34th Annual URSCA Conference.

UCDAVIS

Posters, Orals, and Arts & Design Exhibit
April 28 -29, 2023

DESIGN • CREATE • EXPLORE • DISCOVER • IMPACT

The Undergraduate Research, Scholarship and Creative Activities Conference is sponsored by:
Undergraduate Research Center, Undergraduate Education, Student Affairs, University Library and Global Affairs

LAND ACKNOWLEDGEMENT

We acknowledge the land on which we are gathered. For thousands of years, this land has been the home of Patwin people. Today, there are three federally recognized Patwin tribes: Cachil DeHe Band of Wintun Indians of the Colusa Indian Community, Kletsel Dehe Wintun Nation, and Yocha Dehe Wintun Nation.

The Patwin people have remained committed to the stewardship of this land over many centuries. It has been cherished and protected, as elders have instructed the young through generations. We are honored and grateful to be here today on their traditional lands.

UCDAVIS

34st Annual Undergraduate Research, Scholarship and Creative Activities Conference

Letter from the Chancellor

April 28, 2023

Dear Students, Colleagues and Guests:

It's time to dive in and take the plunge at UC Davis' 34th annual exhibition of undergraduate research!

You are charting yourself for course for career success at one of the nation's top research universities. Our scholarship and research addresses some of society's most critical challenges, including climate change, feeding the world and sustaining the health of all living beings. Student researchers, who reflect a wide variety of fields, are the leaders and change makers of tomorrow.

We are guided by UC Davis' 10-year strategic plan, "To Boldly Go," which builds on our student success, research strengths and entrepreneurial spirit to shape a better tomorrow for all. You see the mission carried across our campuses, from the Diane Bryant Engineering Student Design Center (ESDC), which is set to open in September, and the 25-acre Aggie Square innovation hub that's developing on our Sacramento campus.

This conference provides and showcases educational opportunities that prepare students for careers in their areas of interest. Many employers are seeking talented people who not only shine in their research and scholarship but have the capacity to collaborate and communicate their work in the most impactful manner possible. In addition to further honing their research skills, the student presenters' oral and poster presentations and art and design exhibitions are a crucial form of practice in preparing for graduate school and the workforce.

I congratulate the student presenters for their dedication and excellent work thus far. They have partnered with faculty mentors and peers in a spirit of problem solving. Now, they can share their work with experts in their fields and our UC Davis community.

I want to further express my gratitude to the faculty members who serve as mentors and role models for our students. In many cases, they adjusted their busy schedules to moderate the conference sessions. This is exactly the kind of thoughtfulness and synergy between students and faculty that defines UC Davis.

Enjoy the conference and keep creating, exploring and innovating!

Gary S. May
Chancellor

ACKNOWLEDGMENTS

The Undergraduate Research, Scholarship & Creative Activities Conference gratefully acknowledges the faculty sponsors and other individuals whose mentoring has contributed to the research produced by our presenters. We would also like to thank the many programs that generously support and encourage undergraduate research and creative activities at UC Davis. Among these are the following: Beckman Scholars Program; California Alliance for Minority Participation (CAMP); Educational Enrichment Outreach Programs (BUSP, BUSP-Honors, BSHARP-MARC, CURE, ADAR); Innovation Institute for Food and Health (IIFH) Internship and Career Center; McNair Scholars Program; Mentor-Mentee Program in Humanities, Arts, Cultural Studies and Social Sciences; Mentorships for Undergraduate Research in Agriculture, Letters and Science (MURALS); Mentorships for Undergraduate Research Participants in the Physical and Mathematical Sciences (MURPPS); Provost's Undergraduate Fellowship; University Honors Program; UC Davis Washington Program; UC Leadership Excellence Through Advanced Degrees (UC LEADS), and Vertically Integrated Projects (VIP).

Thank you to our Sponsors

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Design and Publications

Steven A. Morse | *Enrollment Management and Undergraduate Education*

AGENDA

Poster Sessions: Friday, April 28, 2023

2–5 p.m., U Center

2–3 p.m. — Poster Session A
U Center

3–4 p.m. — Poster Session B
U Center

4–5 p.m. — Poster Session C
U Center

Arts Exhibit: Friday, April 28, 2023

(concurrent with poster session) 2–5 p.m., U Center

3–6 p.m. — Arts/Design Exhibit
U Center

Oral and Performing Arts Sessions: Saturday, April 29, 2023

1–4:30 p.m., Wellman Hall

Noon–1 p.m. — Presenter Check-in
Room 115, Wellman Hall

1–2:30 p.m. — Oral Session 1
Wellman Hall Rooms

3–4:30 p.m. — Oral Session 2
Wellman Hall Rooms

2 Wellman Hall

1:00 PM Pettit, Sophie - Plant Biology
Seed Traits and Seed Survival in California Annual Grasslands

1:15 PM Patel, Preena - Neurobiology, Physiology and Behavior
Electrical Modulation of ERK Dynamics to Control Cell Behaviors

1:30 PM Crum, Daphne - Genetics and Genomics
A Gene-Editing Approach to Extend Tomato Fruit Shelf-Life Without Impacting Fruit Quality

1:45 PM Shenaz, Dilasha S. - Genetics and Genomics
Developing New Tools for Early Detection of Botrytis cinerea on Strawberry Fruit

6 Wellman Hall

1:00 PM Damian Ortiz, Brenda - Sociology
Racializing (Cr)immigration and Its Impact on Undocumented Indigenous Mexican Immigrants

1:15 PM Jeon, Jasmine - Sociology--Organizational Studies
Assessing the Needs of Undocumented College Students Across Racialized Groups

1:30 PM Mares de Juan, Celia S. - Sociology--Organizational Studies
Study Abroad gap, do Students From Different Ethnicities Have the Same Motivations to Study Abroad? A Case Study Method: Semester at Sea Fall 2022

1:45 PM Aguilera, Delfina E. - Sociology
BIPOC Youth & Their Adaptation within Secondary Continuation Schools; Education Dispossession: Intraregional Migration of Students to Outcast

2:00 PM Anene, Angel - Sociology
Navigating Identity Across Space: Second Generation East Africans in the Diaspora

2:15 PM Vargas, Teresita - International Relations
Reclaiming Women's Power, Medieval and Modern: The Anonymous "Roman de Flamenca" and Rosalia's "El mal querer"

26 Wellman Hall

1:00 PM Tang, Alvin Q. - Economics
CalGrant Extension Programs for Fifth Year Students Within the University of California System

1:15 PM Jimenez, Stephanie Giselle. - Psychology
Near-peer Mentoring: Bridging the Gap Between Community College and UC Davis

1:30 PM Vargas Castellanos, Luis Ivan. - Sociology
Crimmigration and the 21st Century "Common Sense": Policing the Racialized Other

1:45 PM Moore, Mikayli A. - Political Science
Female Weightlifter's Presentation of Gender on Instagram

2:00 PM Pratt, Adam - Sociology
The Moderating Effects of Gender on Social Support as a Protective Factor Against Adolescent Suicide

2:15 PM Tucker, Kamryn - Music
Music and Meaning in the Writings of Aldous Huxley and C.S. Lewis

106 Wellman Hall

1:00 PM J NcVn8NXSl - 9eeaXd Mathematics

"It Won't Be Long" (Performing Arts)

1:15 PM Levinson, Andrea - Anthropology
Investigating Pronghorn Paleoecology and Ancient Cooperative Hunting in the Western Great Basin Using Stable Isotopes

1:30 PM Morey, Brooke A. - Anthropology
Stable Isotope Analysis of Deer Remains From Alameda County

1:45 PM Winokur, Moonlily E.. - Anthropology
Clam Harvesting Seasonality and Fish Bone Isotopes at a Disturbed Midden Site in San Francisco, CA

2:00 PM Su, Ryann - Animal Biology
Stable Isotope Analysis of Avian Species Recovered From the East Bay Archaeological Site, CA-ALA-554

2:15 PM Lindemuth, Sophia - Wildlife, Fish and Conservation Biology
A Comparison of Male and Female Childhood Diet at a Middle Period Site in San Jose, CA

119 Wellman Hall

1:00 PM Sontag, Katie C.. - Animal Science
How the Personality of Captive Raptors Influences Their Engagement With Novel Enrichment Objects

1:15 PM Quan, Yuqi - Animal Science
UC Davis College Students' Understanding of Positive and Negative Cat Behavior

1:30 PM Ma, Lyra - Animal Biology

Genetic Association Analysis of Equine Neuroaxonal Dystrophy

1:45 PM Lyon, Alexandra E. - Animal Biology
Hair We Are! Does the Melanocortin 1 Receptor Play a Role in Coat Color Variations of Salt Marsh Harvest Mice (Reithrodontomys raviventris)?

126 Wellman Hall

1:00 PM Peng, Allison - Statistics
Life Under the Ice: Antarctic Microbial Mat Morphology and Spatial Ecology

1:15 PM Gee, David - Mathematical and Scientific Computation
Life Under the Ice: Antarctic Microbial Mat Morphology and Spatial Ecology

1:30 PM Williams, Caden C. - Geology
Life Under the Ice: Antarctic Microbial Mat Morphology and Spatial Ecology

1:45 PM Santich, Summer E. - Sustainable Environmental Design
Experimental Investigation of the Social and Ecological Effects of a Green Roof Environment on California Grassland Plants

2:00 PM Euol, Natan - Community and Regional Development
Experimental Investigation of the Social and Ecological Effects of a Green Roof Environment on California Grassland Plants

202 Wellman Hall

1:00 PM Ma, Yuting - Statistics
Effects of Reward and Punishment on Learning Analyzed by Neural Data Informed State-Space Model

1:15 PM Tat, Wesley - Statistics
The Impact of Pushing Fashion Overseas: Economical, Environmental, and Social Issues on Developing Countries

1:30 PM Bilbrey, Ashley - Computer Science
Wearable, Gaze-Directed Beamforming to Improve Speech Comprehension

1:45 PM Abou Najm Karim - Computer Science

Wearable, Gaze-Directed Beamforming to Improve Speech Comprehension

2:00 PM Manvattira Ganapathy, Aman - Computer Science and Engineering
Wearable, Gaze-Directed Beamforming to Improve Speech Comprehension

216 Wellman Hall

1:00 PM Bacha, Tarek - Neurobiology, Physiology and Behavior
Comparison Study Between a Ketogenic Diet and a High-fat Diet on Pancreatic Cancer Incidence in Mice

1:15 PM Carter, Samuel J. - Neurobiology, Physiology and Behavior
Characterizing the Membrane Permeability of Serotonergic Psychedelics through Radioligand Binding Assays

1:30 PM Dhillon, Harleen - Cell Biology
The Effect of HAMSP Diet on Autoimmune Disease in ARE-Del$^{+/-}$ Mice

1:45 PM Amort, Erika J. - Neurobiology, Physiology and Behavior
How Chronic Pelvic Pain Is Deteriorating Quality Of Life in BIPOC Wombs

2:00 PM Kobrya, James - Human Biology
Dr. BOT: Using AI to Bridge Communication Gaps and Prevent Missed Diagnoses in Healthcare

2:15 PM Rourke, Michael - Global Disease Biology
Dr. BOT: Using AI to Bridge Communication Gaps and Prevent Missed Diagnoses in Healthcare

226 Wellman Hall

1:00 PM Song, Sunyangzi(Kelly) - Biochemistry and Molecular Biology
Pathogen Effectors Increase Microbial Fitness during Infections

1:15 PM Javaheri, Elika D. - Biological Sciences
Biosynthetic Production of Biopolymer Precursors From CO_2

1:30 PM Haggard Arce, Sophia T. - Biochemistry and Molecular Biology
Quantification of the Host and Viral Response to Zika Virus Infection

1:45 PM Ledesma, Yanele - Biochemistry and Molecular Biology
Language as a Determinant of Risk for Coccidioidomycosis Among Race and Ethnicity: A Geospatial Analysis

2:00 PM Alcaraz, Chelsie - Biochemistry and Molecular Biology
Evaluating the impact of antioxidants on fecundity in the yellow fever mosquito, Aedes aegypti

2 Wellman Hall

3:00 PM Chang, Julian - Biomedical Engineering
Investigating the Force-Sensitive Properties of LIM Kinase 1 and 2

3:15 PM Diener, Agustina - Biomedical Engineering
Identifying force-dependent protein interactions surrounding actin filaments

3:30 PM Zhao, Karen X. - Biomedical Engineering
Defining the Minimum Force-Sensitive Sequence of Tensin 3

3:45 PM Momjian, Alique - Biomedical Engineering
Simulating Intracranial Atherosclerotic Disease from Magnetic Resonance Imaging using Computational Fluid Dynamics

4:00 PM Muniraj, Sanjana - Biomedical Engineering
Chitosan Hydrogels Containing MK2 Inhibitor Peptide Loaded Nanoparticles to Facilitate Percutaneous Absorption and Dampen Local Inflammation for Atopic Dermatitis Treatment

4:15 PM Watson, Samuel - Biomedical Engineering
Defining the Critical Sequence Required for Force-Sensitivity of LMO Proteins

6 Wellman Hall

3:00 PM Gawde, Radhika - Political Science--Public Service
Litigating Climate Change: A Proposed Solution to Surviving Judicial Barriers to Suing the United States Government for Climate Change Harms

3:15 PM Chan, Ashley - Political Science
Rule of Law in the Judiciary and State Respect for Human Rights

3:30 PM Sharma, Ashneet - History
The Obscurities of Asylum: A Case Study of Indo-Fijian Asylum Seekers

3:45 PM Zeng, Ziyi - Economics
The Unintended Impact of the 2016 Presidential Election on International Student

4:00 PM Leal, Adriana - Spanish
Óscar Romero: Un Caso Práctico en la Capacidad Humana Para Esperanza y Acción Política

4:15 PM Weinstein, Genna - African American and African Studies
The Price of Control: Foreign Aid, Dependency, and Neo-colonialism

26 Wellman Hall

3:00 PM Sripadanna, Sejal - Biochemistry and Molecular Biology
Autophagy Pathways in Suppressing a-synuclein Induced Cell Toxicity

3:15 PM Yang, Joy - Biochemistry and Molecular Biology
Quantifying Stress-induced Autophagy Response

3:30 PM Gao, Xinyu - Biological Sciences
Development of a Model System to Monitor the Autophagy Stress Response During Neurodegenerative Disease Induced Cell Toxicity

3:45 PM Diaz Gonzalez, Alexandro - Biochemistry and Molecular Biology
Characterizing the Roles of Autophagy Regulators in Suppressing α-Synuclein Toxicity

4:00 PM Lim, Trina C. - Biological Sciences
Septins and Nuclear Vacuolar Junctions Regulate the Accumulation of Alpha-Synuclein Inclusions via Autophagy

4:15 PM Oentoro, Tiffany C. - Biochemistry and Molecular Biology
ReSINing to Stress: Defining the Limits of DNA Replication Stress Induced Nucleophagy (ReSIN)

106 Wellman Hall

3:00 PM Li, Andy - Managerial Economics
The Causal Effects of DeFi (Decentralized Finance) on Alleviating Poverty and Promoting Economic Growth in the Developing World

3:15 PM Zheng, Iris - Managerial Economics
Investigating the Causes of Congestion at the Port of Los Angeles during the COVID-19 Pandemic

3:30 PM Jimenez, Karina - History
Catholic Church and Community Involvement in the Farah Strike

3:45 PM Kovach, Katherine - Human Development
Child Maltreatment and Disaster: A Systematic Review

4:00 PM Guerra, Santana - Chicana/Chicano Studies
Archives & Social Abandonment in the Triangle District

4:15 PM Lopez, Jocelyn - International Relations
Media Framing Immigration Policy From 2016-2021: the Narrative From Mexico to the US and its Interaction With Policy in the US

107 Wellman Hall

3:00 PM Nooshi, Aryan - History
The Relationship Between Tunisian Men and New York Times Media Coverage in the 1940s

3:15 PM Misleh, Ali - International Relations
The Portrayal of Arabs in the New York Times during the 1940s

3:30 PM Kapoor, Kavika - International Relations
NYT MEDIA PROJECT: The Representation of Arab Men in the New York Times in the 1940's

3:45 PM Djadri, Hadil - International Relations
NYT MEDIA PROJECT: The Algerian War of Independence Through the Lens of the New York Times

4:00 PM Mohammad, Aaminah - International Relations
Egypt's Representation in the New York Times During the 1960s

119 Wellman Hall

3:00 PM Vera, Adam - Chemistry
The Impact of Smoke from Wildfires on Ecosystem Function in the Sacramento Deep Water Shipping Channel

3:15 PM Chen, Timothy - Environmental Science and Management
Influence of Nitrogen Availability on Early Development in a Native and Invasive Forb

3:30 PM Tescher, Cameron J. - Wildlife, Fish and Conservation Biology
Comparing Songbird Migration Between Coast Range and Central Valley Using Nocturnal Flight Calls

3:45 PM Kaur, Kara - Environmental Science and Management
Drivers Influencing the Establishment of Invasive Grasses in Post-Wildfire Mixed-Conifer Forests

126 Wellman Hall

3:00 PM Cyrus, Joyan M.. - Psychology
Accessibility Concept: The Influence of Chronic and Temporary Accessibility on Social Judgment

3:15 PM De Long, Brandon - Psychology
The Implied Meaning: The Consequences of the Causal Taboo

3:30 PM Lodha, Trisha - Sociology--Organizational Studies
Quantifying the Influence of Depth Information and Task on Boundary Transformations in Memory

3:45 PM Ekwueme, Chisomaga S. - Human Development
Social Support Sources (Friend, Classmate, Teacher) and Students' General and Race-Based Anxiety Across Ethnic Groups During the COVID-19 Pandemic

4:00 PM Wei, Diana - Psychology
Attentional guidance and match decisions rely on separable template information during conjunction search

202 Wellman Hall

3:00 PM Frank, Skye - Chemical Engineering
Characterization of Polydiacetylene Vesicles for the Visualization of Mechanical Stress

3:15 PM Natividad, Carlos Anthony D. - Aerospace Science and Engineering
A Study of Shock Layers in Viscous Flows

3:30 PM Mitchell, Jacqueline L. - Computer Science
Differentially Private Provable Repair of Deep Neural Networks

3:45 PM Agarwal, Shyam - Computer Science and Engineering
AI-powered Student Feedback Generation Using Transformer Models

212 Wellman Hall

3:00 PM Hess, Marta - Marine and Coastal Science--Marine Ecology and Organismal Biology
Convergent Evolution of a Specialized Feeding Mechanism in Zooplanktivorous Fishes

3:15 PM Novoa, Daniel - Microbiology
Assessing Lahontan Cutthroat Trout (Oncorhynchus clarkii henshawi) Hybridization Status Within the Willow-Whitehorse Basin in Southeast Oregon

3:30 PM Donohue, Isoline M. - Biological Sciences
Assessing an Alternative Spawning Strategy for Delta Smelt Supplementation

3:45 PM Borgia, Brooke- Biological Sciences
Widespread Hybridization Events Between Three Sister Species of Anopheles gambiae Complex in Mali

216 Wellman Hall

3:00 PM Framroze, Luhaiza Y.. - Neurobiology, Physiology and Behavior
Investigating the Mechanism of Beta-Delta Cell Crosstalk Within Pancreatic Islets

3:15 PM Escalante, Nelly - Microbiology
Characterizing Cytokine Signatures of NRAMP1 Deficient and Functional Macrophages

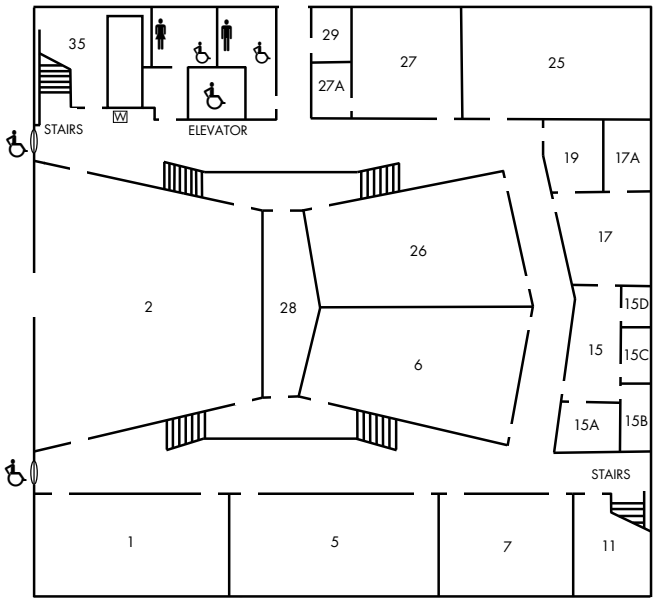
3:30 PM Zheng, Zilan - Biochemistry and Molecular Biology
A Novel Function of MARCKS in Macrophage Activation and Pulmonary Fibrosis

3:45 PM Corea, Melissa - Genetics and Genomics
The Impact of Chd8 Mutation Across Transcriptional and Anatomical Axes in Cerebellar Autism Spectrum Disorder-related Neuropathology

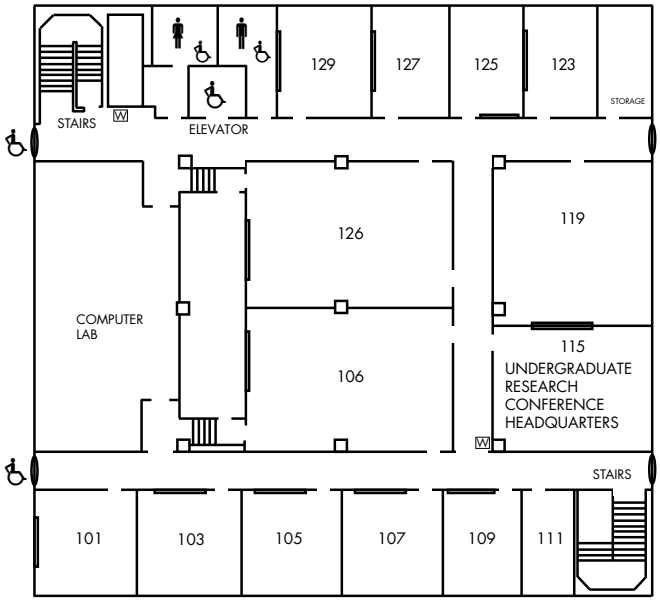
4:00 PM Kawai, Ray - Cell Biology
Whole DNA methylome analysis to investigate multigenerational epigenetic inheritance of autism spectrum disorder

4:15 PM DeMarco, Isabelle - Biological Sciences
Developing Transgenic Arabidopsis for CRISPR Guided Gene Knockout and Chromosome Engineering

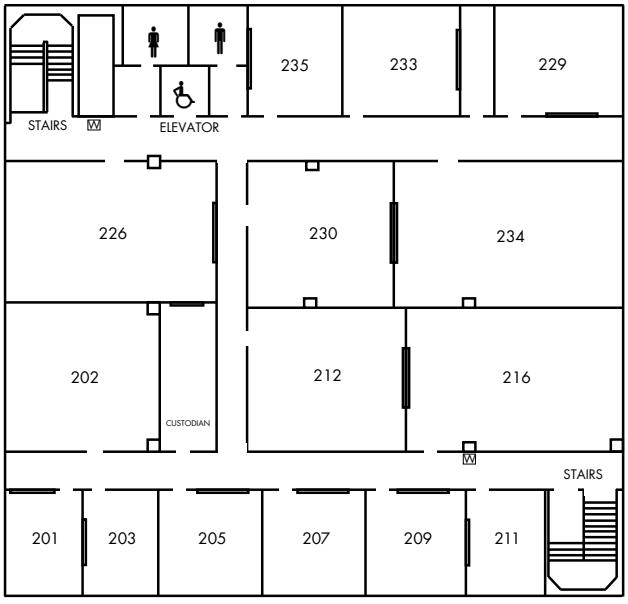
Lower Level



1st Floor



2nd Floor



= Building Entry - Exit = Wheelchair Access W = Water
= Front of Classroom

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ABSTRACTS

How Sample Characteristics in Scientific Paper Titles Influence Readers' Judgments

Sara Abbas
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Current publication practices within psychology are biased to favor dominant over marginalized samples in the publication process. For example, studies coming from White and western countries are more likely to be published in high-ranking journals compared to those from the rest of the world. The field's tendency to prioritize research conducted with dominant group samples can have detrimental effects, such as neglecting meaningful research and driving the assumption that the psychological experience of a very narrow set of people generalizes to all humans. In response to this problem, some psychology journals are beginning to require authors to specify sample characteristics in their titles. However, in the absence of empirical evidence on how this information affects readers, it is difficult to design effective policies. Our study aims to assess how people from various backgrounds might react to literature titles that include different types of sample characteristics. Participants will see three study titles: (1) a control title with no sample characteristics, (2) a dominant sample title (e.g., "among White participants"), and (3) a marginalized sample title (e.g., "among participants of color"). For each title, they will assess how interesting, important, and applicable they find each study.

AMPA Receptor Auxiliary Factor Complexes in the Brain: Defining SynDIG4 and CNIH-2 Interaction Sites

Takhmina Abdul
Sponsor: Elva Diaz, Ph.D.
MED: Pharmacology

Ionotropic AMPA receptors (AMPARs) bind glutamate at postsynaptic sites in the hippocampus and play a crucial role in the central nervous system's excitatory neurotransmission. AMPARs are composed of four subunits (GluA1-4) and complex with auxiliary proteins including CNIH-2 (cornichon-2) and SynDIG4 (synapse differentiation induced gene 4). CNIH-2 increases surface expression of AMPARs and is localized to the trans-Golgi network, whereas SynDIG4 trafficks AMPARs to the synapse during long term potentiation. Studies show that SynDIG4 localizes near CNIH-2 in AMPAR complexes, suggesting possible direct interactions between them. Our objective is to determine how AMPAR trafficking is affected by SynDIG4 and CNIH-2 together. We hypothesize that CNIH-2 and SynDIG4 work together to synergistically traffick AMPARs to the surface of neuronal membranes. Thus, inducing mutations in their putative binding sites will reduce the amount of surface AMPARs. In contrast to the expected trans-Golgi CNIH-2 localization, the mutant construct displayed a higher degree of overlap with cis-Golgi relative to wildtype CNIH-2. Preliminary results indicate differential expression patterns of CNIH-2 upon co-expression with either SynDIG4, GluA1, or alone, although further experiments are necessary to confirm this result.

Wearable, Gaze-Directed Beamforming to Improve Speech Comprehension

KARIM ABOU NAJM
Sponsor: Lee Miller, Ph.D.
MED: Otolaryngology

Conventional hearing aids treat loss of hearing sensitivity; however, they also amplify all sources of sound in the environment, including noise, thus failing to address the fundamental issue. Solving this problem would ameliorate a continual, daily challenge faced by millions of Americans and would represent a profound technological advance in the field. By measuring the eye gaze of the wearer and using it as an indicator of what source of sound to amplify, we generate a facsimile of the human capability for selective amplification. This amplification can be handled through "beamforming", that is, organizing the sound into beams and then enhancing or reducing the individual components based on whether they are aligned with the eye gaze. While beamforming to enhance sound has been explored before, the scope has often been limited either by the number of microphones or by the context in which it has been used. Our development of these processes is inspired by the existing literature but will utilize more sophisticated tools and finely tuned constraints to build a system that is suitable for everyday use by individuals with hearing loss.

