses, leading to potential mismanagement. While magnetic resonance imaging (MRI) is considered the gold standard for diagnosing MLLs, point-of-care ultrasound (POCUS) is a promising alternative that offers rapid bedside imaging in the emergency department (ED) setting.

We describe a 20-year-old female presenting to the ED with persistent right-sided hip pain two months after a pedestrian versus vehicle accident. Initially misdiagnosed as a hematoma, an outpatient follow-up MRI identified a large MLL, with POCUS confirming subcutaneous anechoic fluid collection in the ED. Ultrasound-guided aspiration yielded 150 mL of serosanguinous fluid, with real-time imaging confirming decompression. Laboratory analysis demonstrated elevated red blood cell and nucleated cell counts consistent with MLL.

This case highlights the diagnostic and therapeutic role of POCUS in confirming, guiding, and monitoring aspiration of an MLL, highlighting its utility as a cost-effective adjunct to MRI in the ED.

Presenter: Nabeeha Shaukat; Cell, Molecular, and Developmental Biology
Faculty Mentor: Dr. Scott Pegan, Biomedical Sciences
Additional Contributors: Clarissa Edmundo, Division of Biomedical Sciences and Vanessa Moresco, Division of Biomedical Sciences
Project Title: Uncovering the contribution of Crimean-Congo Hemorrhagic Fever Virus' (CCHFV) Mucin-Like Domain to the Protective Epitope of Anti-GP38 Monoclonal Antibodies

Abstract: Crimean-Congo Hemorrhagic Fever Virus (CCHFV) is a tick-borne, negative-sense RNA virus of the *Nairoviridae* family capable of inducing severe hemorrhage with reported fatality rates of up to 40%. Although CCHFV is historically endemic to Africa, the Middle East, the Balkans, and parts of Asia, expansion of *Hyalomma* ticks into new regions has prompted the World Health Organization to designate it as a high-priority pathogen. Despite the expanding global risk, there are no FDA-approved therapeutics or licensed vaccines that currently exist for CCHFV. Recent structural studies have determined that there are four primary antigenic sites on the virus' secreted glycoprotein 38 (GP38); however, antibody-mediated protection appears to be restricted to site 1. Despite sharing a GP38 epitope, site 1 antibodies seem to differ in their levels of protection. A working hypothesis is that these protective site 1 antibodies inhibit glycoprotein processing by obstructing furin cleavage near a mucin-like domain (MLD)-GP38 junction, which is required for maturation of GP38 from its precursor forms (GP160/GP85). In order to probe this potential mechanism, structural characterization must extend beyond GP38 alone to larger

MLD-containing precursor segments such as GP160. Features like excessive glycosylation complicate X-ray crystallography as a viable structural characterization method for GP160. Therefore, in this project, we are leveraging cryo-electron microscopy (cryo-EM) to characterize GP160 in complex with site 1 antibodies to further define site 1 protective epitopes. This will enable advancement of therapeutic research targeting CCHFV and other human pathogenic nairoviruses.

PRESENTER: MASSIH SOLHJOU, BIOLOGY
ADDITIONAL PRESENTER: SALMAN HABIB, BIOLOGY
FACULTY MENTOR: DR. MARCUS KAUL, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTORS: NINA YUAN, HINA SINGH, NINA CAMAISA, DOMINIC FOK, AND RICKY MAUNG
PROJECT TITLE: MONTELUKAST AS A POTENTIAL THERAPEUTIC STRATEGY TO COUNTERACT HIV-INDUCED NEUROTOXICITY

Abstract: The HIV epidemic continues to disproportionately affect nearly 14,000 people in the Inland Empire of Southern California. Persistent disparities are shaped by limited prevention, delayed diagnosis, and uneven treatment outcomes, often driven by health literacy gaps, structural barriers, and stigma. Local findings also suggest health literacy matters for outcomes, with comprehensive support programs reaching viral suppression rates of 91.4% compared to the national average of 67%. At the same time, the California Healthy Youth Act requirement ends at Grade 12, with no equivalent expectation in higher education. The objective of this project is to identify a measurable HIV education gap among college-aged students in the Inland Empire and propose a scalable, prevention-oriented intervention. This intervention builds on a prior R'Course that was taught on HIV, but will be reinstated. The R'course will consist of weekly instruction with interactive Kahoots, guided discussions, short films, guest speakers, and a final presentation. The proposed course covers the history of HIV and AIDS, ART treatment, PrEP and PEP, HIV epidemiology, social determinants of health and access, HIV and LGBTQ+ communities, HIV and women's health, community response, media portrayals of HIV, and new and emerging treatments. Students will complete a pre and post assessment to measure knowledge gained, alongside quizzes and written reflections. Instruction is grounded in Social Learning Theory and peer education, helping students learn from one another and apply prevention knowledge in real decisions. The goal is to strengthen prevention literacy and support students as informed advocates in their communities.