Eptesipox virus proteins K3 and E3 inhibit the antiviral protein kinase PKR from multiple bat species in a species-specific manner

Smriti Acharya
Sponsor: Stefan Rothenburg, M.D.,Ph.D.
MED: Medical Microbiology & Imm

Bats have a special immune system compared to other mammals. One component of the innate immune response is the protein kinase R (PKR) pathway which restricts viral replication by stopping general RNA translation. To inhibit PKR, many poxviruses encode two PKR antagonists, K3 and E3. However, the sensitivities of bat PKRs to antagonists from bat poxviruses remain unknown. We are particularly interested in *Eptesipox virus* (EPTV) K3 and E3 orthologs because they are distinct: EPTV K3 has a unique C-terminus extension of 78 amino acids, and there are two copies of E3, which show only 22% sequence identity to one another. To determine their inhibitory effects on PKR, we performed a luciferase-based assay with various bat PKRs. K3 exhibited species-specific inhibition of bat-PKRs while the C-terminus extension was important for its activity. The same assays will be conducted with the two E3 paralogs. Furthermore, to define how these interactions influence EPTV replication in cells, we are generating HEK293 cells with inducible bat PKR expression. Characterizing the role of EPTV K3 and E3 will provide new insights into the bat immune system and host range of bat poxviruses.

Elucidating the Causes of *Opuntia littoralis* Decay in Native Nurseries and Restoration Sites in Southern California

Sophia Acker
Sponsor: Johanna Del CastilloMunera, Ph.D.
Plant Pathology

In 2021, native succulent *Opuntia littoralis* (Coastal prickly-pear) plants grown at a restoration nursery in San Diego County, CA exhibited circular and enlarged yellow-reddish and gray lesions surrounding the spines. Severely affected plants had dry and necrotic lesions on the cladode. Symptomatic plants were sent to the Greenhouse and Nursery Pathology Lab at UC Davis. The plant pathogenic fungi *Alternaria alternata*, *A. infectoria,* and *Fusarium brachygibbosum* were recovered from infected plants. In 2022, surveys on 10 locations in San Diego County indicated that affected plants ranged from 5 to 25% prevalence. Symptomatic plants (n=21) were processed in the laboratory. Fungi recovered from the affected tissue were identified by sequencing the ITS and ATPase regions. *Alternaria* species were recovered from 81% of the diseased cladodes. Pathogenicity trials done with the three most commonly recovered species, *A. alternata*, *A. infectoria*, and *A. tenuissima*, on healthy cladodes caused circular yellow and gray dry lesions, like those initially observed in the infected plants. Completion of Koch's postulates will confirm that this is a new pathogen of *Opuntia littoralis* in California. With this knowledge, growers and advisors will be able to detect the pathogen timely and develop best management practices to prevent further spread.

AI-powered Student Feedback Generation Using Transformer Models

Shyam Agarwal
Sponsor: Ali Moghimi, Ph.D.
Biological & Ag Engineering

The efficacy and productivity of student assessment and feedback can be improved through the provision of relevant, targeted content at appropriate times and intervals. However, constraints such as time, resources, and class size can result in limited formative assessment practices and reduced feedback quality and frequency. Our objective is to develop an AI-powered, automated framework to assess students' responses to short-answer questions and subsequently generate personalized and targeted feedback. In this study, we first evaluated the performance of different neural network architectures on a benchmark dataset that consists of written responses from over 1,500 undergraduates on three related items about biological information flow collected during two semesters. We fine-tuned a pre-trained language model, called BERT (bidirectional encoder representations from transformers) on the first-year dataset and tested the performance of the model on the second-year dataset to evaluate the generalization of the model on a dataset with a different distribution (different students and instructor but the same questions). Our preliminary results showed an accuracy of 95% in the classification of second-year data into three classes: correct, incomplete, and incorrect responses. For the next step, we are working on developing a model to automate generating targeted and non-templated feedback.

HapSolo2: New Methods and Code Refactoring of a Leading Optimization Approach for Removing Secondary Haplotigs During Diploid Genome Assembly.

Mansi Agrawal
Sponsor: Edwin Solares, Ph.D.
Engr Computer Science

Reconstructing diploid genomes, which contain information from both parents, is challenging due to their inherent heterozygous nature, (alternative contigs) which leads to ambiguities in the final reconstruction. Programs like PurgeDups and HapSolo exist to help solve this problem. HapSolo is a recently published method that identifies secondary contigs and defines a primary assembly based on multiple pairwise contig alignment metrics.HapSolo evaluates candidate primary assemblies using highly conserved single-copy genes and classifies alternative contigs based on this information using an AI-based optimization approach. The original implementation uses a random forward walking hill climber to minimize traverse the search space, minimizing the cost function by identifying and removing duplicate single-copy genes, and has been effective at classifying and removing alternative contigs across multiple species. In this project, we refactor the code base, implement a forward-looking hill-climbing optimization search algorithm with random restart, and take advantage of GPU compute for highly parallelizing optimization. This can help accelerate genetic research, by reducing genomic noise and assist in producing more complete and continuous genomes, which can lead to important discoveries in fields such as medicine, agriculture, and biotechnology.

BIPOC Youth & Their Adaptation within Secondary Continuation Schools; Education Dispossession: Intraregional Migration of Students to Outcast

Delfina Aguilera
Sponsor: Drew Halfmann, Ph.D.
Sociology

At-Risk-Youth continuation high school students may have undergone immense forms of discriminatory practices that have significantly affected their educational experiences in rather illicit ways. The adaptation of the BIPOC community within secondary education may lead to further educational dispossession, significantly affecting youth of color. One continuation school in Southern California was analyzed and serves a majority-minority student demographic group. Analyzation involves a socio-economic, familial network, home environment, lack or gain thereof in resources, and depictions that readily contribute to youth's involvement in continuation school. Qualitative methods will be used to showcase the educational experience that many BIPOC communities had, including students with differentiation in legal statuses, unmet education needs, lack of mental health resources, drug and gang interventions, and both financial and home stability. Socio-economic factors, criminalization, labeling theory, othering, and school funding are experiences set thus far by post-high school students and pertinent issues addressed by school administration and faculty of the continuation high school. BIPOC students reflect an increased risk of involvement in a continuation school, which increases retention rates and leaves responsibility amongst schools to adhere to students' educational disparities.

Characterization of the Ocular Surface Using Contact-angle Goniometry in a Murine Model of Evaporative Dry Eye Disease (Awar2 Knockout)

Kevin Aguirre Gamarra
Sponsor: Brian Leonard, D.V.M.,Ph.D.
VM: Surg/Rad Science

Evaporative dry eye disease (EDED) is caused by tear film instability, leading to ocular surface irritation and inflammation. This instability is due to altered tear film lipid production. Mice deficient in Awat2 were generated that model human EDED. This study aimed to genotype weaned mice and develop a novel technique to measure ocular surface adherence using dynamic tilt contact-angle goniometry. DNA was extracted from tail tips or ear punches for PCR amplification of Awat2 to identify WT and KO animals. Globes from 12-month-old KO (n=10) and WT (n=11) mice were enucleated, adhered to glass slides with the cornea facing upwards, then placed on the goniometer. A droplet of perfluorodecalin was placed on the cornea and the stage tilted until attachment was lost. The procedure was recorded and analyzed. Corneal lesions were present in most KO animals, indicative of ocular surface disease. The duration of attachment and final tilt angles were significantly decreased in KO animals ($p=0.0053$ and $p=0.0072$, respectively), suggesting reduced adherence properties of their ocular surface. However, no differences were seen in the contact angles. These findings demonstrate that ocular surface disease impacts tear film adherence and that goniometry can be used ex vivo to assess EDED.

Pulmonary Effects of Silver Nanoparticle Preparations by Size, Shape, and Chemical Composition

Anita Akef
Sponsor: Kent Pinkerton, Ph.D.
VM: Anat Physio & Cell Biology

Silver nanoparticles (Ag NPs) can be found in hundreds of consumer products, medical equipment/supplies, and public spaces. However, questions remain regarding the risks associated with Ag NP exposure. To better understand these nanomaterials, this study examined Ag NPs with varying sizes and chemical composition. Three types of Ag NPs were tested: 20 nm (C20) and 110 nm (C110) citrate-stabilized NPs, and 50 nm silver silicate (AgSiO2) NPs. Male rats were instilled intratracheally with Ag NPs (1.0 mg/kg bodyweight [BW]) using 20 nm, 110 nm and AgSiO2 (50 nm). Bronchoalveolar lavage fluid (BALF) and lung tissues were obtained 1-day post-exposure for analysis of BAL cells and histology. To visualize Ag NPs in BAL and lung tissues, autometallography was implemented. All Ag NP types induced elevated numbers of polymorphonuclear cells (PMNs), eosinophils and lymphocytes in the BALF. Autometallography demonstrated uptake of all Ag NPs predominantly in alveolar macrophages of the BAL. Histology of lung tissues confirmed the rapid uptake of Ag NPs in the airway epithelium, underlying submucosa and interstitial spaces with the aid of staining by autometallography. These findings show Ag NP preparations produce mild inflammation with uptake in alveolar macrophages, airway epithelium and the underlying interstitial tissues.

Molecular Basis of Improved Motor Performance of Chat Deficient Mice Treated with AAV-mediated Gene Therapy

Anahid Aivazian
Sponsor: Ricardo Maselli, M.D.
MED: Neurology

Congenital myasthenic syndromes (CMS) are a heterogeneous group of diseases characterized by weakness and muscle fatigue. One variant of CMS results from deficiency of choline acetyltransferase (ChAT). ChAT synthesizes acetylcholine (ACh) from choline and acetyl-CoA at cholinergic synapses, including the neuromuscular junction. Deficiency of ChAT causes weakness and life-threatening episodes of apnea. Using a mutant $Chat^{flox/flox}/Cre\text{-}ER^{T2/T2}$ mouse model, in which deficiency of Chat is conditionally induced by tamoxifen (Tx) injection we hypothesized that reestablishing the ability of neurons to generate acetylcholine could mitigate the negative effect caused by silencing the Chat gene by Tx. In a previous study we showed that mice injected with an adeno associated virus (AAV) carrying human *CHAT* showed improved motor performance when compared with non-injected Chat deficient mice. In this project we used immunohistochemistry and quantitative-PCR to investigate the molecular basis of these observed behavioral changes. Mutant mice showed severe depletion of Chat in spinal cord motor neurons, which recovered to more than 70% of wildtype mice in mutants injected with AAV-*CHAT.* Additionally, cell transduction occurred at the highest level in the brain and liver. Our findings support the use of AAV-mediated gene therapy for the CMS resulting from *CHAT* mutations.

Evaluating the impact of antioxidants on fecundity in the yellow fever mosquito, *Aedes aegypti*

Chelsie Alcaraz
Sponsor: Geoffrey Attardo, Ph.D.
Entomology/Nematology

Aedes aegypti is the world's foremost arboviral vector which is why the Attardo Lab investigates their reproductive physiology and strategies for mosquito control. This project focuses on determining how compounds that interact with oxidative metabolism affect fecundity. We selected three compounds. First, Vitamin C, which had been observed to affect fecundity in *Drosophila melanogaster*. Second, Piperonyl Oxide (PBO), a commonly used synergist used in insecticides applied for mosquito control. Third, Polydatin, a novel synergist candidate. We exposed adults *Aedes aegypti* to various antioxidants including Vitamin C (orally), PBO (topically), and Polydatin (topically). Individual females were then blood fed and placed into enclosures to deposit their eggs. Eggs were collected and counted after 72 hours. Additionally, we collected adult females exposed or unexposed to antioxidants and measured oxidative stress markers. We found no effect on Vitamin C supplementation in *Ae. aegypti* clutch size. However, PBO exposure decreased average clutch size and evaluation on Polydatin is ongoing. Evaluation of oxidative stress markers are ongoing as well. Investigating how these compounds impact mosquito physiology and fecundity is valuable to the lab as we continue to pursue novel strategies for mosquito control.

Enhancing Cell Culture Performance Through Agricultural Product Hydrolysate Utilization

Stephan Alfaro
Sponsor: Karen Mcdonald, Ph.D.
Chemical Engineering

Cultivated meat is currently cost-prohibitive, and one of the main cost drivers are expensive media formulations. Some estimates for cultivated meat production suggest that 1kg of cultivated meat would require 10 liters of media and when the cost of common basal media formulations such as DMEM is approximately $50/L, it is apparent that media costs must come down for commercialization. Basal cell-culture media consists of glucose, amino acids, salts, and growth factors that can be supplied recombinantly or through the addition of fetal bovine serum (FBS). To reduce the cost of cell culture media, complex media sources such as hydrolysates can be added to supply a mixture of glucose and various amino acids of value. In particular, valorization of agricultural waste products such as fruit juices, peels, and seeds can reduce cost, support sustainability, and reduce the costs of disposal. This study aims to try to circumvent the commercial source of media components such as glucose and amino acids by substituting it with a pomegranate hydrolysate. We varied the amount of hydrolysate supplemented into DMEM with 10% FBS to observe the effects on the growth conditions of C2C12 murine myoblast cells.

Salmeterol Xinafoate Preferentially Eradicates Glioma Cells

Orli Algranatti
Sponsor: James Angelastro, Ph.D.
VM: Molecular Bio Sciences

Stress hormones promote cancer progression through β-adrenergic receptors. Epidemiological studies revealed that antagonism of the β-adrenergic receptors disrupts the proliferation of several cancer types. Glioblastomas (GBMs) express β-adrenergic receptors (significantly β-2-adrenergic receptors). Patients with GBMs survival time is 15 months after Standard of Care therapy. Hypothesis: Interference with the β-2-adrenergic receptor promotes the regression of GBMs. β-2-adrenergic receptor biased agonist, salmeterol xinafoate (high potency) activates the G-protein pathway rather than the β-arrestin pathway. For clarity, biased agonists promote intracellular signaling of G-protein coupled receptors through their G-protein or their β-arrestin pathway. Our results show that salmeterol xinafoate causes selective cell death of glioma cells while sparing healthy neurons. Our xenobiotic results were phenocopied by siRNA knockdown of the β2-adrenergic receptor of reduced cell proliferation/survival in the same glioma cell lines employed for our drug studies. The mechanism appears to be through the downregulation of survivin with the synthesis of cleaved caspase-3. Salmeterol xinafoate is currently used for patients with Chronic Obstructive Pulmonary Disease. Our efforts have led to potentially repurposing this FDA-approved drug to treat patients with GBMs and efficiently fast-forwarding into clinical trials due to the previously established drug's safety.

Children and Culture: Associations Between Preschoolers' Self-Regulation and Parents' Mexican-American Cultural Values

Carmina Alves
Sponsor: Daniel Choe, Ph.D.
Human Ecology

Self-regulation is one's ability to control their reactions and behaviors. Children's self-regulating skills are influenced by parent-child interactions, which are informed by parents' cultural values. For example, a study showed adolescents' Mexican-cultural values were positively correlated to their self-regulation. However, there is limited research evaluating relationships between parents' cultural values and self-regulation in Mexican-origin preschoolers. This cross-sectional study examines whether children's performance on lab tasks assessing self-regulation is related to their parents' self-reported values on the 50-item Mexican American Cultural Values (MACV) scale. The MACV scale gives overall scores of Mexican or American values and provides specific subscale reports within those values. Three-year-old Mexican-origin children (N = 37, M_{age} = 36.80 months, SD_{age} = 1.15, 64.9% male) were administered self-regulatory tasks in their preferred language (71.4% English). Preliminary results suggest that children's self-regulation is unrelated to their parents' Mexican-cultural values but is negatively correlated with the specific Mexican value of *respeto* (respect for elders), r = -.44, p = .018. Additionally, children's self-regulation is negatively correlated with parents' American-cultural values, r = -.36, p = .05, and the specific American value of independence and self-reliance, r = -.57, p = .001.

Importance of Representational Thought for Social Cognition: a Novel Measure of Updating

Ayushi Ambekar
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Children undergo rapid developments in their social understanding (also known as a "theory of mind") across the preschool years, and these advancements are characterized by an understanding that mental states (e.g., thoughts, desires) are abstract representations that differ across people, and that guide behavior. Thus, an important milestone in social cognitive development across the preschool years is an understanding that mental states are representational. However, few studies have empirically examined how a capacity for representational thought, including changing or altering representations based on new information, relates to social understanding. To examine this question, we modified a measure of representational updating originally administered to adults from Mack et al. (2016). Participants (4- to 8-years-old, N = 83) completed three classification tasks by learning the corresponding sorting rules and adjusting them based on contextual information (e.g. background screen color). Additionally, children completed a battery of social cognitive tasks including measures of desire, belief, knowledge, and visual perspective understanding. We will also examine whether updating task performance correlates with children's social understanding to reveal the extent to which this under-studied domain-general skill importantly contributes to children's theory of mind development.

How Chronic Pelvic Pain Is Deteriorating Quality Of Life in BIPOC Wombs

Erika Amort
Sponsor: Danica Taylor, Ph.D.
MED: Public Health Sciences

Women from historically underserved communities may experience higher rates of dismissal or minimization of symptoms by healthcare providers. For example, Black, Indigenous, and Women of Color (BIPOC) account for the majority of people suffering from chronic pelvic pain caused by undiagnosed or undertreated benign pain-related gynecological disorders. Additionally, marginalized BIPOC women receive hysterectomies at a 40% greater rate than white women, nationally. Most literature agrees that the lack of research and limited availability of evidence-based treatment plans for BIPOC women may also exacerbate mental health distress. Due to the inequity, further research is needed to explore the effects of chronic pelvic pain on daily life among low socioeconomic status BIPOC women. Through anonymous online surveys and descriptive statistics, this study aims to explore the disease burden and barriers to care experienced by BIPOC women with undiagnosed or undertreated benign pain-related gynecological disorders. The study also aims to provide a basis for standardized and quality care for chronic pelvic pain in underserved populations and promote further research in the field.

Dynamic Modeling of Air Bearing Table Float Unit for CubeSat Attitude Controller

Chris Andrade
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

This project aims to develop a dynamic model for validating small satellite (CubeSat) attitude control for the Human Robotics Vehicle Integration and Performance Laboratory (HRVIP). One of the few methods of simulating spacecraft dynamics on Earth is on an air bearing table, where a small cushion of air between a model spacecraft (float unit) and the table enables low-friction planar motion. This provides 3 degrees-of-freedom: 2 translational and 1 rotational. This poster presentation will focus on the development of a mathematical model for simulating the float unit's dynamics on the air bearing table, which is crucial for validating the performance of the CubeSat control hardware before spaceflight. Although the air resistance is low enough to allow for free motion, the external torque it causes is significant in comparison to the actuator torques being tested on the float unit. To more accurately measure the performance of the actuators requires characterization of the float unit's dynamics as well as the effects of air resistance. Different dynamic modeling techniques are utilized and their results are compared. The dynamic models are simulated to enable tuning of attitude controllers, visualization of spacecraft motion, and analysis of attitude controller errors.

Made For Us, Spoken By Us: The Black Perception on Black Film

Keva Anderson
Sponsor: Masoud Jafarali Jasbi, Ph.D.
Linguistics

Made For Us, Spoken By Us is an honors thesis in Linguistics - College of Letters and Science. Its purpose is to research how Black identifying audiences perceive films which are specifically targeted towards Black audiences. The research explores whether Black people view the characterization and language usage of Black people in films as representative of themselves and/or other Black people. Participants will blind read manuscripts and view film clips from Jordan Peele's films, *Us*, *Get Out*, and *Nope,* then answer questions regarding the language use. Their perception of written versus spoken Standard English and African American Vernacular English (AAVE) will be observed, as well as their reasoning for viewing them as such. The content of this research aligns with the outbreak of Black directors bringing diversity in film to the forefront of popular media and exposing the use of everyday African American Vernacular English, making its use in movies more relevant than ever. The question, then, is whether Black directors making films for Black audiences create natural-sounding scripts and speech that their Black audiences can actually identify as "sounding Black".

Navigating Identity Across Space: Second Generation East Africans in the Diaspora

Angel Anene
Sponsor: Orly Clerge, Ph.D.
Sociology

In this paper, I examine how distinct types of locations help shape and define the symbolic boundary surrounding 1.5th or 2nd generation East Africans' identity living in the United States. This paper adds to this literature by examining how this development of identity is experienced by East Africans specifically, an immigrant group that is rarely studied. Using 12 in-depth interviews with Ethiopian and Eritrean UC Davis college students, I show that the East African identity is a hybridized identity that commences through traditional homogenous spaces facilitated by elders in the community (such as church or the home) and interactions in heterogenous spaces (school, work, etc.). This sense of self, however, is reconstructed as one begins carving out their own new "flexible" spaces (either with members of the same ethnic identity or with those deemed as safe) that guarantee them complete autonomy over how their culture is performed and shared with others. These findings provide an understanding of how a new idea of what is considered "authentic" is emerging from processes of interaction and setting a new precedent for the next generation of East African culture across the diaspora.

Exploring the Interplay between Language and Attention in Early Childhood Development

Raquel Anguiano
Sponsor: Lisa Oakes, Ph.D.
Psychology

The visual world is complex, and deciding what to pay attention to is crucial as it would be overwhelming to attend to everything. It's important to attend to meaningful regions of the environment, especially in early life when visual information is abundant. Studies show that young children's looking behavior becomes more systematic, consistent, and similar to that of adults when viewing natural scenes (e.g., photos of kitchens and nature). Yet, these changes are not fully explained by developing attention to physical features like brightness (Pomaranski et al., 2021). As infants get older, they focus more on parts of scenes that adults consider more meaningful than less meaningful parts (Oakes et al., 2023). However, the relationship between language development and attentional development in toddlers and preschoolers is not well understood. This study aims to fill that gap by exploring how language acquisition and attention are related. Using data from parents on their children's vocabulary, we will analyze how language development affects looking behavior while viewing natural scenes. Our prediction is that as language skills improve, attention will become more focused on meaningful regions of the scenes. These findings will contribute to our understanding of attentional development in toddlers and preschoolers.

Material Trade Study For Air Bearing Table Surface for Low-Friction Planar Motion Testing of CubeSats

Manuel Anguiano
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

One of the few methods of simulating spacecraft dynamics on Earth is on an air bearing table. On an air bearing table, an air bearing creates a small cushion of air between a model spacecraft and the table, enabling low-friction planar motion and simulating spacecraft dynamics. This provides 3 degrees-of-freedom: 2 translational and 1 rotational. The Human, Robotics, Vehicles Integration and Performance Laboratory (HRVIP) aims to test attitude determination systems using this method. However, attitude testing on an air bearing requires a highly flat and smooth surface, ensuring gravitational effects do not interfere with the CubeSat's dynamics. The glass surface used for previous experiments encountered many problems maintaining a flat surface. We researched two alternative materials that would allow for more accurate measurements, while meeting specified flatness and roughness requirements. While we found that precision epoxy could form a flatter surface, grade B granite would be a more cost-effective solution while still meeting our flatness and roughness requirements. The development of this in-house testing environment provides an accessible and cost-effective method for performing CubeSat research. Furthermore, our trade study analysis is useful for other universities and institutions that need to conduct similar spacecraft research.

The Effects of Deficit Irrigation on Microbe Communities Driving Infested Litter Decomposition In Agricultural Systems

Edeline Anthoniraj
Sponsor: Cassandra Swett, Ph.D.
Anr Plant Pathology

Deficit irrigation (DI) is the practice of irrigating crops below their evapotranspirative (ET) needs which is useful to growers with limited water supply. Previous work suggests that in-season DI slows the breakdown of pathogen infested plant litter during the off-season, which could contribute to pathogen buildup in the soil. The goal of this study was to determine whether DI changes microbial communities, thus slowing litter breakdown. We collected soil three times postharvest from two irrigation treatments: 100% ET (Control) and 60% ET (DI) and assayed for bacterial, fungal, and plant nematode loads as well as bacterial and fungal microbial counts. Preliminary data show decreased nematode loads under DI, although bacterial and fungal loads increased under DI at the first collection point. This suggests that a lack of predators allowed the microbial load to increase during the first time point, however analysis of other time points is pending. In the future, this work can be used to understand and manage effects of DI on pathogen survival in soil.

The Fragmented Subject and Surveillance in *Stars in My Pocket Like Grains of Sand*

La'a Anthony
Sponsor: Finn Brunton, Ph.D.
Cinema & Digital Media

How does Samuel R Delany's science fiction novel *Stars in My Pocket Like Grains of Sand* construct a universe which allows for 'fragmented subjects' to thrive while still deeply enmeshed within systems of surveillance requiring legible, stable subjects? I plan to examine Delany's 'fragmented subjects' through a lens of queerness, thinking about how Delany disrupts assumptions about the stability, unity, and centeredness of the self and of identity. I look to both queer theory and scholarship from Science and Technology studies to consider how and why projects of surveillance require standardization and legibility. I suggest that the interactions between these fragmented subjects and the General Information system which surveils them are opened up by thinking about how queerness disrupts projects of state and corporate legibility. I do not intend to suggest a one to one comparison; rather, putting them in conversation helps to clarify how Delany imagines surveillance in *Stars*, as nearly totalizing and accurate, while still ultimately disruptable.

Effects of Probe Sizes Used in Cryoinjury in Relation to Corneal Healing Time

Monica Ardon
Sponsor: Sara Thomasy, D.V.M.,Ph.D.
VM: Surg/Rad Science

Corneal endothelial cells (CECs) maintain tissue transparency to facilitate vision. Unfortunately, CECs have limited proliferative capabilities that, when injured, can lead to extensive cell loss and develop into irreversible CEC dysfunction. To study CEC dysfunction, cryoinjury is used in animal models. Cryoinjury wound healing behavior varies depending on different factors, specifically size of the probe application. Therefore, we sought to compare rabbit corneal endothelial wound healing behaviors induced by cryoinjury in the following probe sizes: 8 mm, 10 mm, and 12 mm. During healing time, central corneal thickness and anterior segment measurements were acquired. When comparing the central corneal thickness between all groups, the 12 mm (989.33 ± 33.00 µm) group was statistically higher than the 8 mm group (557.00 ± 98.70 µm, $p<0.001$) or the 10 mm group (426.17 ± 42.78 µm, $p<0.001$) by day 14/15. Corneal edema was resolved by day 14/15 for the 8 mm and 10 mm group but persisted in the 12 mm group. Results show that the 12 mm cryo-probe provided the slowest healing time which will allow treatment effects to be seen in more detail than using a smaller cryo-probe.

Advancing the Long-Term Storage of Cyborg Cells for Therapeutic Applications

Veena Arunkumar
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Living bacteria have successfully been used for a wide range of applications, such as drug production, bioremediation, and drug delivery. Despite bacteria's unique capabilities in sensing and responding to environmental stimuli, the proliferation and adaptation of these cells pose a significant biocontainment problem. To address the issue, my lab has created Cyborg Cells, which are semi-living cells that are non-dividing but retain many natural cellular functions. The Cyborg Cells are being developed for cancer therapy and immunotherapy, but their long-term storage must be achieved for practical clinical translation. Here, I investigate how the storage of Cyborg Cells affects their functions. Specifically, I evaluated the storage temperature, types of media, and bacterial cell type. For each parameter, I evaluated the functionality of the Cyborg Cells by measuring the metabolic activity through flow cytometry, and I investigated the composition by identifying the presence of contaminants and bacterial cell debris among the intact cells, through CFU and microscopy assays. My work will enable the storage of highly active Cyborg Cells for potential clinical applications.

Filipino-American Laundry: Challenging How We View Filipinos in American Culture

Faith Arnett
Sponsor: James Housefield, Ph.D.
Department Of Design

Even though the clothes we wear are usually made outside our national boundaries, most of us are largely unaware of the textile and clothing traditions of other nations and cultures. "Filipino-American Laundry," an interactive pop-up exhibition, brings this incongruity to the attention of audiences at the URC. The display purposefully addresses stereotypes against immigrants by incorporating words such as "imported," foreign," and "fragile" onto the wooden boards which are meant to mimic wooden crates shipped across international waters. Furthermore, it places the clothes in a specific manner to juxtapose the cultures they come from, creating a meaningful contrast that viewers should use to consider how it reflects being Filipino-American to an outsider. These clothes were all gifted by family members who identify with both cultures, threading a personal connection to each piece. Consequently, the clothes reveal a larger narrative about the diaspora that has affected not only what they and other people wear, but who they identify with as the divide between American and Filipino is distressingly dissonant. The display is simply wood and cloth put together, but viewers are encouraged to grapple with that simplicity in order to understand a much more complicated story about representation.

Using Machine Learning to Bring Physical Dynamics Awareness to a Vehicle Cruise Control System

Sukhpreet Aulakh
Sponsor: Shima Nazari, Ph.D.
Mechanical & Aerospace Engr

The self-adaptive vehicle cruise control system is a well-known tool used for autopiloting vehicles. It allows vehicles to output and adjust their own acceleration and braking, ensuring the passengers stay safe. With the move toward autonomous road vehicles and the increase in nuance on city streets, the demand for safer, smarter autonomous cruise control systems increases. Our goal is to build a self-adaptive vehicle cruise control system which scans, interprets, and forecasts the ahead objects in its environment. To these ends, we develop an algorithm that constantly measures the speed and position of ahead objects in the environment and outputs a command to control the vehicle speed so as to minimize chances of collision, yet maximize rate. We test our system in simulation, and ensure it meets our needs by simulating different situations with different kinds of vehicles ahead braking with different deceleration rates. We also set a maximum deceleration rate for our control vehicle, and test that our control system can properly identify this shortcoming and appropriately learn to adjust its speed.

Maltreat and Its Impact on Emotional and Behavioral Development in Preschoolers

Brittanie Austin
Sponsor: Leah Hibel, Ph.D.
Human Ecology

Maltreatment of any type on a child is distressing and has a plethora of harmful effects including behavioral, psychological, and emotional issues. Maltreatment may involve emotional, sexual, or physical action or inaction, the severity or chronicity of which can result in significant harm or injury. Child maltreatment is prevalent with approximately 2.1 million referrals to Child Protective Services meeting the criteria for maltreatment in 2020 alone. Using a sample of 248 preschool-aged children between the ages of 3 and 6 years old, we will explore how maltreatment impacts children's behavior and emotional development. We will determine maltreatment by coding records obtained from Child Protective Services with the use of the Maltreatment Classification System. We will be using the Strengths and Difficulties Questionnaire to assess behavior in children. This questionnaire will be answered by parents and will look at subscales we have determined to be impacted by maltreatment such as emotional symptoms, conduct problems, and prosocial behaviors. We hypothesize that children's development will be negatively impacted in such a way that there will be a decrease in the ability to regulate emotions and participate in prosocial behaviors as well as exhibit an increase in conduct problems.

WEE1 Kinase Inhibition Mildly Suppresses Radial Chromosome Formation in Response to Aphidicolin-induced Replication Stress

Kalkidan Ayele
Sponsor: Jacqueline Barlow, Ph.D.
Microbiology & Molec Genetics

Radial chromosomes are a diagnostic hallmark of Bloom's syndrome (BS) and Fanconi anemia (FA,) and are products of defective DNA repair. Radial chromosomes represent a severe phenotype of aneuploidy in subsequent cell cycles, which can contribute to carcinogenesis. it is still unknown how and when radial chromosomes form. A prolonged cell cycle, particularly the G2 phase, may contribute to radial formation. To investigate the contribution of G2 to radial formation, we used WEE1 inhibitor (WEE1i) to suppress the activity of the WEE1 kinase- a regulator of the G2/M checkpoint arrest. We induced radial chromosomes in mouse primary WT B cells using aphidicolin (APH). we proposed that WEE1i treatment combined with APH will decrease radial chromosome rate compared to APH alone. We found that WEE1i in combination with APH does not have a synergistic effect regarding total chromosome rearrangement, but mildly suppresses radial chromosome formation. Following our findings, our initial hypothesis is supported. Future studies of -G2/M checkpoint alterations are necessary to collect more evidence supporting our hypothesis.

Using Patient Satisfaction Data to Improve Care Delivery at Nadezhda Clinic

Elijah Azar
Sponsor: Lucy Shi, M.D.
MED: Int Med Hospitalist

Nadezhda Clinic, a non-profit student-run clinic (SRC) affiliated with UC Davis, provides access to primary care services for the underserved Eastern European and Eurasian community of Sacramento. We utilized patient satisfaction surveys to improve delivery of culturally appropriate care that meets the unique needs of our patients. Patient satisfaction data collection started in August 2019 with a pause from March 2020 to July 2022 due to the Coronavirus-19 pandemic. Survey results from the initial six months suggested dissatisfaction with clinic resources, wait times, and patient-provider communication. In response, we moved from a repurposed storefront to a secure clinic space and acquired grants to obtain additional equipment for patient care. Patients were thoughtfully scheduled to minimize wait times and clinic members were trained to optimize clinic flow. 63.17% of respondents from August 2019-March 2020 (pre-intervention) believed the clinic was well-equipped whereas 100% of the respondents after July 2022 (post-intervention) believed the same. 47.37% of the pre-intervention group questioned the accuracy of their diagnosis, which decreased to 26.32% in the post-intervention group. As our clinic continues to expand, we hope to continue using patient satisfaction data to drive improvements in our care delivery model.

Acetaminophen Increases Oxidative Stress in Cells

Maria Azmat
Sponsor: Aldrin Gomes, Ph.D.
MED: Physiology & Membrane Biol

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as ibuprofen and naproxen are known to have side effects that can cause damage to the liver, heart, and kidneys if taken in moderate to higher concentrations. What about drugs that do not have anti-inflammatory properties like acetaminophen? Do they cause the same side effects? To learn more about the possible side effects I designed an experiment that focuses on acetaminophen-induced stress on H9C2 embryonic rat heart cells. Using a Reactive Oxygen Species assay, a cell viability assay, and a Mitochondrial Membrane Potential assay, acetaminophen at physiological concentrations (50-200 μM) was found to induce damage to cellular components like DNA, amino acids, and lipids. Acetaminophen also prevented the healthy growth of cells and may even cause cell death. It also affects mitochondrial functions and results in decreased membrane potential in cardiac cells. This research suggests that moderate to higher concentrations of acetaminophen can cause similar side effects as NSAIDs.

Chlamydomonas reinhardtii as a Sustainable Platform for the Biomanufacturing of Human Insulin

Michelle Azuma
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

As the price of therapeutic proteins continues to rise, access to potentially life-saving medications becomes increasingly difficult for many patients around the world. The most common chassis organisms used to produce these proteins, such as *E. coli* and *S. cerevisiae*, utilize inputs that come at a significant environmental and economic cost. Our goal is to use *Chlamydomonas reinhardtii* to produce a recombinant proinsulin protein for use in diabetes patients. *C. reinhardtii* is a single-celled eukaryotic microalgae that has been shown to be capable of therapeutic protein production. By only requiring light, trace minerals, buffer, and a nitrogen source, microalgae provides a low-cost solution for proinsulin production that is also ecologically sustainable. We report our progress towards the design and assembly of the plasmid vector we will use to genetically engineer *C. reinhardtii*. We will also discuss the optimization of existing microalgae transformation protocols. The Algae to Insulin team is a part of BioInnovation Group at UC Davis, which provides undergraduate students the opportunity to coordinate and innovate in biotechnology research.

Comparison Study Between a Ketogenic Diet and a High-fat Diet on Pancreatic Cancer Incidence in Mice

Tarek Bacha
Sponsor: Gerardo Mackenzie, Ph.D.
Nutrition

Pancreatic Ductal Adenocarcinoma (PDAC) remains among the most lethal cancers. PDAC can take 15-20 years to develop from the occurrence of the initiating mutational event, which opens the opportunity for prevention strategies such as nutritional interventions. While high-fat diets (HFD) have shown to promote PDAC progression, ketogenic diets (KD), characterized by a high fat and very low carbohydrate content, have gained attention for their anti-tumor and anti-inflammatory potential. However, the role of a KD in the onset and progression of PDAC is unknown. We hypothesized that a HFD would accelerate PDAC progression while a KD would slow it down. To test our hypothesis, we fed 6 month-old mice a control diet (CD), HFD, or a KD for 6 months. Subsequently, we euthanized them at 12 months of age to evaluate cancer progression. At 12 months of age, HFD-fed mice had significantly higher body weight and leptin levels. In contrast, KD-fed mice displayed lower glucose and serum insulin levels. However, no changes in PDAC incidence were observed across all diet groups. In addition, no significant differences were observed in cancer-associated RAS/RAF/ERK and PI3K/AKT/mTOR pathways. In summary, consumption of a strict KD failed to improve late-stage pancreatic carcinogenesis in mice.

Perception and Memory of Scientific Findings in Social Media Versus News Articles

Erica Bagby
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Psychologists have recently been communicating scientific findings through social media, as a way to reach a wider, more general audience. Educating wider audiences on matters of scientific discovery is a matter of importance, therefore how platforms influence recognition is imperative. Trust in social media and news platforms is subjective so the perception of these platforms is crucial to access trust in the communication of science. The present study aims to assess the perception and memory of scientific findings presented in social media compared to general news articles. Participants will be asked to take a series of questionnaires assessing the perception and memory of scientific findings. Utilizing design elements to feign the presentation of social media and news articles, the present study aims to measure trust in scientific research and memory for scientific findings when research is communicated over different communication platforms. We predict that participants will have greater recall of scientific findings presented on social media than news platforms, while research findings presented on news platforms will gain more trust than those on social media posts. Our results may provide insight into more effective scientific communication.

Understanding Cardiovascular Disease Risk in the Punjabi Sikh Community

Simran Bains
Sponsor: Sara Dye, Ph.D.
Plant Pathology

Very little is known about health outcomes and major diseases in the Punjabi Sikh community, a minority group from Northern India. Cardiovascular disease (CVD) is one of the major causes of death in this population. Though the effects of poor diet and exercise associated with CVD are well examined, the Punjabi and Sikh cultural influences amongst these CVD risk factors have not been greatly explored. Through a meta-analytical approach, I am investigating why this deadly disease continues to increase in this population using two main inclusion criteria: a participant pool of adults middle-aged and older, and lifestyle studies focused on Punjabi Sikh immigrant populations as a result of the Indian diaspora. Preliminary results suggest diets high in fat, sugar, and salt as well as a decrease or absence of exercise contribute to high risks of CVD in Punjabi Sikh adults. The goal of this study is to encourage future clinical research in this community while educating and inspiring them to take preventative measures to minimize individual CVD risk.

Spatially Discordant Alternans Occurring when Cardiac Tissue is Paced Alternatively From two Sites

Tymoteusz Bak
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

Cardiac alternans are a precursor to arrhythmias potentially including bidirectional ventricular tachycardia. However, the underlying mechanism is still not clear. In this study, we investigated the mechanism of BVT using mathematical models of electrical action potential propagation in cardiac tissue. The two-dimensional tissue was paced alternately from two sites at a constant pacing cycle length. We measured electrical alternans, which are defined as an alternating sequence of the action potential durations. The distance between the two sites and the pacing cycle length were varied. Alternans amplitude was significantly amplified when the tissue was paced alternatively from two sites. SDA was formed even at slow heart rates. Alternans amplitude increased with the distance between the pacing sites. This is arrhythmogenic since it can easily lead to a wave break that may initiate a spiral wave. Fast pacing with steep APD restitution is another mechanism of SDA; however, the nodal line is parallel to the wavefront. When tissue is paced rapidly and alternatively from two sites, APD distribution becomes more complex. Our study demonstrates that alternans can be formed by alternating pacing from two sites that mimics BVT.

The Impact of Repeated Social Experience on Juvenile Rat Social Interactions

Aarifah Bali
Sponsor: Melissa Bauman, Ph.D.
MED: Psychiatry & Behav Sci

Alterations in social development are often indicators of human neurodevelopmental disorders and essential outcome measures for many preclinical animal models. In rat models of neurodevelopment, the frequency and duration of juvenile social interaction provides an opportunity to quantify species-typical social development. In the social dyad paradigm, the experimental (test) rat is introduced to an unfamiliar stimulus rat. Each pair of rats is matched by age/sex/weight, which requires some rats to serve as a stimulus rat multiple times. Here we propose to determine if having repeated social exposure of a stimulus rat can change the way they interact with different test rats. In this study, the test offspring were paired with stimulus rats, tested and video-recorded together, and observed by researchers to score durations of different social behaviors. We screened this data to identify N=12 stimulus rats used repeatedly throughout our experiment and analyzed the durations of time spent in social interaction, play behavior, and time alone to determine if repeated social experience of the stimulus rat contributed to potential differences in the experiment regardless of treatment of the test rat. Results will be presented in the context of improving rigor and reliability of behavioral testing in rodent models of neurodevelopment.

Boots and Staffs: A Comprehensive Beatbox Notation System

Cora Ballek
Sponsor: Juan diego Diaz, Ph.D.
Music

Beatbox—percussive music made with the human vocal tract—is a complex and fast-evolving art form that takes vocal music to its extremes. Despite an undeniable musical appeal that garners virtual audiences in the millions, beatboxing has rarely been studied from a music theory perspective. To enable the academic study of this oral discipline, a notation system is needed. Although various attempts have been made, existing systems often do not reflect pitch information and are mostly unable to capture the vast array of sounds which expert beatboxers utilize, rendering such systems insufficient for describing the nuances required for thorough analysis. This project puts forward a comprehensive notation system which draws on Western staff notation and Standard Beatbox Notation to allow for pitched and non-pitched representation of hundreds of different sounds, while remaining accessible to beatboxers and other musicians. The proposed system is expandable to enable incorporation of new sounds, and can be used to notate beatbox music at two levels of specificity: one which assigns specific sounds and one which assigns general sound classes. Potential benefits of this new system include use as a teaching tool and incorporation of beatboxing into scores for traditional instruments.

The Effects of Repetition on Word Recognition in Infants

Cytlali Ballesteros
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Repetition is a vital aspect of learning. Research indicates that repetition is a common aspect of caretakers' infant directed speech, and is related to language learning in infants. Caregivers provide input to their infants in the form of repetitions of words and phrases, which has a positive relationship with infant vocabulary development. However, we don't know yet how hearing repetitions of words affects how effectively infants recognize words. In this study, we will examine whether the amount of caregivers' word repetition relates to infant word recognition. We will test 24 10- to 14-month-old infants in an experiment with two tasks. In the first task, each parent-infant dyad plays with a set of farm animal toys and reads books about farm animals. Repetition will be measured by recording the number of times caregivers state each animal name. The infants' word recognition accuracy will be assessed in the second task where their eye movements are tracked as they are shown photos of animals while being verbally directed to look at one animal. We predict that if infants hear more repetitions of certain animals, then they will recognize those words more quickly and accurately than infants who hear fewer repetitions.

Ketogenic Diet Impact on Age-Associated Cognitive Function

ARIANA BANERJEE
Sponsor: Keith Baar, Ph.D.
MED: Physiology & Membrane Biol

A ketogenic diet can mimic many of the effects of endurance exercise which include increased mitochondrial mass and function as well as slowing age-related neurocognitive decline. Activation of the peroxisome proliferator activated-receptor gamma (PGC-1α) pathway induced by endurance exercise increases the expression of kynurenine aminotransferases (KATs). In skeletal muscle, KATs are responsible for converting kynurenine to kynurenic acid (KYA). When kynurenine (KYN) passes through the blood brain barrier it can be converted to quinolinic acid, a neurotoxin implicated in a variety of neurocognitive disorders. In contrast, KYA does not cross the blood-brain-barrier. Female mice aged 14-months were randomly assigned to control (CD) or a calorie-matched ketogenic diet (KD) and a series of behavioral tests assessing motor function and neurocognitive function were conducted. Protein acetylation levels, KAT protein levels in the liver, gastrocnemius muscle, and soleus muscle, and levels of KYN and KYA in blood were assessed via tissue homogenization, western blotting, and enzyme-linked immunosorbent assays. By utilizing a ketogenic diet to mimic the effects of exercise and the activation of the PGC-1α-PPARα/β pathway, this study intends to identify a potential mechanism of muscle-brain crosstalk.

Pushback: How Policy, Media, and Public Perception Are Leveraged to Create Organized Resistance Against Criminal Justice Reform

Courtney Banzon
Sponsor: Timm Grattet, Ph.D.
Sociology

Over the past two decades, criminal justice reformers have made significant progress in reforming the “back-end” (e.g., prison, probation, and parole) of the criminal legal system. “Front-end” reforms (e.g., policing, prosecution, and sentencing) have generally received less attention, but recent research indicates that reforming prosecutorial practices may be key to the fight against mass incarceration. As a result, several district attorneys (DA’s) have received greater support and been elected in major cities across the US. All of these DA’s have faced organized resistance to the implementation of progressive policies, both from the media and the public. However, despite multiple recall attempts, only one of these major progressive prosecutors – Chesa Boudin from San Francisco – has been recalled. Through a series of interviews with journalists, elected officials, academic researchers, formerly incarcerated individuals, and more, this podcast will explore how the interactions between policy, media, and public perception are leveraged to create organized resistance against reform. Studying the driving forces behind Chesa Boudin’s recall may indicate whether the strength or speed of reform is limited based on public support, or if there were unique factors and motivations behind the organized resistance that led to Boudin’s removal from office.

Investigation of a Strategy for Controlled Activation of Primordial Ovarian Follicles

Gloria Becerra-Cortes
Sponsor: Anna Denicol, D.V.M.,Ph.D.
Animal Science

Activation of primordial follicles within the ovary is not well understood, but evidence suggests that the PI3K/PTEN pathway is an important regulator. I hypothesize that ovarian cortical tissue exposed to a PTEN inhibitor (bpV(HOpic)) and PI3K activator (740Y-P) during in vitro culture will activate follicles within bovine ovary explants. Biopsies measuring 1mm x 20mm were obtained from ovaries in 5 independent replicates and slow-frozen. Upon thawing, the samples will be cultured in base medium containing vehicle for 6 days (control group). Treatment group samples will receive medium containing a combination of bpV(HOpic) and 740Y-P for 24h, then 740Y-P for an additional 24h, and lastly control culture medium for an additional 4 days (total of 6 days). In each replicate, I will fix 4 fresh samples, 4 samples after 2 days and 4 samples after 6 days of culture from each treatment group using 10% neutral-buffered formalin (total of 20 samples/replicate). The fixed samples will be processed for histological analysis via H&E staining; the spent media will be collected after 4 and 6 days of culture for hormone measurement. If successful, this project will facilitate the study of ovarian follicle activation and enable the recovery of more active follicles from ovarian biopsies.

Assessing Fuel Treatment Preferences in the California Wildland Urban Interface

Mina Bedogne
Sponsor: Emily Schlickman, M.L.A.
Human Ecology

As destructive wildfires become more frequent, urban expansion into California’s wildlands increasingly puts human communities at risk. Experts have identified vegetation management, or fuel treatments, as a primary mitigation approach to lower wildfire-related expenditures while limiting adverse environmental and socioeconomic effects. This study investigates the predominant factors influencing residents’ preferences for and willingness to invest in fuel treatments in the California Wildland Urban Interface (WUI). Using a choice experiment, a form of non-market stated-preference valuation, we examine the values residents from 16 WUI communities place on reducing their wildfire exposure when considering five attributes: fuel treatment type, chance of damage to their residence, environmental benefits, monetary damage to their residence, and program cost. Thus far, preliminary analysis indicates that respondents prefer fuel treatment alternatives to the status quo and that both socioeconomic considerations and ecosystem services that provide personal benefits influence preferences. Further econometric analysis will reveal the statistically significant factors and residents' willingness to pay (WTP) for each. By incorporating a holistic view of potential policy tradeoffs and addressing environmental values overlooked in existing literature, our results can inform policymakers when strategically implementing cost-effective fuel treatment programs that align with residents’ vision for their communities.

Children's Friendship Quality and Trait Anxiety

Mitchell Begg
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

Research from current literature suggests relationships between peer acceptance and trait anxiety within middle childhood. Within this literature, a handful examines the specifics of peer interactions, such as popularity and social skill competence. While there is research involving friendships and anxiety, it tends to sway toward anxiety disorders. This has created a specificity that is difficult to generalize for a larger population of children. The present analyses examine the effects of trait anxiety and perceptions of relationship quality with same-sex close friends. Children 9 to 11 years old were recruited for a larger study that examined social support across a child's social life. We use the NRI (Network of Relationships Index) to measure children's perceived relationship quality of a variety of personal relationships. This analysis uses the NRI subscales that measure companionship, intimate disclosure, and reliable alliance. The STAIC (State-Trait Anxiety Inventory for Children) is used to measure trait anxiety. Results would have important implications on how relationship quality with same-sex friends can influence children's anxiety levels. One future direction would be to add naturalistic observations of these children in their school setting.

The Relationship Between Microsaccades and Pupil Response in a Covert Spatial Attention Paradigm

Grace Bell
Sponsor: George Mangun, Ph.D.
Psychology

Orientating responses are essential to navigate our environment, particularly one that is potentially dangerous. One overt measure of orientating is the pupillary response, for instance when luminance is held constant pupil size is modulated as a function of attention. Additionally, engaging covert spatial attention requires the eyes to be still, yet small eye movements known as microsaccades are made nonetheless. These small eye movements have been proposed as an overt measure of covert spatial attention and V4 firing rates were observed to increase when a microsaccade was directed towards versus away from an upcoming target, further supporting an association between the two. However, it remains to be seen how the pupil interacts with microsaccades under conditions of covert spatial attention. Utilizing high-resolution eye tracking, the current study examined the relationship between pupillary response and microsaccades under conditions of covert spatial attention. Participants engaged in a modified Posner cueing paradigm (80% validity), and were instructed to employ covert spatial attention in order to discriminate the orientation of lines within square-wave gratings. While data collection and analysis are still ongoing, data about pupillary response, along with their relationship with microsaccades, will be presented.

Using Patient Satisfaction Data to Improve Care Delivery at Nadezhda Clinic

Madison Benitez
Sponsor: Lucy Shi, M.D.
MED: Int Med Hospitalist

Nadezhda Clinic, a non-profit student-run clinic (SRC) affiliated with UC Davis, provides access to primary care services for the underserved Eastern European and Eurasian community of Sacramento. We utilized patient satisfaction surveys to improve delivery of culturally appropriate care that meets the unique needs of our patients. Patient satisfaction data collection started in August 2019 with a pause from March 2020 to July 2022 due to the Coronavirus-19 pandemic. Survey results from the initial six months suggested dissatisfaction with clinic resources, wait times, and patient-provider communication. In response, we moved from a repurposed storefront to a secure clinic space and acquired grants to obtain additional equipment for patient care. Patients were thoughtfully scheduled to minimize wait times and clinic members were trained to optimize clinic flow. 63.17% of respondents from August 2019-March 2020 (pre-intervention) believed the clinic was well-equipped whereas 100% of the respondents after July 2022 (post-intervention) believed the same. 47.37% of the pre-intervention group questioned the accuracy of their diagnosis, which decreased to 26.32% in the post-intervention group. As our clinic continues to expand, we hope to continue using patient satisfaction data to drive improvements in our care delivery model.

Investigation of Deficit Irrigation Treatments on Olive Oil Quality

Kevin Benitez Rosales
Sponsor: Selina Wang, Ph.D.
Anr Food Science & Technology

In California, climate change and groundwater management policies have evolved within the last two decades as the state faces increasing weather extremes in addition to hotter and drier seasons. Growers have begun to change when and how much irrigation water is applied through deficit irrigation. We investigated the effect of deficit irrigation treatment on olive oil quality after fall harvest by taking measurements of moisture content, fat content, total phenol content (TPC), ultraviolet absorption, induction time, and ratios of 1,2 to 1,3 diacylglycerols (DAGs). Four irrigation treatments used were 1) A: control group with 100% of water application throughout the season; 2) B: 80% of water application throughout the season; 3) C: 25% of water application during pit hardening; and 4) D: 25% of water application during pit hardening and 125% water application the rest of the season. We found significant differences between the four irrigation methods in fat content, TPC, DAGs, and primary oxidation but not in moisture content and secondary oxidation.

Evaluation of Time-Course Liver Histology in a New Mouse Model of Dysregulated Copper Metabolism

Margarida Bettencourt
Sponsor: Valentina Medici, M.D.
MED: Int Med - Gastroenterology

Wilson disease (WD) is a rare genetic disease characterized by a genetic defect involving the transmembrane ATP7B copper transporter in the Golgi apparatus and endosomal vesicles. This mutation leads to intracellular hepatic and brain copper accumulation with consequent hepatic and neurological abnormalities. There is limited knowledge about the effects of extrahepatic *ATP7B* defect on systemic clinical manifestations. This study aims to characterize liver histology changes in a new mouse model of intestine-specific ($Atp7b^{\Delta IEC}$) *Atp7b* gene deletion compared to the global knockout ($Atp7b^{-/-}$) mouse and their respective wildtype controls at 9, 16, and 24 weeks of age. Hepatocyte nuclei size, hepatic inflammation, steatosis, and fibrosis were investigated. Both wildtype strains of all ages have normal liver histology. At 9 and 16 weeks, $Atp7b^{-/-}$ mice exhibit irregular nuclei, mild inflammation, and no steatosis. However, at 24 weeks, $Atp7b^{-/-}$ mice display prominent irregularities in nuclei size, mild to moderate inflammation, and early fibrosis. $Atp7b^{\Delta IEC}$ mice exhibit regular nuclei size, no steatosis, and no inflammation, but at 24 weeks, developed evidence of inflammatory infiltrate. Both sexes in each genotype displayed similar features for all analyzed parameters. The liver histological findings indicate a possible role of extrahepatic ATP7B on WD hepatic manifestations.