PRESENTER: VIBHA SURESH; CELL, MOLECULAR, AND DEVELOPMENTAL BIOLOGY
FACULTY MENTOR: DR. MASOUMEH GHAFFARI, INTERNAL MEDICINE
PROJECT TITLE: CANCER RISK IN TYPE 2 DIABETES: COMPARATIVE EFFECTS OF GLP-1 RECEPTOR ANALOGUES AND SGLT-2 INHIBITORS IN A REAL-WORLD COHORT

Abstract: Obesity and type-2-diabetes (T2D) are associated with increased malignancy risk. Glucagon-like-peptide-1 analogues (GLP-1A) and sodium-glucose-cotransporter-2 inhibitors (SGLT-2i) are increasingly used for diabetes management, but their association with cancer-risk is poorly defined. Here we compared all-cause or obesity-associated cancer (OAC) incidence among diabetics treated with first-line anti-diabetic medications (FLADM) versus GLP-1A or SGLT-2i. Using the TriNetX US Collaborative Network, T2D adults (ICD-10 E11) were categorized into 3 groups- FLADM (dipeptidyl peptidase-4 inhibitor or metformin) excluding GLP-1A and SGLT-2i, or GLP-1A or SGLT2i plus FLADM- based on first recorded exposure to medication (index event). Insulin usage and cancer diagnosis before index event were excluded. Primary and secondary outcomes were incident diagnosis of any malignant neoplasm (ICD-10 C00-C96) or OAC, respectively. Cohorts were balanced using propensity score matching and hazard ratios (HRs) with 95% confidence intervals (CIs) were calculated using Kaplan-Meier analyses. GLP-1A was associated with increased any malignant neoplasm risk (HR 1.085; CI: 1.068,1.102), but decreased OAC risk [pancreatic (HR 0.787; CI: 0.738-0.839), colon (HR 0.789; CI: 0.746-0.834), endometrial (HR 0.713; CI: 0.65-0.782), liver (HR 0.822; 0.775-0.873), multiple myeloma (HR 0.832; CI: 0.767-0.904)]. SGLT-2i was associated with increased any malignant neoplasm risk (HR 1.146; CI: 1.129-1.163) and decreased risk of endometrial cancer (HR 0.806; CI: 0.72-0.901). In these real-world cohorts, GLP-1A or SGLT-2i usage was associated with modest risk of all-cause malignancy, and decreased risk of OAC versus FLADM. GLP-1A may provide broader protection than SGLT-2i. Additional studies are needed to understand the effects of GLP-1A and SGLT2i on cancer incidence.

Presenter: Brandon Ta, Biology
Faculty Mentor: Dr. Anita Gupta, Biomedical Sciences
Project Title: The Opioid Crisis in Riverside County: An Interactive Analysis of ZIP Code-Level Geographic Disparities

Abstract: The opioid crisis remains a critical public health emergency in the United States. Riverside County has experienced substantial increases in opioid-related emergency department visits, hospitalizations, and deaths, with disproportionate impacts on socioeconomically disadvantaged and unhoused populations. This study evaluates ZIP code-level disparities in opioid-related health outcomes across Riverside County and develops an interactive model to help health officials assess intervention effectiveness and guide targeted resource allocation. Publicly available data from the California Department of Public Health were analyzed using Poisson regression to generate incidence rate ratios (IRRs) for opioid-related emergency visits, hospitalizations, and deaths by ZIP code. IRRs were combined into a normalized (0-1) composite severity score for each ZIP code. Multivariable linear regression models assessed associations between severity scores and Healthy Places Index (HPI) domains, including economic stability, healthcare access, social conditions, and neighborhood environment. The economic domain was the strongest predictor of opioid outcome severity. Indicators such as median household income, employment, and poverty rates were significantly associated with higher composite burden. Healthcare access was not a significant predictor, suggesting that structural socioeconomic conditions and community-level stressors may play a greater role than access barriers alone. ZIP-level analysis reveals substantial geographic disparities in opioid burden across Riverside County. Findings emphasize the importance of addressing economic instability and structural determinants rather than focusing solely on healthcare access. The interactive choropleth model provides a practical tool for identifying high-risk areas and informing targeted, community-based interventions.