Adapting and Testing a 3D-Printed Robotic Hand for Upper Limb Prosthetics Research

Sonia Bhaskaran
Sponsor: Wilsaan Joiner, Ph.D.
MED: Neurology

Although upper-limb prosthetics have increased in complexity (e.g., precise actuation of the fingers), significant research is still required to develop their versatility and responsiveness. Current commercial prosthetic hands are often expensive or lack the full functionality to perform a range of everyday functions, creating a need in research labs for simple, adaptable robotic devices that mimic the functionality of the human hand. To fulfill this need, I constructed a version of the HANDi Hand, a 3D-printed hand developed by the BLINC Lab. This robotic device has independent articulation in all 5 fingers and the ability to collect pressure, joint angle, and visual data. My design incorporates servo motors that are more widely available, as well as a more compact wiring setup to allow for mounting to a moveable arm. The device is capable of achieving 4 basic positions for grasping objects, and further grasp patterns are being added to meet a wider range of everyday needs. Future research directions include evaluating the HANDi Hand against commercially available devices and mapping the grasp patterns to muscle activation data in order to provide real-time control.

The Efficacy of AI-Generated Nutrition-Related Videos in Improving Nutrition Knowledge

Sayan Bhatia
Sponsor: Deborah Fetter, Ph.D.
Nutrition

The advent of interactive artificial intelligence (AI) has led to a spur in content creation and tailored responses to human prompts. Compared to traditional methods of accessing knowledge, AI allows for the provision of information in a manner customized to a user's needs–a feature with potentially promising results in educational applications. This exploratory pilot study aims to investigate the effectiveness of AI-generated informational videos in improving nutrition knowledge. A tool will be developed that combines several AI tools to create a video with engaging visuals, a human-like avatar, and informative dialogue. The tool will allow users to input a nutrition-related question and receive a brief, easy-to-understand video that explains the concept based on relevant peer-reviewed research papers. College-aged students will be selected to participate and be randomly selected into two groups. One group will utilize the AI-generated video tool, while the other group will be given a textbook print-out. The study will employ a pre- and post-test nutrition knowledge questionnaire to assess participants' understanding of a designated nutrition-related concept before and after viewing the selected resource. The findings will help inform future development of AI-powered educational tools for improving public health by providing clear and accessible nutrition-related information.

Cat Caretakers' Attitudes Towards Use of Veterinary Video Telemedicine

Ashley Bidgoli
Sponsor: Carly Moody, Ph.D.
Animal Science

Companion cats face difficulties in accessing veterinary care, with 40% of cat caretakers reporting that they did not seek veterinary care each year, compared to 15% for dog caretakers. This research aimed to study companion cat caretakers' perceptions of veterinary video telemedicine, to potentially improve accessibility to care and cat welfare. Fifty-four IRB-approved quantitative survey questions were published through Qualtrics. Participants were recruited through snowball sampling, required to reside in the United States, be the primary caregiver of at least one cat, and be 18 years or older. Majority (97%) of individuals who took the survey had never experienced a video telemedicine appointment with their cat(s), however, most (85.7%) showed interest in utilizing video conferencing platforms for their felines. Additionally, 73% of participants expressed that taking their cat to the clinic is stressful, and over half believed that it would not be stressful for their cats to have a video telemedicine appointment with the veterinarian. Cat caretakers preferred a video telemedicine appointment over a clinic appointment for behavioral concerns such as destructive behaviors (69%), fears/phobias (71%), and aggression (62%.) Ultimately, video telemedicine is a great option for reducing stress related to clinic visits, specifically for behavioral appointments.

Wearable, Gaze-Directed Beamforming to Improve Speech Comprehension

Ashley Bilbrey
Sponsor: Lee Miller, Ph.D.
MED: Otolaryngology

Conventional hearing aids treat loss of hearing sensitivity; however, they also amplify all sources of sound in the environment, including noise, thus failing to address the fundamental issue. Solving this problem would ameliorate a continual, daily challenge faced by millions of Americans and would represent a profound technological advance in the field. By measuring the eye gaze of the wearer and using it as an indicator of what source of sound to amplify, we generate a facsimile of the human capability for selective amplification. This amplification can be handled through "beamforming", that is, organizing the sound into beams and then enhancing or reducing the individual components based on whether they are aligned with the eye gaze. While beamforming to enhance sound has been explored before, the scope has often been limited either by the number of microphones or by the context in which it has been used. Our development of these processes is inspired by the existing literature but will utilize more sophisticated tools and finely tuned constraints to build a system that is suitable for everyday use by individuals with hearing loss.

Analyzing the impact of instructional video style on student curiosity and confusion

Emma Bishoff
Sponsor: Marina Crowder, Ph.D.
Molecular & Cellular Bio

Students have developed a growing reliance on online educational resources as supplemental material to promote understanding in STEM classes. With many diverse options for delivering content in video form, more needs to be understood about which video styles, structures, lengths, and tones are more effective at engaging students while generating the least amount of confusion. This study aims to identify the impact of different instructional video styles on student engagement and content clarity. Students in a high-enrollment, upper-division genetics course were randomized into groups and surveyed after watching one of three video types on the same scientific content. Responses were collected to two open-ended questions on points of confusion with respect to the videos' presentation, comprehensibility of content, and overall quality. Thematic coding was utilized with a grounded coding theory process to analyze responses that resulted in emergent themes derived from the data. Responses to two questions, with a total of 604 responses, were coded into 22 categories across four emergent themes. The representation of emergent themes across the video styles will help identify video styles that are most effective at generating curiosity and understanding.

Investigating Yup'ik and Inupiat Woodworking Practices from an Archaeological Site near Shaktoolik, Alaska (1400-1900 CE)

Haley Bjorklund
Sponsor: Christyann Darwent, Ph.D.
Anthropology

Wood is uncommon in the archaeological record even though it has been a staple in the human/human-ancestor toolkit for over 300,000 years. However, permafrost deposits and glacial ice patches in the Arctic provide an exceptional environment for organic artifact preservation. With permission of the Shaktoolik Native Corporation, archaeological excavations were undertaken at the Shaktoolik Airport site in western Alaska between 2014 and 2016. The central "mound" area of the site retained excellent integrity because of permafrost, allowing for exceptional preservation of organic artifacts, including a collection of wooden tools and wood-working debris (e.g., blanks, debitage) that span a period of about 1000 years through multiple distinct cultural layers. Analysis of this wood artifact assemblage is focused on understanding driftwood selection practices, woodworking techniques, and the types of formed wooden objects present. Preliminary results indicate that approximately 20% of the collection is formed objects and 80% is woodworking debris. Of the identified formed objects, there is a predominance of hunting and fishing implements, including shafts, bow parts, arrowheads, snare components, and net floats. Initial species identification suggests a preference for softwoods (conifers) for woodworking but hardwoods (deciduous trees) for bark collection.

The Cargo Bicycle: Product Design for The Environmental Long Haul

Jordan Blandino
Sponsor: Beth Ferguson, M.F.A.
Department Of Design

With 27% of greenhouse gas emissions linked to transportation, my work aims to support mobility solutions for a low carbon future. Bicycles, and related products to normalize car-free lifestyles grow ever more prevalent. The *cycletruck* is one such option: A bicycle characterized by a smaller diameter front wheel to accommodate a large, integrated cargo platform at the front of the frame. Key benefits of this time-tested design include stable handling when fully laden and a compact overall size compared to other popular cargo bike styles. While their hauling capacity is impressive, cycletrucks ultimately lack convenient flexibility in how they can be outfitted to securely stow varying personal possessions, work equipment, luggage, or oversized loads. My project addresses this by prototyping and fabricating a modular "fence" system that provides a strong and adaptable means of safely transporting a greater range of items by bicycle. Using 3D modeling software, material testing, and hand-welded prototypes, I am coupling my design education with 12 years of experience as a bicycle mechanic – and a lifetime of using bicycles as a primary means of transportation – to create functional products that encourage sustainable living practices through important design interventions.

The Infant Gut Microbiome and the Fecal Shedding of SARS-CoV-2

Dylan Blaufus
Sponsor: David Mills, Ph.D.
Food Science & Technology

SARS-CoV-2 is shed in feces, and shedding correlates with gastrointestinal symptoms post respiratory infection clearing. The gut microbiota are associated with resistance to enteric pathogens; furthermore, COVID19 infection is associated with alterations to the gut microbiome. We therefore hypothesize that the gut microbiomes of infants born to SARS-CoV-2 positive mothers who exhibit fecal shedding will have a different microbiome than infants who do not shed the virus. We enrolled 10 infants born to SARS-CoV2+ mothers. We used qPCR on fecal RNA to test for the presence of SARS-CoV-2. 16s rRNA gene sequencing (V4 region) was used to assess the infant gut microbiome. Sequencing reads were analyzed using QIIME2. Statistical analyses were completed in R. Of the 10 included infants, 9 were clinically tested for SARS-CoV2 by nasal swab with 1 positive test result. Four infants, including the clinically positive infant, exhibited at least one episode of fecal shedding. Detectable fecal SARS-CoV-2 was associated with increased alpha diversity in the stool sample by a linear mixed effects model ($p<0.001$). We therefore conclude that fecal shedding of SARS-CoV-2 occurs even in infants who test negative on nasal swabs, and is associated with differences in the gut microbiome.

Hyperarticulation in Infant-Directed Speech vs. in Adult-Directed Speech

Clariss Bolanos
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

In infant-directed speech (IDS), parents use a slow and clear manner of speaking when talking to their infants in order to promote an enriching language-learning process. A significant component of IDS is the hyperarticulation, or the exaggeration in enunciating certain sounds in words. In comparison to IDS, acoustic features in adult-directed speech (ADS) are delivered less clearly and at a much faster rate. In this study, we will compare the phonological variation of IDS and ADS. More specifically, we will focus on the frequency of hyper-articulated or reduced “T” sound of words when adults speak to infants versus when they speak to other adults. In order to compare this variation in enunciation between IDS and ADS, parents participated in interactive tasks with their infants and an experimenter that included several target “T” words (e.g., lettuce, hat, carrot, etc.). We will analyze audio recordings from these sessions by measuring the variations in which parents pronounce these “T” words with either an exaggerated-clear or casual-reduced sound. When speaking to infants, my prediction is that parents will emphasize the hyper /t/ sounds instead of the reduced flap sound (similar to /d/), consistent with the goal of providing a clear language-learning environment.

Abstract Spaces in the Brain: Identifying a Grid-Code for Value-Based Decision-Making

Jake Blumwald
Sponsor: Erie Boorman, Ph.D.
Psychology

Many of the everyday decisions we make are encocded as 'value signals' in the brain. First shown to aid in the navigation of physical space, grid cells have more recently been shown to assist in the navigation of abstract spaces — non-physical 2D spaces — by producing a hexadirectional 'grid code'. In abstract navigation tasks, this grid code has been identified in the ventromedial prefrontal cortex (vmPFC) and entorhinal cortex (EC). We utilize novel experimental tasks to understand the neural mechanisms of value-based decision-making. Previous work involving non-human primates (NHPs) has shown 2D representation via a multiplicative term — the integration of value and probability during the decision-making process — and has demonstrated via neuroimaging analysis that a grid code is utilized in representing this space. Using regression modeling of response time and the choice itself during the novel task, we identified that individuals significantly utilize the mutliplicative term, indicating a 2D space of value and probability is being produced in humans. Given that this 2D space is necessary for the existence of a grid code, future work will leverage neuroimaging data to test if a 'grid code' is utilized in this task.

Breed Differences in Dairy Cattle’s Average Daily Performance of Abnormal Repetitive Behavior

Chloe Bolanos
Sponsor: Cassandra Tucker, Ph.D.
Animal Science

Animals in captivity may be restricted from performing a normal behavior repertoire, resulting in the performance of abnormal repetitive behavior (ARB). Recent research has shown that Jersey (J) cattle perform higher levels of ARBs compared to Holsteins (H), but these studies have not included calves and the development of their ARBs. Our study was done through live observational periods of dairy cattle (n=21 H, n=5 J) from 2 weeks of age to 24 weeks of age in 12-hour periods (08:00-20:00h), measuring two common ARBs in dairy cattle tongue-rolling (TR) and non-nutritive oral manipulation (NNOM). Differences between breeds were assessed with a paired t-test in Excel. Jersey cattle spent 7.1% and 33.5% of intervals observed performing TR and NNOM respectively. In comparison, Holsteins spent 4.5% and 27% of intervals observed performing TR and NNOM respectively. The result of this study is that Jersey calves do perform ARBs significantly more on average compared to Holsteins. These findings are important as they improve our knowledge of dairy cattle’s ARBs, which can lead to further research into reducing both breeds' performance of ARBs.

Widespread Hybridization Events Between Three Sister Species of *Anopheles gambiae C*omplex in Mali

BROOKE BORGIA
Sponsor: Gregory Lanzaro, Ph.D.
VM: Pathology, Micro, & Immun

The major human malaria vectors in Africa belong to the complex of species *Anopheles gambiae* s.l., which consists of at least nine species of mosquito. Species boundaries are generally unclear between these closely related species, and a certain level of hybridization has been detected in natural populations. For instance, hybridization rates between two members of this complex, *A. gambiae s.s.* and *A. coluzzii*, were reported as high as 20% in some areas in West Africa. Furthermore, introgressive hybridization of adaptive insecticide resistance alleles from *A. gambiae* to *A. coluzzii* has occurred multiple times across Africa, causing rapid increase of resistance to pyrethroids in previously susceptible *A. coluzzii* populations. In Mali, a massive hybridization event between these sister species was observed in 2006 in multiple locations throughout the country. Here we are investigating hybridization events in Mali that include a third species, *A. arabiensis*, pointing to considerably weaker species boundaries for this complex. We developed a genotyping assay with several species-specific informative markers that identifies the specimens' ancestry: pure species, F1 hybrid or backcross. Understanding this rate of hybridization and its consequences in natural settings is crucial knowledge for current and future malaria control and elimination strategies.

Imani Clinic's Implementation of a Hypertension Program to Improve Cardiovascular Health

Taliyah Borromeo
Sponsor: Javier Lopez, M.D.
MED: Int Med Cardiology (sac)

Hypertension (HTN) is a national burden. Forty-five percent of all Americans suffer from HTN, and only 1 in 4 of them have it well managed. In Sacramento, CA, HTN rose nearly 5% from 2020 to 2021. Low-socioeconomic and uninsured populations and people of color are disproportionately affected by HTN. Imani Clinic, a UC Davis student-run clinic located in Sacramento, primarily serves these populations who unfortunately lack stable access to healthcare. Given Sacramento's HTN burden and the need for long-term care, Imani Clinic is assessing the immediate need for HTN control amongst our patients and their motivation in participating in a free, patient-centered program that facilitates a rapid response for HTN management. We developed a pre-screening process for patient identification and recruitment using our cloud-based electronic health record and will provide cellular-enabled blood pressure (BP) devices for remote care. 81% of Imani's patients have a HTN diagnosis. Among patients with elevated BP, 63% scheduled an appointment with the first phone contact. The need for HTN management for our clinic is high. Most patients have demonstrated a willingness to participate in the program; our ongoing project is now entering the enrollment and implementation phase and results are pending.

Does Covid-19 Infection Affect Skeletal Muscle Lipid Composition?

Ayushi Borthakur
Sponsor: Tong Shen, Ph.D.
UC Davis Genome Center

Infection by SARS-CoV-2 virus causes the coronavirus disease (COVID-19), which often presents with a variety of muscle-related symptoms including aches, inflammation, loss of muscle mass, muscle weakness and muscle fatigue, known as myalgia. However, the mechanisms for the decline in skeletal muscle functionality and strength are not well understood. Being infected with COVID-19 has shown to alter lipid profiles, such as reduced serum cholesterol and elevated level of triglycerides. Here, we investigated the effects of COVID-19 infection on lipid composition of skeletal muscle using a hamster model. We performed lipidomics analysis on 30 samples from hamsters infected with COVID-19 on day 3 (n=15) and day 6 (n=15), compared to corresponding uninfected control hamsters. Preliminary results suggest that acylcarnitines (CAR) and triacylglycerols (TG 52:2:2O) were present in higher amounts in infected muscle. Such lipid changes were more drastic on day 6 of infection than day 3. Phosphocholine (PC 38:6) and sphingomyelin (SM 32:1) were present in lower amounts in infected muscle. Since lipids play crucial metabolic roles in different biochemical pathways, further study of lipid changes in COVID-19 infected skeletal muscle may give rise to novel drug targets for treatment of musculoskeletal symptoms of COVID-19.

The Mismatch Detection Complex Msh2-Msh6 Prevents Rearrangements Caused by a Highly Mutagenic Recombination Pathway Involving Divergent Repeats.

Andrew Brown
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

Msh2-Msh6 is a mismatch detection complex that regulates homologous recombination (HR), a high-fidelity DNA repair pathway that can repair DNA double-stranded breaks and ssDNA gaps. A significant fraction of endometrial, colon, stomach, and bladder cancers have alterations in the human MSH2 and MSH6. During HR, Rad51 forms a filament on the damaged ssDNA, and pairs it with an intact DNA strand that perfectly matches it. This intact DNA strand will serve as the template to fill in information lost when the DNA was damaged. Msh2-Msh6 regulates HR to prevent recombination between mismatched sequences. Recombination between mismatched sequences can cause rearrangements and information loss, but Msh2-Msh6 stops this by recognizing mismatches between the strands in the pairing intermediate, recruiting other proteins to disassemble the intermediate. We investigated whether Msh2-Msh6 also prevents rearrangements from a form of highly mutagenic recombination between repeats called multi invasion recombination (MIR) that occurs when the Rad51 filament engages two or more templates, instead of the typical one. We found that Msh2-Msh6 suppresses MIR between mismatched DNAs. Since, the resolution of multi-invasion intermediates differs substantially from that of normal recombination intermediates, our findings provide insight into the step in the recombination pathway at which Msh2-Msh6 act.

Perception and Memory of Scientific Findings in Social Media Versus News Articles

Kayla Cabanas
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Psychologists have recently been communicating scientific findings through social media, as a way to reach a wider, more general audience. Educating wider audiences on matters of scientific discovery is a matter of importance, therefore how platforms influence recognition is imperative. Trust in social media and news platforms is subjective so the perception of these platforms is crucial to access trust in the communication of science. The present study aims to assess the perception and memory of scientific findings presented in social media compared to general news articles. Participants will be asked to take a series of questionnaires assessing the perception and memory of scientific findings. Utilizing design elements to feign the presentation of social media and news articles, the present study aims to measure trust in scientific research and memory for scientific findings when research is communicated over different communication platforms. We predict that participants will have greater recall of scientific findings presented on social media than news platforms, while research findings presented on news platforms will gain more trust than those on social media posts. Our results may provide insight into more effective scientific communication.

Ligand Dependence of the Bacterial LovHK Two-Component Signaling System Within Mammalian Cells

Alexandra Calderon
Sponsor: Sean Collins, Ph.D.
Microbiology & Molec Genetics

Engineering cells to express foreign signaling systems provide researchers with new avenues for manipulating gene expression and cell behavior, with the goal of leaving native pathways and other cellular factors unperturbed. Two-component signaling (TCS) systems are a simple, but prominent, intracellular signaling mechanism in prokaryotes and eukaryotes, but not mammals. TCS's usually consist of a membrane-bound histidine kinase (HK) receptor which phosphorylates a downstream response regulator (RR) upon ligand binding to regulate gene expression. Recent studies show that transplantation of a TCS pathway into mammalian cells retains the core pathway mechanism but remains active, independent of a ligand. However, a practical synthetic signaling tool for gene regulation needs to be ligand-dependent and self-regulating. Here, we test the ligand dependence within mammalian cells of light-sensing LovHK and its regulation of its downstream elements: the response regulator PhyR and its binding partner NepR, which I artificially anchored at the plasma membrane. My hypothesis is if the pathway is ligand dependent, then PhyR signal would be recruited to the membrane-anchored NepR in the presence of light. A ligand-dependent pathway within a mammalian cell would authenticate an applicable biochemically-isolated pathway providing new sensing capabilities for targeted cell-based therapies.

Characterization of Transcriptional Responses in the Nasal Cavity From Acutely Induced Brain Inflammation

Neon Calumpang
Sponsor: Qizhi Gong, Ph.D.
MED: Cell Biology & Human Anat

Early diagnosis of neuroinflammation in the brain is challenging due to the lack of accessible and reliable biomarkers. The olfactory nerve is capable of crossing the blood-brain barrier, connecting the olfactory epithelium in the periphery to the brain directly. This link makes it a potential route for cerebral neuroinflammatory recognition. Neurons are capable of both retrograde and anterograde signaling. Retrograde signals can travel through the axon and impact gene expression in the neural soma. Therefore, we hypothesize that neuroinflammation in the olfactory bulb (OB) can be communicated retrogradely to the olfactory epithelium (OE). To test this hypothesis, we established an acute animal model by provoking neuroinflammation in the OB and subsequently evaluating cytokine expression changes in the OE. The introduction of Lipopolysaccharides (LPS), a bacterial cell wall component, via stereotaxic injection into the OB, generates a strong inflammatory response. Using this acute model, we investigated gene expression changes in the OE at various points post-injection by RT-qPCR. When compared to vehicle controls, we observed a significant upregulation of the Tnfα and IL-6 genes in the OE after 24 hours. We, therefore, propose that early detection of inflammatory neurodegenerative disease may be possible through changes in gene expression in the OE.

Cultural and Ethnic Differences in Contraceptive Attitudes and Use

Maria Campos-Gomez
Sponsor: Prabhu Shankar, M.D.
MED: Public Health Sciences

Contraceptive use is a critical aspect of women's reproductive health and family planning. However, attitudes and beliefs about contraceptive use vary widely among cultural and ethnic groups. This study aims to explore the attitudes and beliefs about contraceptive use among women of different cultural and ethnic backgrounds and to examine the impact of these attitudes on contraceptive use and access. The study will be conducted using a mixed-methods approach, including qualitative interviews and a quantitative survey. Participants will be recruited from various cultural and ethnic groups. They will be asked about their attitudes and beliefs about contraceptive use, as well as their contraceptive behaviors and experiences accessing healthcare services. The findings from this study will provide essential insights into the ways in which cultural and ethnic differences influence attitudes and beliefs about contraceptive use and how these attitudes impact the use and access to contraceptive services, which may further lead to actionable insights for care providers.

Perception and Memory of Scientific Findings in Social Media Versus News Articles

Marika Verna Candelaria
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Psychologists have recently been communicating scientific findings through social media, as a way to reach a wider, more general audience. Educating wider audiences on matters of scientific discovery is a matter of importance, therefore how platforms influence recognition is imperative. Trust in social media and news platforms is subjective so the perception of these platforms is crucial to access trust in the communication of science. The present study aims to assess the perception and memory of scientific findings presented in social media compared to general news articles. Participants will be asked to take a series of questionnaires assessing the perception and memory of scientific findings. Utilizing design elements to feign the presentation of social media and news articles, the present study aims to measure trust in scientific research and memory for scientific findings when research is communicated over different communication platforms. We predict that participants will have greater recall of scientific findings presented on social media than news platforms, while research findings presented on news platforms will gain more trust than those on social media posts. Our results may provide insight into more effective scientific communication.

Tree Ring Isotope Climate Reconstruction in Tuolumne County, California

Harry Cao
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

The purpose of this research is to create a tree-ring isotope chronology to establish a site-level climate reconstruction for a mid-elevation site in the Sierra Nevada foothills of California. The study uses stable isotope analysis of δ13C and δ18O on old-growth oak from the “Phoenix Powerhouse” archaeological site. The tree-ring isotope data from latewood provides information about precipitation and temperature patterns during the summer growing season. Specifically, the δ13C has been shown to correlate well with temperature while δ18O in wood will give information on precipitation. In this study, we use whole wood samples on a decadal scale and compare them to modern records to establish the reconstruction. This study elucidates valuable information on past climate beyond the reach of modern records. As such, it will offer valuable climate information to archaeologists working within the Sierra Nevada and enable future research into past human-environment interactions from within the study region.

Investigating the Mechanism Driving the Differential Response in Insulin Secretion Between Incretin-based Therapies for Type 2 Diabetes

Emily Cao
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

Over 37 million Americans are living with type 2 diabetes (T2D), a disease characterized by high glucose levels. An important therapy used to treat T2D are incretins, a class of hormones that amplify the amount of insulin secreted from beta cells to lower blood glucose levels. Two known incretins are glucose-dependent insulinotropic peptide (GIP) and glucagon-like peptide-1 (GLP-1). They act on their receptors on beta cells to initiate generation of cAMP, a secondary messenger downstream of incretin signaling that amplifies beta cell insulin secretion. Studies have shown that GIP-based therapies are not as effective in amplifying insulin secretion as GLP-1-based therapies in T2D patients. Preliminary data shows that when GIP is perfused, cAMP in beta cells increases and returns to baseline when the peptide is washed out, whereas when GLP-1 is perfused and washed out, cAMP levels remain elevated. I hypothesize that continued cAMP generation from GLP-1 based therapies can amplify insulin secretion. To test my hypothesis, I will perform insulin secretion assays with isolated mouse islets containing beta cells. I will compare insulin secretion levels across various incretin treatments. These experiments will be beneficial to the field of research focused on improving therapeutic outcomes for T2D patients.

Characterizing the Membrane Permeability of Serotonergic Psychedelics through Radioligand Binding Assays

Samuel Carter
Sponsor: David Olson, Ph.D.
Chemistry

Dendritic retraction of cortical neurons is characteristic of several stress-related neuropsychiatric disorders. Psychedelics, such as LSD (lysergic acid diethylamide), psilocybin (the active compound found in magic mushrooms), and *N,N*-dimethyltryptamine (DMT) resemble serotonin (5-HT) in their chemical structure and thus bind to the serotonin subclass 2 (5-HT_2) receptors and promote cortical neuron growth, which is hypothesized to explain their therapeutic utility. Interestingly, 5-HT does not promote psychedelic-like effects when administered to cortical cultures. We hypothesized that intracellular 5-HT_{2A} receptors may mediate the plasticity-promoting properties of serotonergic psychedelics, possibly explaining why 5-HT administration does not employ the same plasticity mechanisms. To test this, we used competitive radioligand binding experiments, which allow investigators to determine the binding affinity of any unlabeled, soluble drug for a receptor of interest. We conducted competitive radioligand experiments with both 5-HT and 5-methoxy-*N,N*-dimethyltryptamine (5-MeO-DMT) against [^{3}H]- lysergic acid diethylamide ([^{3}H]-LSD) using membrane preparations obtained from HEK 293T cells expressing the 5-HT2_A receptor and intact HEK 293T cells expressing the 5-HT2_A receptor. We found that 5-MeO-DMT is approximately ten-fold more potent than 5-HT at the 5-HT_{2A} receptor in intact HEK 293T. This work emphasizes that subcellular localization of G-protein coupled receptors (GPCRs) can greatly impact GPCR-mediated signaling.

More Targets to Attack Makes a Better Defense

Denise Cerna
Sponsor: Burkhard Schipper, Ph.D.
Economics

In recent years, Stackelberg security games have been used for the improvement of resource allocation in areas like counterterrorism in airport security and the protection of wildlife against poachers. In a Stackelberg security game, the defender optimally uses a mixed strategy to defend a set of targets against the attacker. The attacker then observes this strategy and decides which target to attack. In the current paper, we consider not only optimal strategies with respect to a given set of targets, but also the defender's ability to create or raise awareness of additional targets. We show that raising awareness/creating additional targets can be beneficial because the defender may introduce lower value targets that divert the adversary's attention away from other higher value targets.

Characterization of Transcriptional Responses in the Nasal Cavity From Acutely Induced Brain Inflammation

Brittaney Chan
Sponsor: Qizhi Gong, Ph.D.
MED: Cell Biology & Human Anat

Early diagnosis of neuroinflammation in the brain is challenging due to the lack of accessible and reliable biomarkers. The olfactory nerve is capable of crossing the blood-brain barrier, connecting the olfactory epithelium in the periphery to the brain directly. This link makes it a potential route for cerebral neuroinflammatory recognition. Neurons are capable of both retrograde and anterograde signaling. Retrograde signals can travel through the axon and impact gene expression in the neural soma. Therefore, we hypothesize that neuroinflammation in the olfactory bulb (OB) can be communicated retrogradely to the olfactory epithelium (OE). To test this hypothesis, we established an acute animal model by provoking neuroinflammation in the OB and subsequently evaluating cytokine expression changes in the OE. The introduction of Lipopolysaccharides (LPS), a bacterial cell wall component, via stereotaxic injection into the OB, generates a strong inflammatory response. Using this acute model, we investigated gene expression changes in the OE at various points post-injection by RT-qPCR. When compared to vehicle controls, we observed a significant upregulation of the Tnfα and IL-6 genes in the OE after 24 hours. We, therefore, propose that early detection of inflammatory neurodegenerative disease may be possible through changes in gene expression in the OE.

Chlamydomonas reinhardtii as a Sustainable Platform for the Biomanufacturing of Human Insulin

Samantha Chan
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

As the price of therapeutic proteins continues to rise, access to potentially life-saving medications becomes increasingly difficult for many patients around the world. The most common chassis organisms used to produce these proteins, such as *E. coli* and *S. cerevisiae*, utilize inputs that come at a significant environmental and economic cost. Our goal is to use *Chlamydomonas reinhardtii* to produce a recombinant proinsulin protein for use in diabetes patients. *C. reinhardtii* is a single-celled eukaryotic microalgae that has been shown to be capable of therapeutic protein production. By only requiring light, trace minerals, buffer, and a nitrogen source, microalgae provides a low-cost solution for proinsulin production that is also ecologically sustainable. We report our progress towards the design and assembly of the plasmid vector we will use to genetically engineer *C. reinhardtii*. We will also discuss the optimization of existing microalgae transformation protocols. The Algae to Insulin team is a part of BioInnovation Group at UC Davis, which provides undergraduate students the opportunity to coordinate and innovate in biotechnology research.

EEG Investigation To Evaluate Multi-Level Processing of Language in Ecologically Relevant Conditions

Cathleen Chan
Sponsor: Lee Miller, Ph.D.
MED: Otolaryngology

The neural mechanisms responsible for listening to language in a noisy environment are poorly understood. Our current EEG findings are from a larger three-part study to better quantify listening ability. Participants listen to a story with chirp speech ("Cheech"). This allows us to examine neural activity at multiple time scales. Participants report "color" words in the target story. The two condition types are a "single speaker" playing a target story and a "dual speaker" playing a target and distractor story concurrently. We observed significant EEG component differences at peak amplitudes after chirp onset of "color" words for the single talker compared to the dual talker conditions. In auditory brainstem responses (ABR), reflecting the early encoding of sound, we observed more negative peaks before and after Wave V. The Middle Latency Responses (MLR), which corresponds with the transmission of speech information from lower to higher levels of processing, exhibited a more negative Na component. The Late Latency Responses (LLR), historically associated with higher cognitive processes, showed a more positive Pb component peak amplitude. multilevel component amplitude differences could be indicative of additional cognitive demand of listening to speech with noise, when compared to listening with no distractions.

Rule of Law in the Judiciary and State Respect for Human Rights

Ashley Chan
Sponsor: Heather Elko, Ph.D.
Political Science

Examining the relationship between rule of law and state respect for human rights is not new. However, political scientists studying this relationship have found conflicting results. This project contributes to the debate by examining how a state's rule of law in its judiciary influences compliance with multiple different types of human rights, and how it does so in different ways. I posit that (1) the absence of judicial corruption and (2) a judiciary with greater independence and an increased ability to exercise effective checks on the other two branches of government will be associated with an increased state respect for the freedom from disappearance, the right to assembly and association, and the right to opinion and expression. I do not expect rule of law in the judiciary to be associated with state respect for the freedom from torture. I evaluate these hypotheses using data from the Human Rights Measurement Initiative and the World Justice Project Index across 21 countries from 2018 to 2021. My findings provide some support for my argument: the absence of judicial corruption and greater judicial independence are associated with increased state respect for all four human rights.

Investigating the Force-Sensitive Properties of LIM Kinase 1 and 2

Julian Chang
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Mechanotransduction plays a crucial role in cell homeostasis and signaling pathways. Studies have shown that some LIM proteins - which contain zinc-binding LIM domains - respond to physical forces by binding to fibrous structures in cells. LIMK1 and LIMK2 are LIM kinase proteins involved in tumor progression in cancers. Here, we evaluate the force-sensitive properties of LIMK1 and the LIMK2 isoforms 2a and 2c. MDCK mammalian cells were transfected with full-length LIMK1, LIMK2a, and LIMK2c, and were physically stimulated. Results from these experiments show that LIMK1 accumulates at higher levels than LIMK2a and LIMK2c, forming fibrous structures when cells are stretched. Additional cells were transfected with only the LIM domains of these proteins. LIMK1's LIM domain exhibited greater levels of accumulation than the LIM domains of LIMK2a and LIMK2c. These results not only suggest that LIMK1 is more force-sensitive than LIMK2a and LIMK2c, but they also indicate that LIMK1's LIM domain is responsible for its force-sensitive behavior. These results may have implications for how LIMK1 and the isoforms for LIMK2 affect cancer progression and tumor cell activity.

Pulmonary Effects Of Silver Nanoparticle Preparations By Size, Shape And Chemical Composition

Pernelle Chan
Sponsor: Kent Pinkerton, Ph.D.
VM: Anat Physio & Cell Biology

Silver nanoparticles (Ag NPs) can be found in hundreds of consumer products, medical equipment/supplies, and public spaces. However, questions remain regarding the risks associated with Ag NP exposure. To better understand these nanomaterials, this study examined Ag NPs with varying sizes and chemical composition. Three types of Ag NPs were tested: 20 nm (C20) and 110 nm (C110) citrate-stabilized NPs, and 50 nm silver silicate (AgSiO2) NPs. Male rats were instilled intratracheally with Ag NPs (1.0 mg/kg bodyweight [BW]) using 20 nm, 110 nm and AgSiO2 (50 nm). Bronchoalveolar lavage fluid (BALF) and lung tissues were obtained 1-day post-exposure for analysis of BAL cells and histology. To visualize Ag NPs in BAL and lung tissues, autometallography was implemented. All Ag NP types induced elevated numbers of polymorphonuclear cells (PMNs), eosinophils and lymphocytes in the BALF. Autometallography demonstrated uptake of all Ag NPs predominantly in alveolar macrophages of the BAL. Histology of lung tissues confirmed the rapid uptake of Ag NPs in the airway epithelium, underlying submucosa and interstitial spaces with the aid of staining by autometallography. These findings show Ag NP preparations produce mild inflammation with uptake in alveolar macrophages, airway epithelium and the underlying interstitial tissues.

Finding Minimal Step Confirmations of Biological Two-Component Links

Jonathan Chang
Sponsor: Mariel Vazquez, Ph.D.
Mathematics

The structure of links is present in biology such as in DNA replication and polymers. The finding of links in biology draws a connection to the mathematical field of topology. When studying and developing a proper model for these objects, it is fruitless to take projections or images of them as there are numerous projections for a singular object and formalizing the topology will be incredibly challenging. Thus, we discretize the amount of projections through modeling and representing them in the simple cubic lattice. An object in the simple cubic lattice must have vertices at integer coordinates, the edges must be a unit length and can only form angles of 90 or 180 degrees, and all vertices must be connected and self-avoiding A two-component link is when there are two parts that are intertwined such that you cannot separate them without cutting. We utilize a computer-assisted approximation for the minimal step confirmations using a markov chain, Monte-Carlo sampling method, the BFACF algorithm. This will perform equivalent moves on a knot configuration while preserving its unique topology with the intention to reduce the amount of edges. Understanding the lattice model for links is crucial in order for other biological applications.

Optimizing Cell Viability in Cartilage Tissue Engineering for The Treatment of Osteoarthritis

Enmian Chang
Sponsor: Natalia Vapniarsky Arzi, D.V.M.,Ph.D.
VM: Pathology, Micro, & Immun

Cartilage tissue's limited regeneration ability can result in irreversible cartilage loss and joint inflammation. Our lab successfully manufactured cartilage constructs as a potential solution using a scaffold-free tissue engineering approach. During the process, chondrocytes (cells in healthy cartilage) are expanded in monolayer before they're seeded in suspension cultures for eleven days and subsequently seeded at a high cell density into agarose molds to form cartilage constructs. However, more than 50% of chondrocytes are lost by the end of the suspension culture. The mechanism of cell death is unknown. We hypothesized that cell death is due to anoikis, and viability could be improved by supplementing the culture with apoptosis inhibitors. Using a full-factorial design, we tested the effects of adding apoptosis inhibitors (IGF-1 and z-VAD-FMK), to suspension culture media. We determined that IGF-1 supplementation significantly improved cell viability after two days of culturing but had no effect on cell viability over ten days. We are now also exploring the effect of IGF-1 on caspase-3 (major apoptosis enzyme) activity using a luminescence assay and quantifying caspase-3 gene expression with qPCR. In summary, this project will elucidate the mechanism of cell death and aid in cell preservation in our quest for cartilage tissue-engineering.

Developing a Workflow for the Production and Purification of Cel7A Enzyme From *Trichoderma reesei* JLT102a

Shauna Chen
Sponsor: Tina Jeoh, Ph.D.
Biological & Ag Engineering

Cel7A is an enzyme that breaks down cellulose, the main component in plant cell walls, into soluble sugars. The fungus, *Trichoderma reesei*, produces several cellulase enzymes, including Cel7A. This project establishes a workflow for producing purified Cel7A from a specific strain of this fungus, JLT102a, that is engineered to constitutively express Cel7A where expression of other cellulases are suppressed. To maximize Cel7A expression while minimizing harmful proteolytic activity, the growing conditions for JLT102a require a glucose media maintained at a temperature not exceeding 30°C and sufficient aeration. The purification of Cel7A starts with filtering the solid fungus from the culture broth. Next, the clarified broth is concentrated down to smaller volumes using tangential flow filtration. The final stage of purification involves two types of column chromatography. Column chromatography separates the enzyme from other components based on chemical interactions, such as hydrophobicity and isoelectric point (pI). At different stages of the workflow, Cel7A enzyme activity was tracked using activity assays and gel electrophoresis. Having available purified Cel7A allows for further research on its role in the breakdown of cellulose into biofuels and bioproducts.

Zebrafish Models of Primary Microcephaly and Microcephalic Osteodysplastic Primordial Dwarfism Type II

Monica Chao
Sponsor: Li-en Jao, Ph.D.
MED: Cell Biology & Human Anat

The centrosome acts as the main microtubule-organizing center in animal cells. Its function is important for spindle organization and chromosome segregation. Intriguingly, primary microcephaly, a disorder of brain development that results in smaller brain, is caused by recessive mutations of several genes that encode centrosomal proteins. It is unknown how centrosomal dysfunction could lead to brain-specific defects such as microcephaly. Given the high degree of conservation between human and zebrafish genes, the fast embryonic development, and the ease of genetic manipulation and phenotypic analyses, we use the zebrafish model to study the etiology of primary microcephaly and related disorders. Here we used the CRISPR technology to mutate cep215 and pcnt, two centrosomal genes whose human orthologs are linked to primary microcephaly and microcephalic osteodysplastic primordial dwarfism type II, a disorder characterized by microcephaly and short stature. We have developed a genotyping strategy to quickly screen for wild-type, heterozygous, and homozygous mutant fish after fin biopsy. We are in the process of characterizing the cellular and developmental phenotypes of these mutant embryos. We believe that these zebrafish mutants we generated would be valuable models to study the pathogenesis of tissue-specific phenotypes caused by centrosome defects.

Student Future Academic Performance After Being Placed on Dean's List

Zhilu Chen
Sponsor: Giovanni Peri, Ph.D.
Economics

This study utilizes the fuzzy regression discontinuity design to examine the causal impact of being placed on the Dean's list on future student academic performance. The purpose of this study is to investigate if being on the Dean's list leads to improved academic outcomes and to take into account individual differences in responses to such incentives. The study measures academic performance through various dependent variables such as subsequent GPA, dropout rate, time to graduation, and credits taken the following year. It also considers heterogeneity in the effects by examining the impact of previous academic performance, gender, and native language. The results of this study have significant implications for our understanding of the effects of positive education incentives on student motivation and academic achievement. Positive education incentives have the potential to motivate students and improve academic outcomes, but individual responses to these incentives may vary. This study can inform education policy decisions on the best ways to use incentives to promote student success. The use of fuzzy RDD allows for a rigorous examination of the causal effect of being placed on the Dean's list on academic performance, taking into account the uncertainty of the threshold for placement on the list.

Associations between Environmental Toxins, Inflammation, and Depressive Symptoms in Adolescence

Tiffany Chen
Sponsor: Paul Hastings, Ph.D.
Psychology

Environmental toxins' impact on public health is a serious concern, especially in ethnically and economically minoritized populations. Inflammation is a central mechanism by which toxins negatively affect health. While inflammation is an adaptive response to acute stressors or disease, chronic low-grade systemic inflammation can lead to mental health disorders. More specifically, studies have shown that heightened inflammation in response to environmental toxins can lead to depression. Previous research have shown that water contaminants, such as lead, nitrate, and arsenic, are associated with higher levels of proinflammatory cytokines (CITES) and with depressive symptoms. In this study, 229 low-income Mexican-origin adolescents in northern California were assessed for cumulative exposure to air toxins and 13 water contaminants between the ages of 10-16 using publicly available data from state agencies. At age 17, adolescents' immune system reactivity, as indicated by IL-6, was measured in the lab following a social exclusion challenge (Cyberball) relative to baseline levels. They also reported their depressive symptoms concurrently and two years later. Previously, we found that lower drinking water quality significantly predicted higher IL-6 reactivity. Our future research will investigate whether increased inflammation from water toxin exposure is related to depression.

Promoter optimization in delivery of multi-unit CRISPR system for RNA knockdown in Angelman Syndrome

Harry Chen
Sponsor: David Segal, Ph.D.
MED: Pharmacology

Angelman Syndrome (AS) is a rare neurodevelopmental disorder that arises from a dysfunctional or missing maternal *UBE3A* expression in the brain. This causes severe intellectual and motor disability, and there is currently no cure or effective therapeutic. Due to a brain-specific long non-coding RNA transcript known as *UBE3A-ATS*, paternal *UBE3A* is silenced. In clinical trials of antisense oligonucleotides, brain *UBE3A* expression has been shown to be restored through the reactivation of the paternal allele. We have previously shown that the CRISPR-Csm complex shows greater precision than other previously described RNA targeting tools. In this study, we compared the expression levels of three different promoters that express the Csm system in lentivirus plasmids. In each HEK293T cell culture, three separate plasmids were delivered: first, a plasmid that produced the target RNA: *UBE3A-ATS* fused to the fluorescent protein GFP, then two plasmids that express the Csm system fused to the fluorescent protein mCherry. The Csm system was split into two plasmids due to packaging limits. By analyzing the fluorescence levels of different wavelengths, we can analyze the efficiency of the different promoters. Our results will then help with the translation of this work into human AS iPSC-derived neurons.

Light-Enhancement in Catalytic Activities of PLP-Dependent Enzymes

Yuezhou Chen
Sponsor: Michael Toney, Ph.D.
Chemistry

Pyridoxal 5'-phosphate (PLP)-dependent enzymes represent about 4% of all known enzyme activities. PLP-dependent aspartate aminotransferase (AAT) was previously found to exhibit enhanced catalytic activity with L-Asp upon exposure to blue light. The light enhancement is attributed to the photoinduced deprotonation of Cα-H on the external aldimine intermediate to form the quinonoid intermediate, a partially rate-limiting step in the enzymatic catalysis. This project attempts to understand how general this phenomenon of light-enhanced catalysis is with other PLP-dependent enzymes and their reactions, since they share the similar chemistry. The five enzymatic reactions being explored include AAT with cysteine sulfinate, dialkylglycine decarboxylase (DGD) with aminoisobutyric acid (AIB), DGD with L-Ala, wild-type alanine racemase (AR) with D-Ala, and R219E AR with D-Ala. Steady-state kinetics and stopped-flow kinetics are used to observe catalytic activity increases after exposure to blue light. With the generalization of this light-enhanced kinetics, the conclusion may impact enzyme kinetics in plant biochemistry, animal biochemistry, human medicine, pharmacology, and many related applied fields due to the abundance of PLP-dependent enzymes in nature.

Influence of Nitrogen Availability on Early Development in a Native and Invasive Forb

Timothy Chen
Sponsor: Jennifer Funk, Ph.D.
Plant Sciences

Nitrogen, an essential plant nutrient, is important in grassland competition dynamics. Nitrogen-based fertilizers are commonly applied, though most of the current literature on grassland species focuses on community effects of nitrogen, which leaves out the detailed morphological effects of both nitrogen addition and removal in stages of early growth. I compared the effect of nitrogen addition and limitation on the above and below ground traits of California native, *Hemizonia congesta* (hayfield tarweed), and its non-native counterpart, *Centaurea solstitialis* (yellow starthistle). This study involves observing germination and trait development for 10 weeks, using trait differences as proxies for fitness. I predict *C. solstitialis* will have greater biomass, height, and leaf area under the high nitrogen treatment, but that *H. congesta* will exhibit faster and more expansive root growth in the low nitrogen treatment. This study will shed light on how native and invasive species respond to varying nitrogen availability, informing nitrogen's role in early plant establishment in California grasslands. For grassland managers, trait differences in response to nitrogen availability could inform timing decisions of when to apply or immobilize nitrogen, utilizing it as a tool to limit the spread of *C. solstitialis* or promote the growth of natives such as *H. congesta*.

Seasonal Dynamics of Methane Emissions and Their Microbial Controls in the Amazon Rainforest

Grace Cheng
Sponsor: Jorge Rodrigues, Ph.D.
Land Air & Water Resources

The Amazon rainforest is a hotspot of biodiversity and biological activities, partaking in a major role in nutrient cycling and the global cycling of greenhouse gases. Recently, the Amazon floodplain has been reported to emit as much methane as all of Earth's oceans combined, however, the underlying microbial and physicochemical interactions remain elusive. Thus, the objective of this study was to determine how the interactions between microbial communities and physicochemical properties regulate methane emissions in the Amazon rainforest during different seasons. We collected five sediment samples from four different areas within the Arapixuna region, State of Para, Brazil, an intersection between the Amazon and Tapajos Rivers, during dry and wet seasons in 2019. DNA samples were extracted and submitted for the 16S rRNA gene and whole genome (metagenomics) sequencing, and sediment samples were used for metabolomic analysis. These molecular analyses will provide a genetic basis for understanding the variation in microbial community structure and their metabolites. Additionally, the measurements of carbon and nitrogen compounds concentrations were determined and will be used for analyzing the potential correlations with the genetic data. Ultimately, all these datasets will be compiled and analyzed to explain how microbial methanogenesis in wetlands is controlled by environmental changes.

The Role of DAXX in Histone H3.3 Incorporation and piRNA Pathway During Meiotic Sex Chromosome Inactivation

Sonia Cherkaoui Jaouad
Sponsor: Satoshi Namekawa, Ph.D.
Microbiology & Molec Genetics

About 9% of men in the US experience infertility problems. Meiotic Sex Chromosome Inactivation (MSCI) is an essential event in spermatogenesis, and disruptions to this programmed silencing of the XY chromosomes lead to infertility. During MSCI, histone H3 proteins are replaced with a histone variant H3.3. At that time, an H3.3 specific chaperone DAXX is highly expressed and accumulated on the sex body in the pachytene spermatocytes. However, the role of DAXX during MSCI remains unknown. A previous study showed that an H3.3 knockout leads to downregulation of the piRNA pathway which is responsible for the silencing of the retrotransposons. Based on our preliminary data and the literature, we hypothesized that DAXX mediates H3.3 incorporation and retrotransposon silencing on the sex chromosome during MSCI. To understand the mechanism of H3.3 recruitment, we generated *Daxx* conditional knockout in germline and demonstrated that the absence of DAXX affects H3.3 incorporation. Next, we evaluated the localization of piRNA pathway proteins and the expression of retrotransposons by Immunohistochemistry (IHC). Results showed that the absence of DAXX does not significantly change the expression of the piRNA pathway components and retrotransposons. We concluded that DAXX regulates H3.3 incorporation, but not directly involved in the piRNA pathway.

Analysis of Morphological Changes In Pistachio Cultivars And Their Relation To Endocarp Split

Alisa Chernikova
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

The pistachio (*Pistacia vera*) is a popular crop not only because of its nutritional benefits, but also because of its relative tolerance to drought and salinity stress. The pistachio pericarp consists of the hull (exo-mesocarp) and shell (endocarp) that surround the edible seed (kernel). Currently, the mechanisms behind shell and hull split are largely unknown. Goldens Hills and Kerman are two widely grown pistachio cultivars that have relatively high split and relatively low split, respectively. Previous research suggested that this differential split rate may be a result of pericarp thickness and dorsal suture angle along with other structural features of the pistachio fruit. In this study, we propose a possible model for hull and shell split. We found that a thinner pericarp and wider kernel girth could contribute to Golden Hills' higher split rate, while a thicker pericarp and potentially more rigid shell may contribute to Kerman's lower split rate.

Phenotypic plasticity in shell shape varies in the marine snail (*Nucella canaliculata*) across California and Oregon coasts

Yujin Cho
Sponsor: John Stachowicz, Ph.D.
Evolution & Ecology

Phenotypic plasticity occurs when a genotype expresses different phenotypes when exposed to different conditions. Experiments show that the marine snail (*Nucella canaliculata*) displays plasticity in shell shape and thickness depending on predator presence. I aimed to determine whether differences in the physical or biotic environment sites along the California and Oregon coast would produce phenotypically different snails. We collected wild snails from five coastal locations, then scanned and morphometrically analyzed them using image analysis software. This produced relative warp scores for all of the snails, describing their general shape (length vs width; shape and size of shell opening) while controlling for differences in size and orientation. I then took size measurements, which allowed me to quantify the exact morphometric changes found in the relative warp analysis. I hypothesized that there would be observed phenotypic differences between California and Oregon sites due to differences in expected predation pressure and food supply. Although I did find that shell shape varied across populations, there was no consistent difference in shell shape between Oregon and California sites, suggesting that determinants of shell shape are more complex in the field than in laboratory experiments.

A Case Study Using California Olive Pomace for Potential Valorization Strategy of Olive Oil Industry Byproducts by the Application in Avocado Oil Based Cosmetics

Yongju Cho
Sponsor: Selina Wang, Ph.D.
Anr Food Science & Technology

This research project aims to assess the effectiveness of California olive pomace extract in avocado oil-based cosmetic cream. The resin-purified olive pomace extract (RPOPE) with 303 mg gallic acid equivalents (GAE)/ g was used as a natural antioxidant. Four cream sample groups were formulated: negative antioxidant control without antioxidants, positive antioxidant control with 70 ppm of EDTA, and two experimental groups with 400 ppm and 800 ppm GAE of RPOPE. All samples were subjected to the treatment of 1ppm ferrous iron as prooxidants and were incubated in the dark at 35 ^{O}C for 2 weeks. Their L* a* b* color values were analyzed at week 0 and week 2. As for the L* value, the control groups exhibited no significant difference with average values, whereas the value displayed an inverse relationship with RPOPE concentration. On the other hand, A* and b* values increased with RPOPE concentration. The antioxidant capacity of the extract is evaluated with DPPH assay, suggesting that RPOPE has higher antioxidant activity than the control groups for both week 0 and week 2. Overall, the project demonstrates a potential valorization strategy of olive pomace as a value-added ingredient, thus improving the sustainability of the olive agricultural industry.

Investigation of Deficit Irrigation Treatments on Olive Oil Quality

Caitlin Chua
Sponsor: Selina Wang, Ph.D.
Anr Food Science & Technology

In California, climate change and groundwater management policies have evolved within the last two decades as the state faces increasing weather extremes in addition to hotter and drier seasons. Growers have begun to change when and how much irrigation water is applied through deficit irrigation. We investigated the effect of deficit irrigation treatment on olive oil quality after fall harvest by taking measurements of moisture content, fat content, total phenol content (TPC), ultraviolet absorption, induction time, and ratios of 1,2 to 1,3 diacylglycerols (DAGs). Four irrigation treatments used were 1) A: control group with 100% of water application throughout the season; 2) B: 80% of water application throughout the season; 3) C: 25% of water application during pit hardening; and 4) D: 25% of water application during pit hardening and 125% water application the rest of the season. We found significant differences between the four irrigation methods in fat content, TPC, DAGs, and primary oxidation but not in moisture content and secondary oxidation.

Force Controlled Robotic Manipulation for Peeling and Separating Nonrigid Magnetic Build Plate

Ian Chuang
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

As part of a robotic manufacturing scenario proposed by the HOME Space Technology Research Institute, we demonstrate a fine manipulation robotic task to peel off a nonrigid build plate from a magnetic surface using force control. In this scenario, a metallic component is 3D printed on a build plate and the plate is removed from the 3D printer bed and transported by a robotic agent into a furnace for sintering. However, removing the magnetically attached build plate is challenging for manipulators since the plate is deformable and requires fine force control to peel off. Research on manipulating deformable objects, especially with tasks like peeling, is limited. To address this problem, we propose the use of a cartesian compliance controller and an optimal arm trajectory that considers the dynamics and bend of the plate to gently peel it off from the 3D printer bed. Using a UR5e robotic arm and its force torque sensor, we demonstrate an effective method of removing the build plate with minimal force, without causing damage or stress to the plate or the 3D printer. The results of this work will be integrated with the other components of the proposed scenario, and presented for NASA review.