Presenter: Jordan Wimberly, Neuroscience
Faculty Mentor: Dr. Iryna Ethell, Biomedical Sciences
Additional Contributors: Ritika Thapa, Neuroscience and Victoria Wagner, Neuroscience
Project Title: Effects of SNAP-5114 Injection on GABA Expression in FXS Mouse Model

Abstract: 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 and frontal cortex for either GABA and astrocyte marker GS or PV and cFos, an indicator of recently active cells. There was a statistically significant increase in GABA levels for cKO SNAP treated mice in the auditory cortex and a statistically significant increase in GABA for both cKO SNAP and vehicle treated mice in the frontal cortex. This work can provide insight into astrocytic regulation of GABAergic signaling as a potential therapeutic approach for hypersensitivity in FXS.

PRESENTER: SHIMRIAH WOO, NEUROSCIENCE
FACULTY MENTOR: DR. ERICA HEINRICH, BIOMEDICAL SCIENCES
PROJECT TITLE: MECHANISMS OF INNATE IMMUNE ACTIVATION AT HIGH ALTITUDE: THE ROLE OF HYPOXIA-INDUCED INCREASES IN GUT PERMEABILITY

Abstract: High altitude offers breathtaking views, but it is equally breathtaking for another reason: reduced oxygen. Exposure to high altitude exposes the human body to hypoxia, a state of reduced oxygen delivery to tissues. As elevation increases, individuals commonly experience decreased blood-oxygen saturation, headache, fatigue, and symptoms of acute mountain sickness (AMS), all reflecting physiological stress and incomplete acclimatization. Despite serious health risks, millions of individuals travel to elevated regions annually.

Emerging evidence suggests that the inflammatory signaling may contribute in physiological adaptation under hypoxic conditions. Our group previously showed that three days of high-altitude exposure produces a systemic inflammatory response accompanied by shifts in peripheral immune cell populations. However, the mechanisms underlying this response, and its potential role in AMS susceptibility, remain unclear.

We hypothesize that hypoxemia at high altitude disrupts intestinal barrier integrity, allowing bacterial components, such as lipopolysaccharide (LPS), to translocate into the bloodstream activate inflammatory and immune regulatory pathways. To test this, eighteen healthy participants (11 women; 27.5±8.6 years) were assessed at sea level and after 1–3 days at 3800 meters (Barcroft Station). Immune phenotypes and circulating LPS responses were investigated.

While analyses are ongoing, preliminary data indicates reduced responsiveness to LPS stimulation on day three compared to sea level. Understanding the relationship between gut permeability and inflammation at high altitude may reveal mechanisms underlying both the process of acclimatization and the pathophysiology of AMS, potentially revealing the gut microbiome as a therapeutic target to mitigate high-altitude illness.

PRESENTER: MARCUS YAN, BIOLOGY
FACULTY MENTOR: DR. NATALIE ZLEBNIK, BIOMEDICAL SCIENCES
ADDITIONAL CONTRIBUTOR: BRANDON OLIVER, NEUROSCIENCE
PROJECT TITLE: ENDOCANNABINOID SIGNALING INFLUENCES THE DOPAMINERGIC SUBSTRATES OF COGNITIVE FLEXIBILITY

Abstract: Dopamine (DA) in the mesolimbic system is crucial for reward-based learning. A reward prediction error is adapted and encoded via mesolimbic DA neurons to associate a cue with the value of a reward. During reversal learning, flexible updating of stimulus-reward contingencies is needed to optimize choice performance. The endocannabinoid system has emerged as a critical modulator of the mesolimbic DA system. Endogenous cannabinoids influence cue-motivated behavior via midbrain dopaminergic projections to the NAc. Extracellular DA levels are also shown to be reduced in the NAc following CB1 antagonism and increased following CB1 agonism. Therefore, endocannabinoid signaling may play a role in reward processing and reversal learning performance on a reward-motivated task via regulation of mesolimbic dopamine function. The current experiment examines the different effects of endocannabinoid signaling during an operant 80:20 probabilistic reversal learning (PRL) task, using male and female C57BL6/J mice (N = 30. Mice were first trained to discriminate between two levers for a sucrose pellet reward, followed by an acquisition phase and a reversal phase in which the correct and incorrect levers were inverted. The mice were given chronic treatments of the monoacylglycerol lipase (MAGL) inhibitor JZL-184 and/or the CB1 receptor antagonist AM251. Performance on the PRL task was analyzed to assess mean differences in the number of sessions required to reach the learning criterion for acquisition and reversal. Analysis of error probabilities (win-stay and lose-shift) was also conducted. Results demonstrate that systemic manipulations of endocannabinoid signaling impair reversal learning performance. These findings provide critical insight into the role of the endocannabinoid system in flexible reward-based learning and may have significant implications for understanding how cannabinoid exposure can influence decision-making.