Presence of Tick-Borne Diseases in Lagomorphs and Their Ticks From Northern Baja California, Mexico

Claire Chung
Sponsor: Janet Foley, D.V.M.,Ph.D.
VM: Medicine & Epidemiology

Lagomorphs— rabbits and hares— are hosts for multiple tick-borne zoonoses, notably *Babesia* species and *Francisella tularensis*, which are an apicomplexan parasite and bacteria, respectively. *Babesia* causes babesiosis and *F. tularensis* causes tularemia, and both diseases may be fatal in humans, especially immunocompromised individuals. Using polymerase chain reaction (PCR) and DNA sequencing, we tested blood samples and ticks collected from desert cottontail rabbits (*Sylvilagus audubonii*) and hares (*Lepus californicus*) in two locations in northern Baja California, Mexico for both *Babesia* and *F. tularensis*. The results of this study will help inform whether lagomorphs and their ticks pose a zoonotic disease risk to people in the region. As people further develop previously uninhabited areas, the risk of exposure to vector-borne zoonoses is expected to increase in the future. This study provides data on the presence of zoonotic diseases at the intersections of wildlife and human health, and contributes to data needed for surveillance and management of disease spread.

Who Moved in Next Door; Do Giant Kangaroo Rats (*Dipodomys ingens*) Spatially Arrange Themselves to Avoid Inbreeding?

William Claflin
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Veterinary Genetics Lab

Over the last century, California's Central Valley has undergone large-scale agricultural development fragmenting the desert ecosystem and putting many species, such as the Giant Kangaroo Rat (*Dipodomys ingens*), at risk of extinction. Giant kangaroo rats have been found to be a dispersal-limited or philopatric species with a normal distribution range of about 700 meters. This study aimed to identify dispersal behaviors that may affect mate choice and whether the rats selectively surround themselves with unrelated or less related potential mates. Fecal samples were collected from the Carrizo Plain in the southern Central Valley, collected from 2 trapping grids approximately 100 meters apart. We genotyped individual samples at 15 microsatellites to assign samples to distinct individuals and assess relatedness amongst identified kangaroo rats. Out of 200 fecal samples, we were able to successfully genotype 145 giving us a genotype success rate of ~75%. We identified 83 distinct individuals from the genotyped samples. Finally, we examined the relatedness among individuals and their geographic position to determine the species' population structure. Evidence of geographic organization of related individuals was found between sampled individuals, but more research is required to determine possible sex biases occurring in kangaroo rat dispersal.

Investigating Potential Conserved Roles for Thyroid Hormone and Its Receptors in Opsin Gene Regulation During *Xenopus laevis* Metamorphosis

Jada Co
Sponsor: John Furlow, Ph.D.
Neuro Physio & Behavior

Previous studies in human organoids and developing mice, chickens, zebrafish, and salmonids have identified how local thyroid hormone (TH) action through thyroid hormone receptors (TRs; in many instances identified as the TRβ isoform) controls retinal cone opsin expression, and how various players in the TH signaling pathway are expressed in waves during retinal development in general. Our research with the model amphibian *Xenopus laevis* is addressing the questions of a) when in larval and juvenile development do visual pigment types change for a new adult visual system, b) whether these changes regulated by TH, the driver of metamorphosis, and c) what happens to any visual pigment developmental expression patterns in *X. laevis* lacking a functional TRβ gene? Exploiting our newly developed genome-edited line carrying inactivating mutations in all copies of the TRβ gene in the tetraploid *X. laevis* genome, our experiments are establishing the roles of TH and TRβ in visual pigment expression changes during *X. laevis* metamorphosis. Our studies are contributing to the longer term goals of determining the mechanisms of TH disruption by environmental chemicals in perinatal development, including impacts on color vision and other retinal disorders across all vertebrates including humans.

The Effects of Saccade Sizes on the P1 Event-Related Potential in a Posner Cueing Paradigm

Alexander Cohen
Sponsor: George Mangun, Ph.D.
Psychology

The Posner cueing paradigm requires participants to maintain central fixation while attending to peripheral stimuli, allowing for the investigation of covert spatial attention. Accordingly, the P1 ERP has been shown to be sensitive to attentional manipulations, potentiating on attended versus unattended trials at electrode sites contralateral to the locus of attention– known as the P1 attention effect. Despite participants sustaining central gaze, small eye-movements, known as microsaccades, nonetheless occur. Previous research suggests an increase in V4 neuronal firing rates when microsaccades are directed towards versus away from an upcoming target. While microsaccades have typically been defined as less than 1° in visual angle, recent research suggests that microsaccades may not be functionally different from larger saccades. Thus, larger eye-movements may similarly result in early, visual-area neuronal enhancement, which could be observed as a P1 potentiation. Through the utilization of simultaneous electroencephalogram (EEG) and eye-tracking, the current study aims to compare the P1 ERP on trials with three classes of eye-movements: full saccades (>5° of visual angle), middle-ground saccades (2°-4°), and microsaccades (<1°). While data collection and analysis are ongoing, EEG-eye-tracking data investigating the extent to which varying sizes of saccades affect attention on early visual ERP components will be presented.

The Role of Duplicated Thyroid Hormone Receptor Beta Genes in *Xenopus laevis* Metamorphosis

Ryan Cometa
Sponsor: John Furlow, Ph.D.
Neuro Physio & Behavior

Thyroid hormone (triiodothyronine [T3]) is essential for development throughout all vertebrates. Anuran metamorphosis has served as a valuable model for thyroid hormone's influence on development due to its conservation in vertebrates and the accessibility of its embryos for experimental manipulation compared to mammals. Earlier studies have begun to explore the purpose and functionality of the two thyroid hormone receptor (TR) genes found in vertebrates, with TRα regulating hind limb development and TRβ regulating notochord reabsorption. It has also been found that one species, *Xenopus laevis,* a naturally occurring allotetraploid, has duplicated copies of both TR genes. This study hopes to characterize the purpose of these copies - specifically in TRβ - through precocious and natural metamorphosis assays. Current findings are showing a similar growth pattern between wild-type and TRβ KO individuals through stage 55 (early hind limb development) in natural metamorphosis. Precocious-metamorphosis assays have shown that total TRβ knockouts as well as the homozygous L knockouts do not have notochord resorption. Through these studies, we will increase our understanding of the unique roles of TRβ, especially in tail regression, as well as begin to understand the potential evolutionary benefits of the whole genome duplication observed in the *Xenopus laevis* population.

Investigating Inducible Gene Localization in Mutants of Nuclear Pore Complex Proteins in *S. cerevisiae*

Kalyn Concepcion
Sponsor: Benjamen Montpetit, Ph.D.
Food Science & Technology

Regulated gene expression is critical to cellular function and evidence has shown that organization of chromatin in the nucleus contributes to regulation of transcription. For example, association of chromatin with the nuclear pore complex (NPC), a large assembly in the nuclear envelope, has been shown in transcriptionally active inducible genes. We are interested in further exploring the mechanisms controlling localization of transcriptionally active genes at the nuclear periphery in *S. cerevisiae*. For this, we are using a copper inducible gene array, which we have preliminary found shows a bias to peripheral localization upon induction via live imaging. In strains harboring these arrays we have generated deletions of several NPC proteins shown to play a role in the physical association of other inducible genes. Gene positioning has been assessed using fluorescence in situ hybridization and live cell imaging. We are quantifying nuclear localization in these deletions to examine if there is a disruption, which would suggest a loss of physical gene tethering upon activation. Furthermore, we are investigating the effect of this change in gene localization on transcriptional output. The results of these experiments will further understanding of the role of positioning in regulating transcription.

The Impact of Chd8 Mutation Across Transcriptional and Anatomical Axes in Cerebellar Autism Spectrum Disorder-related Neuropathology

Melissa Corea
Sponsor: Alexander Nord, Ph.D.
Neuro Physio & Behavior

Little is known regarding the neuropathology of Autism Spectrum Disorder (ASD) in the cerebellum, a brain region associated with motor function and higher-order cognitive functions. ASD is a broad neurodevelopmental disorder that affects social, cognitive, and behavioral functions. Previous studies have validated that a 5-basepair deletion in the CHD8 gene results in cognitive impairment in mice. We hypothesize that such a mutation will disrupt cerebellar neuroanatomical processes and gene expression, resulting in ASD-like phenotypes, specifically displaying abnormal Purkinje neuron positioning. Cerebellum sections from postnatal day 12 WT and *CHD8^5bp-del* mice were collected and stained using immunohistochemistry (IHC). A calbindin conical marker was used to stain Purkinje neurons, which are essential to signal processing and outputs in the cerebellum, and imaged using fluorescent microscopy. Results showed no significant difference in how Purkinje neurons were organized between WT and *CHD8^5bp-del* mice. Future projects are set to examine the dendritic branching of Purkinje neurons to reveal the molecular pathways that impact cerebellar transcriptional regulation. All in all, this study provided initial insights regarding the role of CHD8 in cerebellar development and ASD-related neuropathology.

Golden Lettuce: Improving Carotenoid Content in Lettuce (*Lactuca sativa*) via Gene Overexpression

Isabel Coughlan
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

Lettuce (*Lactuca sativa*) is one of the most consumed leafy greens in the United States, however it also happens to have one of the lowest nutritional densities when compared to other common vegetables. Carotenoids, which are essential precursors to vitamin A, compose a significant amount of this nutritional density, yet only amount to about 25% of the carotenoid content found in other leafy greens. The carotenoid biosynthesis pathway has been well-studied in other organisms, however only a few studies have shown constitutive expression of carotenoid biosynthesis (CB) genes to increase carotenoid content in vegetative tissue. To identify the role of these genes in lettuce, we have developed transgenic lines that constitutively express three separate genes: *LsDXR*, *LsDXS* and *LsLCYB*. As part of a larger study, I will be targeting upstream open reading frames (uORFs) occurring in the 5' untranslated region of these key biosynthesis genes with CRISPR/Cas9 to test the impact on expression and overall carotenoid content. Additionally, I will be functionally characterizing selected carotenoid biosynthesis genes in lettuce, which will discern the mechanics of carotenogenesis as a whole. Ultimately, increasing an understanding of these important regulators in carotenoid biosynthesis will help engineer more nutritious lettuce in the future.

A Gene-Editing Approach to Extend Tomato Fruit Shelf-Life Without Impacting Fruit Quality

Daphne Crum
Sponsor: Barbara Blanco-Ulate, Ph.D.
Plant Sciences

California grows approximately 90% of U.S. tomatoes (*Solanum lycoperscium*). Fruit biology and quality research together with new breeding and gene-editing technologies are necessary to develop fresh market tomatoes with excellent quality and shelf-life. Polygalacturonase (PG) and Pectin Lyase (PL) are two enzymes highly produced in ripe tomatoes and are responsible for degrading pectin, the main component of fruit cell walls. Pectin degradation is the main process that leads to fruit softening. CRISPR Cas-9 gene-editing technology has been used to knock out PG and PL in separate tomato lines, and PL CRISPR knock-out (ko) fruits exhibited longer shelf-life. Our research aims to evaluate the interactive effects of PG and PL on fruit quality attributes of fresh market tomato varieties using a double PGxPL CRISPR ko line. In this project, I identified double ko tomato plants via PCR and gel electrophoresis, and I assessed shelf-life qualities like water loss and firmness in tomato fruits. In comparison to single ko lines, we found that double ko tomato fruits exhibit longer shelf-life without significantly impacting fruit quality, suggesting strong interactions between PG and PL. I will continue to support the project by measuring pectin degradation in each line on a molecular level.

Effect of Collagen Architecture on Myoblast Migration

Tyler Cunningham
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MED: Physical Medicine & Rehab

Myoblasts regenerate damaged muscle tissue. The migration of myoblasts through extracellular matrices (ECM) is important for regeneration. In fibrotic conditions, the ECM is modified through excessive collagen production and increased cross linking. I hypothesize in ECM architecture mimicking fibrosis, myoblast migration is compromised. C2C12 tdTomato cells, an engineered murine myoblast cell line, which stably expresses a fluorescent protein allowing live cell tracking, were used. Cellular responses to changes in collagen architecture - collagen's cross linking, fibril size, and concentration - were recorded. Cells were seeded onto 2D/3D collagen gels. Live cell imaging was conducted over 6 hours at 30 minute intervals. Cell tracker software calculated cellular responses. Preliminary data indicated in 2D, collagen concentration didn't substantially impact myoblast migration. Cells migrated at 0.114275812 µm/min at 3 mg/mL and remained constant with similar directional persistence through different concentrations. However, cell area increased with concentration. In 3D, cells migrated in the x direction at 0.05548910 µm/min and z direction at 0.064991076 µm/min, and, with increasing concentration, the speeds decreased. More data is needed to determine how collagen architecture impacts myoblast migration. This will indicate whether targeting collagen architecture is a viable way to enhance myoblast migration and regeneration in fibrotic muscle diseases.

Accessibility Concept: The Influence of Chronic and Temporary Accessibility on Social Judgment

Joyan Cyrus
Sponsor: Jeffrey Sherman, Ph.D.
Psychology

The concept of accessibility has long been studied to explore its impacts on social judgments. Accessibility refers to the easiness and effortlessness of cognitive operation, affecting the likelihood with which mental representations may be activated from memory. Social cognition studies on accessibility have mainly examined the underlying cognitive mechanisms that influence social judgments. These studies assessed the role of statistical heuristics on accessibility activation and why temporary and chronic accessibility might be situational. One goal of this work has been to examine the simultaneous impact of mental representations that are temporarily versus chronically accessible. The present work is designed to expand on this question by investigating the conditions under which temporary versus chronic accessibility drives judgments. In particular, we test how time pressure and cognitive load affect the relative impacts of chronic and temporary sources of accessibility. We predict that reducing processing capacity via time pressure or cognitive load increases the relative impact of information that is temporarily accessible.

Inducing bovine embryonic stem cells (bESC) into a steroidogenic fate

Alexys Dailly
Sponsor: Anna Denicol, D.V.M.,Ph.D.
Animal Science

Steroid hormones, such as estradiol and progesterone, are synthesized by ovarian follicular cells and are critical for maintaining reproductive cycles and overall health. The recent establishment of bovine pluripotent embryonic stem cells (bESC) provides the opportunity to induce these cells into ovary-like steroidogenic cells, which could be used in applications like hormone replacement therapies. The goal of my project is to induce bESC differentiation into a steroidogenic state, which will be completed through a series of experiments. The first ongoing experiment aims to optimize the timing (24, 48, or 72h) for mesoderm induction of bESC. The resulting mesodermal cells will be treated for 3-5 days with one of three molecules known to induce cells toward a steroidogenic fate. In the final experiment, cells obtained from the conditions selected in the prior experiments will be cultured with cAMP, which is the last step in activating steroidogenesis in cells. Techniques including RT-qPCR, flow cytometry, and hormone assays will be used to identify key transcripts and proteins of the steroidogenic pathway. Anticipated results are that the differentiated cells will express steroidogenic markers and secrete progesterone and estradiol. We also expect adjusting the timing and doses will improve the protocol's efficiency and cell differentiation.

Low-Cost Microfluidic Device for Single-Cell Isolation and Cloning

Leyou Damene
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

The Microfluidics Research Team in the BioInnovation Group is developing a low-cost microfluidic chip, known as a single-cell capture (SCC) device, to study heterogeneous cellular populations. We expect this device and methodology to enable the capture, cloning, and analysis of singular cells from heterogeneous populations (cell cultures or tissues) without the use of cell surface markers. The monoclonal cells cultured on chip can then be extracted and studied or used in applications like tissue regeneration. We based our initial device design on examples from literature that used photolithography to create masks for PDMS casting. However, the cost of photolithography limits access to these tools. We propose that common and affordable 3D printing technologies can be used as an alternative to photolithography to create SCC devices that will perform nearly as well as those built using photolithography. Our current device–created with 3D-printed molds–achieves a SCC rate of 35%, comparable to devices created using photolithography (60% capture rate) but at 1/100th the upfront cost. We are currently testing cell culturing, cloning, viability, and function on-device by measuring cell survival and proliferation of various mammalian cell types. We are also working on techniques to optimize and control the growth environment on chip.

Racializing (Cr)immigration and Its Impact on Undocumented Indigenous Mexican Immigrants

Brenda Damian Ortiz
Sponsor: Caitlin Patler, Ph.D.
Sociology

Scholars of international migration have contributed with a robust field of research on Mexican-origin immigrants, but have paid minimal attention to the unique experiences of Indigenous immigrants who have encountered the U.S. (cr)immigration system. This study will add to the existing literature that has lacked to expand and bring forth the unique relevant experiences of undocumented Indigenous Mexican-origin immigrants. Analyzing survey data collected by the *Encuesta Sobre Migración En La Frontera Norte de México* (EMIF) on Stata software, this study will explore: 1) how the contexts of departure from the United States vary across Mexican-origin individual who identify as Indigenous, compared to those who do not, 2) if Indigenous individuals are more likely to be removed by U.S. immigration authorities, compared to voluntarily returning to Mexico, 3) whether an Indigenous identification impacts those who experienced immigration detention in the United States (e.g. length of detention), and 4) whether the experiences (in RQ1-3) vary among individuals who speak Indigenous languages compared to those who do not. Understanding the different levels of (cr)immigration impact across different racial/ethnic groups, findings will reveal how racialization influences the interaction between undocumented Indigenous Mexican immigrants and the U.S. (cr)immigration system.

Development of Attitude Determination and Control System Software for Low Cost Satellite Control Methods

Jasmine Dang
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

Our poster discusses the Attitude Determination and Control System (ADCS) software architecture for REALOP, UC Davis' first, and completely undergraduate-led, CubeSat mission. Once launched into space, the CubeSat will rotate in an unpredictable manner, known as tumbling. ADCS is in charge of detumbling and pointing the Raspberry Pi camera on the satellite towards the Earth. While in orbit, Sun and magnetic field sensor data is used to determine the orientation of the satellite. Once the current orientation is determined, the ADCS software calculates how to best control the actuators, which are the hardware mechanisms used to point the satellite in the desired direction. These actuators include magnetorquers, which are used to reduce tumbling in the satellite, as well as reaction wheels and hard disk drives (HDDs), which are used to rotate the satellite about one axis to point toward the Earth. Combined with additional subsystems, ADCS will be used to demonstrate the feasibility of low-cost satellite control methods.

Mathematical and Experimental Models of Steam-driven Fluid Oscillations in a Laboratory Geyser with a Bubble Trap

Uthkarsh Das
Sponsor: Maxwell Rudolph, Ph.D.
Earth And Planetary Sciences

Geysers are eruptive geologic phenomena defined by episodic venting of water and steam. They serve as volcanic analogs, exhibiting some similar dynamics during both the eruption and recovery phases. Many geysers, including Yellowstone National Park's "Old Faithful', are thought to have laterally offset subsurface reservoirs, termed a bubble trap, in which steam can accumulate, giving rise to fluid oscillations that have been observed in the geyser conduit. Characterizing these oscillations place constraints on the subsurface geometry of geyser systems that are otherwise difficult or impossible to measure. Here, we extend previous work on bubble trap effects by including a thermodynamic treatment of steam in a mathematical model of geyser dynamics using Hamiltonian mechanics. We use steam tables to implement an equation of state for steam, and we use a relaxation model to consider the equilibrium vs. nonequilibrium response of the geyser system to perturbations. We compare the predictions from our mathematical model with observations from a laboratory geyser to gain insight into the behavior of fluids in geysers. We will scale the model to Old Faithful to compare the oscillation frequency prediction to observed measurements from the Geyser.

Identification of Anaerobic Bacterial Species Able to Form Byproducts of Biohydrogenation on Unsaturated Fatty Acids

Hannah De Groot
Sponsor: Timothy Hackmann, Ph.D.
Animal Science

Fatty acids are important biomolecules in our cells and components of our diet. Microbes can transform unsaturated fatty acids into saturated ones through a process known as biohydrogenation. Although it is hypothesized that a great many microbes are capable of biohydrogenation, few microbes that carry out this process have been identified. New discoveries in this field could have implications for everything from inhibition of atherosclerosis to solving milk fat depression in cows. We sought to investigate which species of bacteria produce byproducts of biohydrogenation, identifying *Cutibacterium acnes* AP1, *Tractidigestivibacter scatoligenes* SK9K4, *Parafannyhessea umbonata* A2, and *Sporanaerobacter acetigenes* Lup33 as prime suspects because they have genes homologous to linoleic acid isomerase. A combination of analyses was used to find evidence of biohydrogenation occurring, including spectrophotometric, iodine-based analysis, and gas chromatography. Initial findings show that AP1, SK9K4, and Lup33 have positive results for producing biohydrogenation byproducts using spectrophotometric analysis. Strain A2 was negative for spectrophotometric analysis, but when under gas chromatography did produce a downstream intermediate byproduct suggesting that it is still capable of biohydrogenation. Identification of these strains are potential targets for manipulating fatty acid synthesis to provide solutions to human and animal health.

The Influence of Parent Pitch on Infant Vocabulary Size

Eileen De Jesus
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Adults use a specific speaking style when speaking with infants. Infant-directed speech (IDS) often has a high pitch and a broader pitch range than speech directed to adults (e.g., Fernald et al., 1989).Parents might tend to place an emphasis on raising their pitch to support the children's processing of new words (e.g., Ma et al., 2011). This change in pitch may promote speech processing for word learning and support vocabulary development (Kalashnikova, 2018). This investigates the role of pitch in language acquisition. Is parent pitch in infant directed speech related to infants' vocabulary size? By testing 8- to 10- and 18- to 20-month-old English learners and their parents, we measure how parents talk to their infants versus other adults. We examine the characteristics of IDS while parents introduce a set of words during play-based interactions and compare these characteristics to the same words produced in adult-directed speech collected while parents interacted with an experimenter. Because pitch may affect infant attention and learning, we predict that parents who have a higher pitch in IDS may have infants with larger vocabularies than parents with lower pitch in IDS.

The Implied Meaning: The Consequences of the Causal Taboo

Brandon De Long
Sponsor: Mijke Rhemtulla, Ph.D.
Psychology

Causality is a uniquely contentious problem in the field of psychology: while psychological theories aim to explain why and how variables relate to each other, psychological data are often based on observation rather than experimentation. It is often taught in statistics courses that "correlation does not imply causation" to steer future psychologist researchers away from misinterpreting their results. Researchers instead attempt to avoid causality altogether by replacing causal language with non-causal words like "prediction" and "association". As a result, psychological research has not embraced modern tools that allow researchers to incorporate causality into statistical models, controls, and study design. My paper aims to quantify this taboo by extracting the implied causal claims in the introduction, the discussion section, and the title of psychological research and analyze if the claims of the papers justify the chosen research design. I hope that by quantifying this problem psychological researchers will evolve from the old taboos against causality to the new reimagined integration of causality in psychological research allowing for studies with more transparent intentions, appropriate modeling, and explicit conclusions.

Magnet Ingestion in Children Remains a Common Problem Worldwide Despite Increasing Regulations

Elena De Loizaga
Sponsor: Minna Wieck, M.D.
MED: Surgery

Pediatric magnet ingestion can lead to devastating consequences. To minimize the risk, many countries have enacted policies restricting manufacturing and/or sales. However, the problem persists worldwide, especially among children under the age of six. This study investigates and compares the global incidence of pediatric magnet ingestion and the related national policies. A comprehensive literature review was conducted in both English and Spanish with the search terms: magnet, ingestion, and pediatric, along with their synonyms. Out of all the papers extracted, 24 studies from five continents met the inclusion criteria. No studies came from Africa. Incidences per year ranged from <1 to 2914, but these varied significantly based on the study design and population served by the study hospital(s). In every study, pediatric patients required hospitalization, surgical procedures, and/or other medical interventions. National policies to place warning labels, restrict sales, or ban high-powered magnets were primarily seen in western nations. These policies began in the 2000's and have increased in recent years, but many countries still lack national policies to limit access to small, ingestible magnets. Thus, further research is needed to track magnet ingestion and implement policies to minimize these injuries worldwide.

Historical Ecology of Freshwater Fisheries in Central California

Dalenn Dearman
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

We explore the historical ecology of several larger and economically important fish species in the ancient California Delta: Sacramento Perch (*Archoplites interruptus*), Pikeminnow (*Ptychocheilus grandis*), Thicktail Chub (*Gila crassicauda*), Sacramento Sucker (*Catostomus occidentalis*), and Sturgeon (*Acispenser* sp.). We compare fish bones from five archaeological sites: Sacramento River, California Delta, Livermore Valley, and two on the Feather River, dating between 1500 and 300 years ago. We use bone size as a marker of fish age, and carbon and nitrogen stable isotopes in bone collagen as a marker of fish diet. Together, these measures allow us to trace individual fish diets as a function of age, providing new details about ancient fish ecology in different environments. Results indicate that fish trophic ecology was flattened within the smaller waterways, but expanded in larger systems. Results also show fish diet changes with age among some species, such as Sacramento Perch, but not others, such as Thicktail Chub. As the Central California waterways have been greatly altered by over a century of dam and levee construction, canalization, conversion to farmland, and the introduction of a wide range of invasive fish species, the study has implications for modern habitat restoration work seeking to benefit native species.

Analysis of Trace Element Composition in a Southern Sierra Stalagmite as a Proxy for Paleohydrological and Paleoclimatological Variations

Mikayla Deigan
Sponsor: Isabel Montanez, Ph.D.
Earth And Planetary Sciences

Establishing a relationship between climate conditions and wildfire frequency and intensity in the past is essential for accurate future climate projections and designing climate mitigation strategies. Speleothems are multi-proxy past climate (paleoclimate) archives that record the chemical signature of the dripwater from which they precipitate. By analyzing their trace element and stable isotope composition, researchers can interpret paleo- hydrological and environmental conditions. Recent studies have shown speleothems can be used to detect past wildfires due to variations in trace elements and δ^{1}?O in the soil as well as fire-indicative organic molecules. This makes speleothems useful for characterizing the relationship between past wildfire regimes versus prevailing climate conditions in the past. Here I present a high-resolution Holocene record from a cave in the Southern Sierras. By studying time series of trace element concentrations, measured using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LAICPMS), we can identify the response of soil and karst hydrology to change in climate and highlight outlier patterns that may be caused by fire events. Applying advanced statistical and time-series analysis methods allows for the identification of hidden variability patterns and correlations between elements that are characteristics of specific hydrogeochemical conditions in the soil and karst.

Developing Transgenic Arabidopsis for CRISPR Guided Gene Knockout and Chromosome Engineering

Isabelle DeMarco
Sponsor: Luca Comai, Ph.D.
Plant Biology

CRISPR-Cas9 is a useful genetic engineering tool which involves the use of the Cas-9 enzyme to cut DNA and a guide RNA (gRNA) strand to identify a region for Cas-9 to target. Many types of genome edits can be made using CRISPR, including gene knockouts, DNA insertions, and chromosomal rearrangements. Current practice to make CRISPR edits in Arabidopsis plants is to transform the Cas-9 gene and gRNA into genome via floral dip with both genes in the same construct. This project aims to establish an alternative method to floral dip so that CRISPR edits can be made in Arabidopsis F1 hybrid progeny. Initially we generate two transgenic lines, one expressing the Cas-9 protein, and the other expressing a gRNA that targets the GL2 gene required for branched trichomes. By crossing these plants, hybrid offspring with unbranched trichomes will indicate GL2 knockout. Future experiments can be done using the same Cas-9 expressing Arabidopsis and plants with other gRNA transgenes to induce more complex chromosome rearrangements. The ability to do these genome edits in hybrid plants would unlock new possibilities for crop improvement as well as complex genetic experiments in the laboratory.