PRESENTER: STEPHANIE ZHENG, BIOLOGY
FACULTY MENTOR: DR. ELIZABETH JACOBS, INTERNAL MEDICINE
PROJECT TITLE: A SCOPING REVIEW OF WELL-CHILD VISITS AMONG IMMIGRANT FAMILIES

Abstract: Well-child visits (WCVs) are central to pediatric preventive care, yet immigrant families in the United States experience disparities in access and quality of WCV care. Structural barriers, language discordance, and cultural incongruence contribute not only to missed visits but also to increased caregiver burden in care management. In this scoping review, we synthesized the evidence on barriers to and interventions to improve WCV access among immigrant families.

We synthesized qualitative, randomized controlled, and other quantitative studies examining factors that influence WCV care in immigrant communities. In nine studies, we found that language and cultural differences emerged as central barriers. Even when visits occurred, communication quality, cultural alignment, and trust facilitated access to the information and care provided. Preventive care models were unfamiliar to many first-generation parents, leading to uncertainty and dissatisfaction despite visit completion. In underserved communities, children whose families faced overlapping structural barriers, including poverty, limited English proficiency, and insurance instability, were less likely to report regular physician visits or an established source of care.

In this review, we identified many barriers to access to WCVs that could be addressed in health systems to improve care, including navigating unfamiliar health systems, translating medical information, coordinating insurance, and reconciling collective family decision-making norms within an individualistic care model. Advancing access to well-child visits in underserved regions requires culturally responsive, equity-focused strategies that address structural and communication barriers within pediatric preventive care systems.

School of Public Policy

PRESENTER: ELLA FITZPATRICK, PUBLIC POLICY
FACULTY MENTOR: DANIELLE WHITE, CUREL
PROJECT TITLE: FROM POLICY TO PUBLIC IMPACT: COMMUNICATING MENTAL HEALTH LAW IN WASHINGTON, D.C.

Abstract: This project reflects on my participation in the University of California, Washington D.C. (UCDC) program during the Fall 2025 quarter, where I served as a Strategic Communications Intern at the Bazelon Center for Mental Health Law. The Bazelon Center is a non-profit organization that is dedicated to advancing the civil rights of individuals with mental health disabilities through policy advocacy, litigation, and public education. On the communications team, I conducted research to inform social media strategy, identified media engagement opportunities, and maintained media press lists. I supported website development and collaborated with the legal team on communications projects, drafting and editing web content, newsletters, and blog posts. I also attended and covered webinars and legal proceedings. During this experience, I learned how to translate complex legal and policy concepts and news into accessible content that informed diverse audiences. My coursework as a Public Policy major, provided me with the necessary understanding of fundamental policy concepts to understand the structural inequities in our nation's mental health systems and disability rights law. Through this internship, I learned that effective advocacy depends on legal advocacy and public communications equally to initiate policy conversations at the national level.

PRESENTER: ALEXA CAMILA VALDEZ, PUBLIC POLICY
FACULTY MENTOR: DR. VLAD SIRBU, UNIVERSITY WRITING PROGRAM
PROJECT TITLE: AN ETHNOGRAPHIC VIEW OF COCKFIGHTING IN MEXICO CITY AND ITS IMPACT

Abstract: Since their early domestication, chickens have served a myriad of purposes. One of the oldest and most controversial reasons for their selective breeding has been to partake in cockfighting, or rooster bloodsport. This culturally relativistic analysis explores the manner in which participant galleros in urban Mexico City, Mexico, come to understand their roles within this underground world. Drawing on self-conducted interviews with two standout informants, historical context, and key anthropological lenses, this research provides various insider perspectives into an often insular practice and the community it creates. By demystifying the people behind the combat birds, these interviews and their subsequent analysis add to a growing body of research that seeks to holistically understand hidden practices. The resulting findings point to a continuously evolving subculture, complete with rites of passage and superstitions that ultimately allow for the subversion of the previously studied gender norms in the ring or palenque space. These new community-centered insights offer a reflection of the indelible mark that combat birds and their husbandry leave on participants, underscoring the complex relationship between tradition, legality, and identity.