The Impact of Private Education on Post-secondary Outcomes

Sophie Dewees
Sponsor: Giovanni Peri, Ph.D.
Economics

The idea that private education is more effective than public in terms of increasing student test scores and improving post-schooling outcomes has motivated many policies such as the 2013 Wisconsin Parental Choice Program (WPCP) which allows lower-income students to choose to attend private schools. Using data from the American Community Survey and the Wisconsin Department of Public Instruction, this paper employs a difference-in-differences approach to examine the impact of private education on post-secondary outcomes such as the probability of employment and the probability of being in college. The presence of private schools in each county in 2013 is used to determine the intensity of treatment. I find that a one percentage point increase in the ratio of private schools to school-age children by county in 2013 has limited impacts on my outcome variables of interest when students are ages 17-25. There is, however, a significant added treatment effect of 1 percentage point for girls' probability of employment.

The Optimization of PegRNAs for Gene Editing of Pathogenic *Ppp2r5d* Mutations in Primary Mouse Fibroblasts.

Rency Dhaduk
Sponsor: Kyle Fink, Ph.D.
MED: Neurology

Jordan's Syndrome (JS) is a rare autosomal dominant intellectual disability disorder caused by de novo missense mutations that occur in the gene *PPP2R5D*. To date, over 300 JS patients have been identified with 12 unique pathogenic mutations spanning *PPP2R5D*. Currently, there is no cure for JS and the current standard of care only offers symptomatic treatments, therefore, we propose PRIME editing (PE) as a novel therapeutic intervention for the treatment of JS. Utilizing a novel eGFP HEK293 reporter cell line and primary mouse fibroblasts containing human equivalent mutations in *Ppp2r5d*, we aim to perform a guide RNA screen to evaluate unique PRIME editing gRNAs (pegRNAs) for the gene correction of pathogenic *Ppp2r5d* mutations. To facilitate the guide screen, pegRNA constructs with altering spacers, primer binding sites, and reverse transcription template lengths will be assembled into plasmids and nucleofected into cells. To evaluate PE editing efficiencies, treated cells will be assessed 72-hr post-nucleofection via amplicon sequencing. In summary, our research aims to identify optimal pegRNA designs for improved gene editing outcomes of pathogenic *Ppp2r5d* mutations.

The Effect of HAMSP Diet on Autoimmune Disease in ARE-Del$^{+/-}$ Mice

Harleen Dhillon
Sponsor: Weici Zhang, M.D.,Ph.D.
MED: Int Med Rheumatology

Primary biliary cholangitis (PBC) is an autoimmune liver disease with no current cure. Based on previous research, it has been shown that a high-amylose maize starch propionate-yielding (HAMSP) diet can suppress autoimmune disease in non-obese diabetic strain mice. To address if disease can be affected in ARE-Del$^{+/-}$ mice, which is the female-predominant murine model of PBC, mice chow was supplemented with 15% HAMSP. We measured the body weight of each of the mice and employed flow cytometry to measure the numbers and function of T-regulatory cells in the colon, spleen, liver, and lymph nodes. We will also measure anti-mitochondrial antibody titers, which is the serological signature of PBC, via ELISA to determine if levels are affected by the HAMSP diet. Our results have shown an increase in body weight for mice given the HAMSP diet, along with an increase in T-regulatory cells, which indicate a reduction in autoimmune disease in these mice compared to ARE-Del$^{+/-}$ mice with standard rodent diets. These results can have important implications in the development of therapeutics for PBC in the future.

Investigating Promoter-Proximal R-loops as a Source of Genome Instability

Saloni Dhopte
Sponsor: Frederic Chedin, Ph.D.
Molecular & Cellular Bio

R-loops are three-stranded non-B DNA structures that form co-transcriptionally when the nascent RNA reanneals to the template DNA strand. Along with having general physiological roles, R-loops associated with dysfunctional RNA processing lead to DNA damage and genome instability. Promoter-proximal R-loops occur with the pausing of RNA polymerase II (RNAPII), potentially leading to transcription-replication conflicts. RNase H1, an enzyme that resolves R-loops, primarily binds to promoter regions and is known to ameliorate R-loop-induced genomic instability phenotypes, implicating promoter-proximal R-loops as a potential source of harmful R-loops. XRN2, a 5'-3' exoribonuclease involved in transcription termination, primarily acts at the 3'-end of genes; although some studies suggest it may assist with premature termination and recycling of paused RNAPII complexes. I hypothesize that RNase H1 provides a substrate for XRN2 by cleaving the nascent RNA engaged in an R-loop, resulting in the clearing of RNAPII complexes, alleviating the R-loop, and subsequently reducing genomic instability. To test this hypothesis, I have generated cell lines depleted in XRN2 using shRNA constructs and evaluated DNA damage via immunofluorescence. Preliminary data suggests increased DNA damage in shXRN2 cells treated with PladB, a drug shown to elevate RNAPII promoter pausing, indicating a possible role of XRN2 and promoter-proximal R-loops.

Characterizing the Roles of Autophagy Regulators in Suppressing α-Synuclein Toxicity

Alexandro Diaz Gonzalez
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

The causes of neurodegenerative disease (ND) are not well understood, but are believed to result from the accumulation of aggregated proteins that contribute to cell toxicity and loss of neuronal function. Autophagy is a membrane trafficking pathway that cells use to target damaged organelles and protein aggregates to the vacuole or lysosome for degradation and it has been proposed to be protective for ND progression. The exact autophagy pathways triggered by aggregated proteins to suppress cell toxicity are not well understood. We hypothesize that the autophagy response to protein aggregation involves multiple autophagy pathways. To test this, we are characterizing the hierarchy of autophagy gene function in suppressing cell toxicity induced by the Parkinson's protein, alpha-synuclein. We predict that the Atg1 kinase, which functions at the top of the autophagy pathway and is required for activating multiple forms of autophagy, will exhibit the most severe cell toxicity phenotype when mutated. In contrast, Atg7, which functions only in a subset of autophagy pathways, will have a more minor impact on cell toxicity when mutated. We are testing these predictions by measuring the viability and growth rate of wild type or mutant cells induced to express α-synuclein.

Curanderismo in the Oaxaca Community

Julie Diaz Ruiz
Sponsor: Monica Torreiro-Casal, Ph.D.
Chicano Studies

How did the application of Curanderismo and its healing methods impact the Oaxaca community during the Covid-19 pandemic? The utilization of Holistic healing to heal the mind, body, and spirit in the Oaxacan community during the Covid-19 pandemic. Exploring and understanding the various methods the Oaxacan community occupied underlines what beneficial tools are being used to prompt health and wellness. The Latinx community is often overlooked and mistreated in the healthcare system and it's important to bring awareness to cultural practices and how they can prompt wellness through holistic healing. Taking a qualitative approach, I collected data through interviewing and testimony hearing to give an insight to the sacred practices in the Latinx community. Data demonstrates how community members are utilizing remedies to heal and how the healing process can impact the mind in a positive way. Findings in data can encourage the usage of natural resources and provide an alternative approach to western medicine. It is important for community change that we understand the history of our ancestors and the connection it has to contemporary issues in society. Normalizing and encouraging pre colonial cultural practices of limpias and remedios provides a new perspective in western medicine and contributes to accessing healthcare.

The Role of Demographic Variables on Parent-Infant Behaviors During Naturalistic Puzzle Play

Lino Diaz Serrano
Sponsor: Lisa Oakes, M.D.,Ph.D.
Psychology

Over the first year of life, infants come to know an incredible amount about the world around them, and much of this is gained through their daily interactions with their caregivers. Previous work has shown that play provides a deictic context for parents to scaffold the development of infants' sustained, joint attention and language skills. Importantly, these interactions are also influenced by other characteristics of the dyad, such as exposure to multiple languages in the home. In this project, we will analyze a dataset examining parent-infant naturalistic play. Both parents and infants wore head-mounted eye trackers to document the eye-gaze of 53 9-month-old infants (17 females, 36 males) and their parents during a 3-minute puzzle-play task. Infants and their parents were presented with an age-appropriate puzzle. They were instructed to play as they would at home. We coded both parents' and infants' looks to their partner's face, partner's hand, and the puzzle and parents' speech was transcribed. We also collected demographic information, such as the languages spoken in the home, parental education, and infant sex. Our analysis will focus on the impact of these demographics on parental input and visual attention during puzzle play.

Effective Population Size and Ecology of California Coastal Dune Trapdoor Spider *Aptostichus stephencolberti*

Kylie Dickinson
Sponsor: Jason Bond, Ph.D.
Entomology/Nematology

Aptostichus stephencolberti is a trapdoor spider distributed throughout the coastal dune habitats of Monterey, Santa Cruz, San Mateo, and San Francisco Counties. This endemic spider is cryptic, constructing silken burrows into the faces of vulnerable dune habitat, its burrows scarcely identifiable by a thin trapdoor formed from silk and sand. Though potentially abundant at some localities no true population estimations have been completed and the fragile shifting nature of its habitat and known sensitivity to invasive plant species make population assessment essential. We completed random sampling in the protected and unprotected restored dune habitat of Sunset State Beach, seeking to estimate the effective population size and illuminate the ecology of *A. stephencolberti.* Sampling-based estimates will be compared to genomic-based estimates to assess the validity of different prediction techniques on this highly genetically structured species. We plan to identify crucial habitat components that support robust populations and will expand population assessments into older secondary and tertiary dune habitat in future outings.

Identifying force-dependent protein interactions surrounding actin filaments

Agustina Diener
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Mechano-transduction is the process by which a cell senses, integrates, and converts mechanical stimuli into biochemical signals. This results in intracellular changes that regulate cell adhesion and cell behavior. Despite having a critical purpose in cell fate, the molecular details of this process are not well understood. Actin filaments are thought to be force-sensing, but the comprehensive list of proteins surrounding the "tensed" actin network has not been described. To identify force-dependent interactions surrounding actin, we fused TurboID, a biotin ligase that promiscuously biotinylates proximal proteins, with Ftractin and found it colocalizes to actin filaments. Our preliminary mass spectrometry analysis of TurboID-Ftractin identified over 1000 proteins and ranked them based on relative abundance of proteins in control and stretch samples. PLEK2 was the first candidate, however, the Western Blot did not show increased presence of this protein in the stretch sample. Alternative analysis identified three new candidates: ARL15, B9D9, and PEX5. The latter one was only present in the stretch sample and I am in the process of generating a plasmid containing GFP tagged with PEX5 to test for force-sensitivity. By identifying more proteins that interact with actin under force-bearing conditions, we will better understand the molecular basis of mechano-transduction.

NKA Dimerization and Expression

Vicky Diep
Sponsor: Julie Bossuyt, D.V.M.,Ph.D.
MED: Pharmacology

The Na+/K+ ATPase (NKA) is a primary active transporter that is ubiquitous throughout all cell types in the body. It consists of an alpha subunit that binds and catalyzes ATP in order to transport Na+ and K+ ions across the plasma membrane, a beta subunit that ensures the proper folding and trafficking of the pump itself to the plasma membrane, and an additional regulatory subunit, a FXYD protein, expressed in a tissue-specific manner. Dimerization has previously been described in other ATPases of the P-type family to which the NKA belongs. However, dimerization and the role that it plays in the function and regulation of the NKA remains unknown. By using fluorescence lifetime imaging (FLIM) technology, this project investigates how changing the composition of the NKA dimer complex affects NKA localization and expression on the plasma membrane. Additionally, western blotting is used to quantify protein expression in order to examine whether such changes in NKA expression are correlated to changes in signaling cascade events within the cell, such as phosphorylation of SRC and ERK, that may be present in cardiac disease.

Reading Climate: How English Scholars are Contributing to Climate Change Discourse

Jessica Diggs
Sponsor: John Marx, Ph.D.
English

Scholarly discourse concerning climate change mitigation has largely been dominated by the scientific community. Scholarly contributions to this discussion need not be limited to those disciplines, and when it is assumed that scientists have the most to say, we fail to recognize that such complex problems as our changing climate benefit from diverse disciplinary contributions, including those from literary scholarship. This project seeks to test a hypothesis that English literary studies have a place in a holistic approach in combating the impacts of climate change. By using secondary scholarly texts, popular texts, and interviews, my project will investigate how literary scholars are using their analytic and rhetorical skills to extract insights and even promising mitigation for the effects of climate change through various works of fiction and nonfiction. By collecting and presenting an overview of the current discussion and work being done by literary scholars, this project hopes to show that this discipline is actively contributing to the fight against climate change.

Zebrafish Models of Primary Microcephaly and Microcephalic Osteodysplastic Primordial Dwarfism Type II

Justin Dinh
Sponsor: Li-en Jao, Ph.D.
MED: Cell Biology & Human Anat

The centrosome acts as the main microtubule-organizing center in animal cells. Its function is important for spindle organization and chromosome segregation. Intriguingly, primary microcephaly, a disorder of brain development that results in smaller brain, is caused by recessive mutation of several genes that encode centrosomal proteins. It is unknown how centrosomal dysfunction could lead to brain-specific defects such as microcephaly. Given the high degree of conservation between human and zebrafish genes, the fast embryonic development, and the ease of genetic manipulation and phenotypic analyses, we use the zebrafish model to study the etiology of primary microcephaly and related disorders. Here we used the CRISPR technology to mutate *cep215* and *pcnt*, two centrosomal genes whose human orthologs are linked to primary microcephaly and microcephalic osteodysplastic primordial dwarfism type II, a disorder characterized by microcephaly and short stature. We have developed a genotyping strategy to quickly screen for wild-type, heterozygous, and homozygous mutant fish after fin biopsy. We are in the process of characterizing the cellular and developmental phenotypes of these mutant embryos. We believe that these zebrafish mutants we generated would be valuable models to study the pathogenesis of tissue-specific phenotypes caused by centrosome defects.

NYT MEDIA PROJECT: The Algerian War of Independence Through the Lens of the New York Times

Hadil Djadri
Sponsor: Suad Joseph, Ph.D.
Anthropology

How did the *New York Times* (NYT) represent Algeria in the 1960s? To answer this question, I used ProQuest to analyze 42 articles, of which 10 were relevant. This research draws parallels between the Algerian independence movement and the broader historical context in the 1960s to better evaluate how Algeria was perceived in the media. The 1960s was integral in North African and Middle Eastern history because independence movements shifted the perception of Arabs from being subordinate to their colonial powers to being autonomous people. As a leading American newspaper, the *NYT*'s portrayal of Algeria was influential in shaping worldwide perception of the Algerian war and the people fighting it. The *NYT*'s representation largely reflected the United States' foreign policy interests in decolonization and the Cold War. Reference to Algerians as "rebels," "insurgent nationalists," and "rebel terrorists" also framed the Algerian cause as a rebellion, which discredits the struggle for self-determination after enduring French colonial rule for more than one hundred years. This research is part of a long-term analysis project of the *NYT* from 1850 to the present from the Suad Joseph Lab. The project analyzes the representation of Islam and Muslims over 150 years.

Specific Protein Domains are Required for Localization and Function of MHCI H2-K^b in Neurons

Terilyn Do
Sponsor: Anne Usrey, Ph.D.
Neuro Physio & Behavior

For the central nervous system (CNS) to develop properly, appropriate synaptic connections need to be established. While major histocompatibility complex class I (MHCI) proteins play a significant role in the immune system, they also regulate neuronal synapse formation. However, the mechanisms underlying this function remain unknown. Our preliminary findings indicate that the position of a moxVenus fluorescent tag on the MHCI protein H2-D^b influences its subcellular localization to puncta at synapses in neurons. We hypothesize that this finding is generalizable to other neuronally expressed MHCI molecules, that deletion of functional domains and motifs of MHCI will change the proteins to which it binds, and that c-terminal domains are responsible for the punctate synaptic localization of MHCI molecules. To test these hypotheses, we are creating and expressing constructs that tag moxVenus to the N- or C- terminus of MHCI H2-K^b and we are deleting its functional domains and motifs. We will determine if the location of moxVenus alters the tagged protein's expression in neurons using immunocytochemistry and its protein interactions using co-expression with synaptic proteins in HEK293T cells followed by co-immunoprecipitation. These results will provide critical insight into how MHCI is localized to synapses and how it may alter synapse formation.

Spatial Generalization of Motor Adaptation Based Solely on Explicit Visual Feedback Compared to Implicit Learning with Dynamic Perturbations

Kareelynn DonJuan Fernandez
Sponsor: Wilsaan Joiner, Ph.D.
MED: Neurology

In our previous work we demonstrated that the force-velocity relationship required to compensate for physical perturbations to arm reaching movements (e.g., velocity-dependent force-fields) can be learned through visual feedback. Specifically, subjects made arm reaching movements in force channels that countered any lateral applied force and subsequently forced subjects to move in a straight line. We provided visual feedback of the lateral force exerted during the movement, as well as the required force pattern based on the movement velocity. Thus, subjects were shown explicit information on the extent the applied temporal pattern of force matched the required force profile as if a perturbation had been applied. Here we systematically examined the extent this feedback benefits motor adaptation by intermixing explicit visual feedback with physical perturbations. Our preliminary results suggest that motor learning based on physical perturbations and visual feedback rely on different, largely independent mechanisms that can be used synergistically to enhance the rate and retention of learning.

Investigating Insulin Transcription through Single Molecule Fluorescence in Situ Hybridization

Caleigh Donnelly
Sponsor: Edmund Powers, Ph.D.
College Bio Sci Deans Office

The goal of this project was to utilize single-molecule florescence in situ hybridization (smFISH) to monitor insulin transcription in a variety of cell lines. Single-molecule fluorescence in situ hybridization differs from regular FISH experiments as it detects single transcripts in the nucleus and transcribed protein products in the cytoplasm of individual cells. Through smFISH imaging, one can get a better picture of the differences in transcriptional output of different cell lines. This project involved the use of EndoC-βH1 cells, a genetically engineered human cell line that replicates the human pancreatic β cell. These first-of-their-kind cells provide better, human-relevant models for diabetes research and drug testing. Results of these experiments include application of a pre-existing image analysis pipeline to resulting EndoC-βH1 imaging, but it was determined that this pipeline was not well suited to the cell line. However, the optimization of smFISH protocol for Insulin and controls in HBEC's (Human Bronchial Epithelial Cells), PANC-1's (Non-insulin producing pancreatic duct cells) and EndoC-βH1 cells was achieved. For EndoC-βH1 cells, it was determined that a hybridization period of 4 hours after permeabilization overnight with 70% ethanol and insulin probe (both intronic and exonic) concentration of 10 nM led to the best imaging.

Assessing an Alternative Spawning Strategy for Delta Smelt Supplementation

Isoline Donohue
Sponsor: Andrea Schreier, Ph.D.
Animal Science

Delta smelt (*Hypomesus transpacificus*) are close to extinction in the wild, so the UC Davis Genomic Variation Laboratory (GVL) partnered with the Fish Conservation and Culture Laboratory (FCCL) and the U.S. Fish and Wildlife Service to find the best spawning strategy to produce genetically diverse fish for supplementation into the wild. Currently, to maintain the genetic diversity of the captive population, the GVL selects males and females to spawn in 1 x 1 pairwise crosses yearly, which is too labor-intensive at the scale of production needed for supplementation. This project tests two alternative strategies, where the eggs and milt of 3 females and 3 males are 1) *factorially* spawned to eliminate sperm competition, or 2) *pooled* together for a more efficient spawning method. The FCCL applied each spawning strategy in 10 replicate tanks and raised the offspring to the larval stage. For my project, I extracted, genotyped, and assigned parentage to larval fish to determine whether the parents were evenly represented among the offspring. Using effective population size (N_e) as a measure of genetic diversity retention, we determined that the factorial strategy led to more even parental representations and higher N_e values, suggesting it is the better spawning strategy.

Structural Determinants of Diet Quality for Pregnant People in California: A Baseline Analysis of the GROWell RCT

Indira D'Souza
Sponsor: Leigh ann Simmons, Ph.D.
Human Ecology

Diet quality in pregnant people has been linked to pregnancy and infant outcomes, including birthweight and infant autonomic nervous system function. Structural determinants including educational level, minoritized race/ethnicity and immigration status are correlated with diet quality in pregnancy. Mental health factors such as prenatal depression may also play a role in maternal nutrition. The GROWell randomized controlled trial is a fully remote mobile health intervention designed to improve diet quality in overweight or obese pregnant people from early pregnancy to 6 months postpartum. Conducting a regression analysis of baseline data collected at study enrollment (average gestational age 13.5 weeks), factors such as race/ethnicity, education, income, and location in California will be used to predict diet quality in pregnancy, as measured by the Rapid Eating Assessments for Patients (REAP) scale. Baseline data collected from N=221 participants (target enrollment is 480) shows a mean REAP score of 53 (range 36-71), lower than the national average of 58/100. The current sample is 50% Non-Hispanic White, 47% historically marginalized race/ethnicity, and 3% unreported. Exploring the structural determinants of diet quality will lead to recommendations to address current disparities and promote access to healthy food during pregnancy.

Using Ultrasound Imaging to Decode Individual Finger Movements

Jeff Du
Sponsor: Wilsaan Joiner, Ph.D.
MED: Neurology

Restoring hand functions via prosthetics requires an in-depth study of the control mechanisms that actuate finger movements. Previous studies in our laboratory have used ultrasound imaging to examine the spatial and temporal activation patterns of the flexor muscles (e.g., Flexor digitorum profundus - FDP, and flexor digitorum superficialis - FDS). We hypothesize that we can quantitatively characterize the activation of the FDS and FDP in relation to finger flexion characteristics (e.g., the starting/ending point and flexion speed). In this study, we used a CyberGlove, a hand joint-angle tracking device, together with a Terason uSmart 3200T Ultrasound Imaging System to examine and correlate the extent of individual finger flexion to the activation of FDS and FDP in 30 healthy able-bodied subjects. Subjects completed one experimental session with their dominant hand during which they performed a set of pre-determined hand gestures under various limb positions. These results directly show how muscle deformations directly relate to fine finger movement, and importantly provide foundational information for the improved control of prosthetic devices.

Diabetes Prevention Program Comparison of Curriculum in Relation to Cohort Quality of Life & Weight Neutrality

Elizabeth Dui
Sponsor: Francene Steinberg, Ph.D.
Nutrition

Around 11% of the US population have diabetes and approximately 35% of the US population over age 20 have prediabetes. The prevalence of diabetes has increased from .93% in 1958 to 7.40% in 2015 and that percentage is rising. It's evident that diabetes is a health concern and for that reason programs such as the Diabetes Prevention Program (DPP) are necessary to help bridge the preventative healthcare gap. The UC system has a DPP that administers various versions of the curriculum that teaches facilitators and participants the content in different approaches. In the DPP the curriculum is facilitated by RDN-trained facilitators and utilizes skills such as motivational interviewing. Motivational interviewing focuses on counseling patients as an intervention strategy to treat lifestyle problems and diseases. In this project, there is a comparison of the DPP Group Lifestyle Balance from the University of Pittsburgh 2017 and Prevent T2 2022 in regards to their approaches, results/responses from participants, and administration from facilitators. Through qualitative responses, factors such as emotional well-being, weight, and participation will be analyzed. The goal of this project is to see if quality of life is impacted due to delivery of the program from a weight-centered and weight-neutral approach.

Purkinje Cell Arborization and Connectivity in an Animal Model of Autism

Jade Lin Dungca
Sponsor: Diasynou Fioravante, Ph.D.
Neuro Physio & Behavior

In addition to motor control, the cerebellum is now understood to modulate cognition and emotion[1,2] and be an important target in cognitive and neurodevelopmental disorders[3]. *CHD8*, a gene associated with intellectual disability (ID) and autism, is expressed throughout the brain early in development[4] but its expression persists well into adulthood only in the cerebellum. The roles of *CHD8* in cerebellar structure and function are not well understood. To address this question, we have launched electrophysiological/morphological analyses of the primary output neurons of the cerebellar cortex, the Purkinje cells (PCs)[5], in mutant mice with germline *chd8* haploinsufficiency[6]. Our hypothesis is that synaptic inputs onto PCs and PC dendritic morphology will be impaired in *chd8*+/- mice compared to wildtype controls. First, whole-cell recordings of synaptic inputs will be obtained from PCs in acute slices. At the end of recording, PCs will be labeled with biocytin-streptavidin to visualize cell morphology and image. Z-stacks of confocal images spanning the whole dendritic arbor will be acquired and will undergo Sholl analysis (ImageJ) for differences in dendritic complexity. An effect would suggest that *chd8* regulates PC connectivity and dendritic arborization, with mechanistic implications for the cerebellum in ID and autism.

State Estimate for CubeSat Navigation Testing on an Air-Bearing Table

Logan Dunn
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

This poster discusses a computer vision-based state estimation system for testing of CubeSat relative navigation, developed by the Human, Robotics, Vehicle Integration and Performance Laboratory (HRVIP). Onboard state estimation enables testing of spacecrafts performing rendezvous and proximity operations, such as inspecting another spacecraft. Attitude determination and control systems (ADCS) for an inspection satellite will be tested in-house on an air bearing table, which creates a cushion of air on which a float unit can translate and rotate. The float unit determines its own position and attitude using a computer vision system (which detects the float unit's pose relative to ArUco tags surrounding the table) and an inertial measurement unit (which directly measures acceleration and rotational velocity). Sensor measurements are combined with a state transition model using a Kalman Filter, which allows the float unit to know its position and attitude with higher accuracy than either the model or sensors alone. Additionally, a separate camera system overlooking the air bearing table will measure the float unit's position and attitude externally, serving as ground truth for the onboard navigation. This research enables accurate ground testing of the inspection satellite technology to improve the reliability of the spacecraft.

Enhancing Cell Culture Performance Through Agricultural Product Hydrolysate Utilization

Samantha Dvorochkin
Sponsor: Karen Mcdonald, Ph.D.
Chemical Engineering

Cultivated meat is currently cost-prohibitive, and one of the main cost drivers are expensive media formulations. Some estimates for cultivated meat production suggest that 1kg of cultivated meat would require 10 liters of media and when the cost of common basal media formulations such as DMEM is approximately $50/L, it is apparent that media costs must come down for commercialization. Basal cell-culture media consists of glucose, amino acids, salts, and growth factors that can be supplied recombinantly or through the addition of fetal bovine serum (FBS). To reduce the cost of cell culture media, complex media sources such as hydrolysates can be added to supply a mixture of glucose and various amino acids of value. In particular, valorization of agricultural waste products such as fruit juices, peels, and seeds can reduce cost, support sustainability, and reduce the costs of disposal. This study aims to try to circumvent the commercial source of media components such as glucose and amino acids by substituting it with a pomegranate hydrolysate. We varied the amount of hydrolysate supplemented into DMEM with 10% FBS to observe the effects on the growth conditions of C2C12 murine myoblast cells.

Cerebellar Regulation of Learned Fear Extinction Through Connections to the Parabrachial Nucleus

Alicia Dye
Sponsor: Diasynou Fioravante, Ph.D.
Neuro Physio & Behavior

Despite its unassuming architecture, the cerebellum regulates a multitude of diverse functions such as motor learning, affect, and learned fear. How is this functional diversity achieved? We propose that extensive anatomical connections to relevant brain centers form this neural substrate of diverse functionality. To test this model, we investigated the circuit between deep cerebellar nuclei (DCN) and parabrachial nuclei (PBN). Because PBN process pain and project to emotion brain centers, we hypothesized that PBN serve as circuit nodes for cerebellar regulation of learned fear. We expected that optogenetic inhibition of the DCN-PBN pathway would affect extinction of learned fear. We injected a virus that either expressed a proton pump (ArchT) which inhibits neuronal activity in the presence of light, or GFP (control), in the DCN of juvenile mice, then implanted optic fibers bilaterally above the PBN. We measured fear-related defensive behavior in a typical fear conditioning paradigm. During extinction, mice were exposed to tones, without the shock, in a new environment. Inhibition of the DCN-PBN pathway during tone-alone extinction trials slowed extinction of learned freezing to the tone compared to the control. Although preliminary, the data suggest that the DCN-PBN pathway may play a role in regulating learned fear.

Investigating Mechanisms of Hull Split During Pistachio Fruit Development

Shaina Eagle
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

Very little is known about the cellular basis and mechanisms behind hull split in *Pistacia vera*. An intact hull is vital for protecting the inner kernel from pests and pathogens, especially once the shell has split. In order to understand the mechanism behind hull split we investigated the anatomy and average area of two cell types in the hull. During the 2022 field season, we sectioned and imaged samples from two cultivars, Golden Hills and Lost Hills, to quantify the thickness of the cuticle (waxy layer covering the skin made up of flat, rectangular cells) and size of both hypodermal parenchyma and filler parenchyma cells. Hypodermal parenchyma cells are the 2-4 layers of oblong cells below the cuticle, and filler parenchyma cells are the 2-6 layers of larger, circular cells below hypodermal parenchyma cells. Golden Hills has a high rate of tattering (breakage in the skin), while Lost Hills has a high rate of hull cracking (a tear that exposes the shell). Initial findings indicate that Golden Hills has a significantly thicker cuticle at a late stage of development. In addition, the average Lost Hills filler parenchyma cell area is significantly bigger than that of Golden Hills across developmental stages.

Structural Racism in Context

Caroline Eckel
Sponsor: Robert Faris, Ph.D.
Sociology

Racial inequities perpetuate the world of health in the US despite various advances in health advocacy, innovation, and increased access to services. This phenomenon reveals a system driven by structural racism and discrimination (SRD) which unequally distributes resources, power, and opportunities. A distribution that preserves unequal social institutions to disadvantage Black Americans while advantaging White Americans. These disparities within the health and social institutions manifest throughout the life course, starting at adolescence. The *Context* study, a seven wave panel survey of over 7,000 adolescents collected in rural North Carolina between 2002 and 2006, offers a unique opportunity to examine the long-term consequences of SRD for the at-risk population of Black Americans in the rural South. The National Institute on Drug Abuse invested in a follow-up of the original *Context* participants, who are now being triangulated through means of public record and social media searches. Search success rate is highly variable. The proposed study will draw on the original *Context* data to examine racial and gender differences in whether original participants can be identified and located. Traceability in itself is an important indication of social marginality, but results will also provide implications regarding selection bias in longitudinal panel studies.

The Effect of Social Experience on Oxytocin Receptor Density in Prairie Vole Tissues

Daniel Egziabher
Sponsor: Karen Bales, Ph.D.
Psychology

Social relationships play a key role in overall physiological and psychological well being. The COVID-19 pandemic highlighted the need for a better understanding of the physiological consequences of isolation and decreases in social connectedness. The prairie vole is an excellent model to study the biological consequences of differing social conditions because it is a small rodent that exhibits both pair bonding and biparental care. Here we will examine differences in oxytocin receptor density in prairie voles that were placed in different social groups. Oxytocin has been implicated in the importance of social interactions and social experience. Prairie voles were housed singly or in opposite-sex pairs and underwent metabolic testing. Following testing, the subjects were euthanized and tissue was collected for histological analysis. In the next few months, brain and adipose tissue will be sectioned and undergo autoradiography to determine oxytocin receptor density in several regions of interest. We anticipate finding differences in OTR density in certain brain regions and within adipose tissue that will reflect both metabolic changes and changed behavior.

Social Support Sources (Friend, Classmate, Teacher) and Students' General and Race-Based Anxiety Across Ethnic Groups During the COVID-19 Pandemic

Chisomaga Ekwueme
Sponsor: Adrienne Nishina, Ph.D.
Human Ecology

We hypothesize: (1) lack of social support will be correlated with anxiety as support is protective; (2) lack of friend/classmate support will be more strongly associated with anxiety than teacher support as closer relationships may be more impactful; (3) non-white participants will report more anxiety than their white counterparts, due to socio-political pandemic climate. College students (N = 202; 67.3% women, 22.3% men, 3.9 % non-binary; 42.6% Asian/Pacific Islander, 30.5 % White, 13.7% Latinx, 11.2% Multiethnic, 2.0% Black) reported on social support and anxiety during online instruction. Lacking support was related to greater anxiety. Lacking teacher support (r = .40) was more strongly associated with general anxiety than lacking classmate support (r = .23), with no differences between friends (r = .35) and classmates/teachers (ps < .05). Lacking support from teachers (r = .19), classmates (r = .17), and friends (r = .16), were similarly associated with race-based anxiety (ps < .05). White and non-white students reported similar general anxiety, $t(194) = -.361$, *ns*. However, non-white students reported higher race-based anxiety than white students, $t(192) = -5.18$, $p < .001$. Online instruction may have reduced peer interactions, leaving teachers as primary support. Supporting educators could be key to reducing anxiety.

How Sample Characteristics in Scientific Paper Titles Influence Readers' Judgments

Shruti Elanthiraiyan
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Current publication practices within psychology are biased to favor dominant over marginalized samples in the publication process. For example, studies coming from White and western countries are more likely to be published in high-ranking journals compared to those from the rest of the world. The field's tendency to prioritize research conducted with dominant group samples can have detrimental effects, such as neglecting meaningful research and driving the assumption that the psychological experience of a very narrow set of people generalizes to all humans. In response to this problem, some psychology journals are beginning to require authors to specify sample characteristics in their titles. However, in the absence of empirical evidence on how this information affects readers, it is difficult to design effective policies. Our study aims to assess how people from various backgrounds might react to literature titles that include different types of sample characteristics. Participants will see three study titles: (1) a control title with no sample characteristics, (2) a dominant sample title (e.g., "among White participants"), and (3) a marginalized sample title (e.g., "among participants of color"). For each title, they will assess how interesting, important, and applicable they find each study.

Importance of Representational Thought for Social Cognition: a Novel Measure of Updating

Sarah El-Arabaty
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Children undergo rapid developments in their social understanding (also known as a "theory of mind") across the preschool years, and these advancements are characterized by an understanding that mental states (e.g., thoughts, desires) are abstract representations that differ across people, and that guide behavior. Thus, an important milestone in social cognitive development across the preschool years is an understanding that mental states are representational. However, few studies have empirically examined how a capacity for representational thought, including changing or altering representations based on new information, relates to social understanding. To examine this question, we modified a measure of representational updating originally administered to adults from Mack et al. (2016). Participants (4- to 8-years-old, N = 83) completed three classification tasks by learning the corresponding sorting rules and adjusting them based on contextual information (e.g. background screen color). Additionally, children completed a battery of social cognitive tasks including measures of desire, belief, knowledge, and visual perspective understanding. We will also examine whether updating task performance correlates with children's social understanding to reveal the extent to which this under-studied domain-general skill importantly contributes to children's theory of mind development.

Regulation of BRCA2 Oligomerization by PALB2

Karl Ensberg
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

Homologous recombination is the highest fidelity pathway humans have to repair double stranded breaks in DNA. Through the proper coordination of many proteins, the pathway utilizes the sister chromatid as a template for the repair of damaged DNA in somatic cells. BRCA2 and PALB2, which are both binding partners and tumor suppressor proteins, are necessary for cells to utilize homologous recombination. BRCA2 has been shown to form oligomers both in vivo and in vitro, which can be destabilized by the interaction with single stranded DNA and DSS1. This study aims to elucidate the effect of PALB2 on BRCA2 oligomerization, in order to better understand the biological function of their interaction. The BRCA2 binding domain of PALB2, WD40, was cloned, overexpressed and purified from the insect cell *Spodoptera frugiperda* Sf9 system together with a null A1025R mutant which disrupts the BRCA2 binding site. Future pull-down assays will be used to characterize the ability of PALB2 to destabilize BRCA2 oligomerization in order to further elucidate the protein dynamics involved in homologous recombination.

Early Stages of Tau Pathology in a Rhesus Monkey Model of Alzheimer's Disease

Carissa Erices
Sponsor: John Morrison, Ph.D.
MED: Neurology

Alzheimer's Disease (AD) is a fatal progressive neurodegenerative disorder that currently has no disease-modifying therapies proven to significantly slow disease progression. To better understand the degenerative phase of the disease, we developed a Rhesus non-human primate model of tau pathology by injecting a viral vector carrying an aggregation-prone variant of human tau (AAV-2xTau) into the entorhinal cortex (ERC). Previous results show that the model recapitulates progressive tau pathology, neuronal death, and neuroinflammation at 3 and 6 months after injection. In the current experiment, we tested the hypothesis that early events associated with tau propagation and neuroinflammation will be visible 6-weeks after injection. Our preliminary results demonstrate that tau pathology-associated markers are present 6-weeks after the injection in both the ERC and hippocampal formation (HF), including in the AD-critical neurons of layer II of the ERC and CA1 field of the HF. The 6-week animals also displayed morphologically preserved axons and neurons compared to 3- and 6-month animals, despite both early and late markers of tau phosphorylation being present. This likely reflects the earliest stage of tau propagation and neuronal dysfunction, preceding the frank neurodegeneration and exacerbated neuroinflammation and astrocytic recruitment observed at more advanced stages of the disease.

Understanding Host Specificity of *Fusarium falciforme*: a Stem Rot and Decline Pathogen of Muskmelon and Tomato

Anna Erichsen
Sponsor: Cassandra Swett, Ph.D.
Anr Plant Pathology

California is the primary producer of muskmelons (*Cucumis melo*) and processing tomatoes (*Solanum lycopersicum*) in the United States. Falciforme stem rot and decline, caused by fungal pathogens within the *Fusarium falciforme* species complex (FFSC), is an emerging disease that is reducing yields of both California muskmelon and processing tomato. Many growers rotate muskmelons and tomatoes, in the families Cucurbit and Nightshade respectively, to manage pathogens affecting one plant family or the other. It is unclear whether FFSC pathogens are host specific or if they have a broad host range across multiple plant families. Through greenhouse cross-inoculation trials, this study seeks to uncover any evidence of host-specificity of *Fusarium falciforme* species complex pathogens of muskmelon and tomato. Determining host-specificity will aid in developing diagnostic tools to recognize whether distinct pathotypes are present. This understanding will also guide toward more effective disease management practices, such as crop rotation, to ensure the quality and quantity of future yields.

Using Patient Satisfaction Data to Improve Care Delivery at Nadehzda Clinic

Rose Erkinova
Sponsor: Lucy Shi, M.D.
MED: Int Med Hospitalist

Nadezhda Clinic, a non-profit student-run clinic (SRC) affiliated with UC Davis, provides access to primary care services for the underserved Eastern European and Eurasian community of Sacramento. We utilized patient satisfaction surveys to improve delivery of culturally appropriate care that meets the unique needs of our patients. Patient satisfaction data collection started in August 2019 with a pause from March 2020 to July 2022 due to the Coronavirus-19 pandemic. Survey results from the initial six months suggested dissatisfaction with clinic resources, wait times, and patient-provider communication. In response, we moved from a repurposed storefront to a secure clinic space and acquired grants to obtain additional equipment for patient care. Patients were thoughtfully scheduled to minimize wait times and clinic members were trained to optimize clinic flow. 63.17% of respondents from August 2019-March 2020 (pre-intervention) believed the clinic was well-equipped whereas 100% of the respondents after July 2022 (post-intervention) believed the same. 47.37% of the pre-intervention group questioned the accuracy of their diagnosis, which decreased to 26.32% in the post-intervention group. As our clinic continues to expand, we hope to continue using patient satisfaction data to drive improvements in our care delivery model.

Characterizing Cytokine Signatures of NRAMP1 Deficient and Functional Macrophages

Nelly Escalante
Sponsor: Renee Tsolis, Ph.D.
MED: Medical Microbiology & Imm

Natural Resistance Associated Macrophage Protein 1 (NRAMP1) is a metal ion transporter expressed in phagocytic cells such as macrophages, neutrophils, and dendritic cells. NRAMP1 deficiency has been associated with greater susceptibility to infections by intracellular pathogens such as *Salmonella enterica* serotype Typhimurium (*S.* ser. Typhimurium). However, the mechanism by which NRAMP1 protects against pathogens and infection has not been described. We propose that the main antimicrobial mechanism of NRAMP1 is to alter cytosolic iron concentrations to cause metabolic reprogramming of the cell, which includes the production of different cytokines. Using bone marrow-derived macrophages (BMDM), we aim to characterize differences in inflammatory cytokine signatures between NRAMP1 functional and deficient macrophages. Additionally, we aim to investigate whether the polarization state of macrophages (M0, M1, M2) influences the effect of NRAMP1 function on the production of different cytokine signatures. We are using qPCR to measure the expression of several inflammatory cytokines of *S.* ser. Typhimurium infected BMDM at different points of infection. The results of these experiments will help us further understand the role of NRAMP1 in limiting *S.* ser. Typhimurium infection and observe which macrophage polarization states exhibit greater NRAMP1 activity.

Immigrant Flights or Immigrant Rights?: A comparative analysis of political party rhetoric and immigration rates

Julia Estrada
Sponsor: Mccage Griffiths, Ph.D.
Political Science

In modern democracies like the United States (U.S.) and the United Kingdom (U.K.), immigration policy is a key issue in recent administrations. The relationship between dominant political party rhetoric and immigration is important to understand so voters can make informed decisions and recognize the impact this has on a vulnerable population. It is expected that ruling parties implement administrative rhetoric and policy that affects the immigration rate. Political right-wing parties tend to favor more restrictive immigration rhetoric, likely resulting in lower immigration rates. In comparison, the political left's inclusive rhetoric favors higher immigration rates. However, immigration rates may also be driven by international crisis variables like pandemics, war, and hostile governments. The strength of the relationship between administration rhetoric and immigration rates will provide insight into how parties in two similarly functioning modern democracies manipulate constituencies and commit to immigration policy platforms. This research gives voters and immigration advocates the confidence to make strategic political decisions as well as enhances academic knowledge by shaping understandings of political party behavior, how party rhetoric translates into policy outcomes, and provides insight into whether or not political parties follow platform promises with regard to immigration.

Experimental Investigation of the Social and Ecological Effects of a Green Roof Environment on California Grassland Plants

Natan Euol
Sponsor: Anna Kiers, M.L.A.
Human Ecology

As urbanization expands and continues to displace natural habitats, elevated ecosystems, particularly green roofs, offer a way to restore biodiversity and improve human well-being. The UC Davis Green Roof Research project is a multidisciplinary study exploring the ecological and social benefits of California native grassland plants in green roofs. The site, located outside the third floor of the UC Davis Student Health and Wellness Center, is adjacent to a public area for students and members of the UCD community. The project trials untested grassland plants for their adaptability to a green roof environment and their potential to mimic local native habitats and support pollinators. It additionally examines the social significance of planted natural spaces within urban landscapes. Data collected, including plant growth and vigor, floral display, and pollinator abundance, along with qualitative assessments obtained through surveys and observations, will ultimately contribute to a better understanding of the ecological impact of grassland plants and their relationship to pollinators such as bees, hummingbirds, and butterflies within the urban environment.

Choosing and Persisting in STEM: An Equity-based Approach to Out-of-School STEM Program Design

Cameron Evans
Sponsor: Sanjay Joshi, Ph.D.
Mechanical & Aerospace Engr

Considering the growing number of STEM-related jobs in the United States and abroad, efforts to encourage underrepresented students to pursue careers in STEM aims to increase the diversity of culturally-relevant perspectives across STEM industries. At the same time, these efforts serve to indirectly support opportunities for historically marginalized students to increase socioeconomic status, earning potential, and obtain leadership positions. The UC Davis Mind and Machine Summer Camp is an informal-STEM experience for junior-high school level students, designed to address gender-based disparities in the number of degrees earned in higher-education STEM, particularly in engineering and computer science degrees. This research project utilizes an equity-based framework to improve the quality of the UC Davis Mind and Machine Summer Camp and its perceived value to the community and campers. My approach integrates available research along with survey data from families in the greater Woodland community and women in high-level engineering education or professions to understand what factors persuade students and families to choose STEM educational opportunities, and to stay committed to STEM studies.

State Estimate for CubeSat Navigation Testing on an Air-Bearing Table

Natasha Evans
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

This poster discusses a computer vision-based state estimation system for testing of CubeSat relative navigation, developed by the Human, Robotics, Vehicle Integration and Performance Laboratory (HRVIP). Onboard state estimation enables testing of spacecrafts performing rendezvous and proximity operations, such as inspecting another spacecraft. Attitude determination and control systems (ADCS) for an inspection satellite will be tested in-house on an air bearing table, which creates a cushion of air on which a float unit can translate and rotate. The float unit determines its own position and attitude using a computer vision system (which detects the float unit's pose relative to ArUco tags surrounding the table) and an inertial measurement unit (which directly measures acceleration and rotational velocity). Sensor measurements are combined with a state transition model using a Kalman Filter, which allows the float unit to know its position and attitude with higher accuracy than either the model or sensors alone. Additionally, a separate camera system overlooking the air bearing table will measure the float unit's position and attitude externally, serving as ground truth for the onboard navigation. This research enables accurate ground testing of the inspection satellite technology to improve the reliability of the spacecraft.

Using Machine Learning to Bring Physical Dynamics Awareness to a Vehicle Cruise Control System

Jasper Fadden O'Roarke
Sponsor: Shima Nazari, Ph.D.
Mechanical & Aerospace Engr

The self-adaptive vehicle cruise control system is a well-known tool used for autopiloting vehicles. It allows vehicles to output and adjust their own acceleration and braking, ensuring the passengers stay safe. With the move toward autonomous road vehicles and the increase in nuance on city streets, the demand for safer, smarter autonomous cruise control systems increases. Our goal is to build a self-adaptive vehicle cruise control system which scans, interprets, and forecasts the ahead objects in its environment. To these ends, we develop an algorithm that constantly measures the speed and position of ahead objects in the environment and outputs a command to control the vehicle speed so as to minimize chances of collision, yet maximize rate. We test our system in simulation, and ensure it meets our needs by simulating different situations with different kinds of vehicles ahead braking with different deceleration rates. We also set a maximum deceleration rate for our control vehicle, and test that our control system can properly identify this shortcoming and appropriately learn to adjust its speed.

Assessing the Effects of Genetics and Diet on Trimethylamine N-oxide Clearance in Collaborative Cross Mice

Jude Farhat
Sponsor: Brian Bennett, Ph.D.
Nutrition

The metabolite trimethylamine N-oxide (TMAO) is associated with cardiovascular disease, renal disease, and diabetes. The degree to which genetics and environmental factors (such as diet) affect TMAO clearance remains unknown. We hypothesize that differences in genetic backgrounds and diet affect TMAO clearance levels. To investigate this, mice from over 20 strains of the Collaborative Cross (CC) were fed different diets for 8 weeks. Urinary concentrations of TMAO were measured before and five weeks after the diet challenge using liquid chromatography with tandem mass spectrometry (LC-MS-MS). We obtained urinary creatinine measurements to correct for differences in concentration between urine samples. R-studio was used to visualize results and perform statistical analyses. TMAO clearance demonstrated differences in the level of variability both between and within strains at both baseline and post-diet week five. TMAO clearance levels also differed between diets. These preliminary results suggest that both genetic background and diet may contribute to differences in metabolite excretion. Future studies will explore whether TMAO clearance impacts risk for developing cardiovascular or metabolic disease.

Identification of Autism-associated Cis-Regulatory Elements

Luis Farrach
Sponsor: Ana Santos, Ph.D.
MED: Psychiatry & Behav Sci

Majority of the human genome consists of non-coding DNA (ncDNA). Regions of ncDNA are repeatedly associated with diseases including Autism Spectrum Disorders (ASD). Enhancers are cis-regulatory elements within non-coding DNA that help regulate gene expression patterns. Genetic variation in enhancers can have a significant impact on nervous system development. Our previous study determined which disease-associated variants cause dysfunction using a Massively Parallel Reporter Assay (MPRA). We constructed a library of ~1000 ASD-associated single nucleotide polymorphisms (SNPs) in enhancers found in whole genome sequencing studies (GWAS). To ensure the validity of our findings we chose six enhancers with the highest, and six with the lowest activity. We generated a reporter construct for each enhancer to validate using conventional orientation. These constructs were then packaged into adeno-associated virus (AAV) using a triple transfection in HEK293 cells. AAV were then delivered into primary neuron cultures to evaluate cell-type specific activity. After neurons matured in culture, they were fixed and underwent immunocytochemistry. Enhancer activity was detected by GFP expression and co-localization was assessed with cell-type specific markers using NeuN, GAD67, and GFAP. Overall, results show that MPRAs are valuable to identifying enhancers relevant to ASD and may advance our understanding of its pathophysiology.

Abalone Vision

Gordon Feliz
Sponsor: Edwin Solares, Ph.D.
Engr Computer Science

Overfishing off of the coast of California of *Haliotis spp.* (abalone) has led to crashes in their population leading up to their classification as an endangered species. Due to their imperiled status, researchers have begun efforts to increase their numbers through captive breeding programs. These programs are necessary as they are an endangered species and must be bred in captivity in order to culture larger populations for reintroduction into their native habitats. This however requires that the abalone's sex be known prior to being placed in a breeding chamber with the opposite sex. This has posed a challenge as sexing requires invasive methods, which can be lethal for the individual. We propose leveraging automated methods for measuring and classification of gonad organs and classification of abalone sex using modern computational techniques, such as machine learning, specifically computer vision. This allows researchers to scale up their captive breeding program efforts, and speed up the time it takes to release individuals into their native habitat, with the goal of removing red abalones from being an endangered species.

The Impact of Local Industrial Composition on College Major Choice

Ken Fesler
Sponsor: Giovanni Peri, Ph.D.
Economics

I study how a students' choice of college major is correlated with the industrial composition of the area where they grew up. College major choice has lasting future economic implications; I examine whether students living in an area known for or influenced by certain industries have a greater likelihood of picking a college major related to those industries. I use Economic Census data to determine local industrial employment by sector and American Community Survey data to link degree fields to industrial groupings, serving as an intermediate step to relate industrial composition to college majors. By considering how the employment of local industries predicts what fields students choose to major in, combined with the link between degrees and majors, this study reveals what effects local industries may have on the direction students seek for their careers, with implications having the ability to affect where industries decide to locate and families decide to live.

Synthesis and Applications of F_5SCH_2 - Transfer Reagents

Ellen Feuss
Sponsor: Cody Pitts, Ph.D.
Chemistry

Fluorinated groups like the trifluoromethyl (-CF_3) group have been often employed in pharmaceuticals due to their ability to modulate properties such as solubility, lipophilicity, conformation, pKa, metabolic stability, and cellular permeability. Another fluorinated group known as the pentafluorosulfanyl (SF_5) group, nicknamed the "super-CF_3 group," can enhance physicochemical properties of compounds relative to CF_3 derivatives, yet SF_5 does not appear as often as CF_3 in the literature. Compared to the CF_3 group, SF_5 is a stronger electron-withdrawing group, larger in size/volume, more lipophilic, and more chemically stable. However, the SF_5 group presents a far greater synthetic challenge than installing a CF_3 group. Pentafluorosulfanyl chloride (SF_5Cl) - a key source of SF_5 radicals - is one of the few known SF_5-transfer reagents that can install this group on organic molecules. All known pentafluorosulfanylating reagents, such as SF_5Cl, are difficult to make and handle. Synthesis usually involves hazardous materials and/or specialized apparatuses. But, based on recent work in our laboratory and by others, SF_5Cl is now more accessible and easier to work with. Thus, we can envision the synthesis of new SF_5-containing compounds, including new reagents. This project details the first steps towards making never-before-synthesized benzylic-SF_5 compounds via the design of F_5SCH_2-transfer reagents.

Design and Test Plan of a High-Altitude Return-to-Site Vehicle

Liliana Figueroa
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

Scientific balloon missions, such as NASA's SuperBIT and TAURUS, collect enormous amounts of data that contribute to the understanding of our solar system. These missions will generate enormous amounts of data; therefore, a data vault recovery system is needed to recover the data safely. NASA's FLOATing DRAGON competition encourages teams of university students to develop prototypes of their data vault recovery systems. Under Dr.Stephen Robinson's Human/Robotics/Vehicle Integration and Performance Lab (HRVIP), HERMES: "High-altitude Experimental Rogallo Mission to Escort Safely" team developed a return-to-site vehicle inspired by NASA research; a folding Rogallo wing designed for safe escort of data vaults from high-altitude balloon experiments. HERMES will be housed and deployed via a high-altitude balloon gondola and enter autonomous GNC flight. HERMES navigates by controlling wing pitch and roll to reach predetermined waypoints, while beaconing basic health information. Various tests will be conducted: glide performance, wing deployment, GNC testing, thermal testing, landing survivability and a final test flight is planned for August 2023 in New Mexico. Such novel technology could then be implemented for data recovery in other systems such as weather balloons.

Investigating the Mechanism of Beta-Delta Cell Crosstalk Within Pancreatic Islets

Luhaiza Framroze
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

Pancreatic islets are clusters of alpha, beta, and delta cells that produce glucagon, insulin and somatostatin, respectively, and maintain blood glucose homeostasis via an intricate network of cross communication. Delta cells perform crucial paracrine functions, by regulating insulin and glucagon secretion. In diabetes, the loss of functional beta cells results in a loss of beta-delta cell crosstalk, consequently leading to islet wide dysfunction which further hinders glycemic control. The mechanism underlying communication between beta and delta cells is largely debated with two prevailing models: paracrine signaling or gap junction coupling. Our preliminary data imaging Ca^{2+} activity in beta and delta cells within an intact islet suggests their coordination is predominantly mediated via paracrine signaling. This is exemplified by our observation that delta cell Ca^{2+} flux precedes beta cells in response to both high glucose and direct depolarization with KCl. Since coordinated activation via gap junctions requires the activation of a critical cell mass, I hypothesise that gap junction coupling between beta cells delays their response to stimuli. To investigate this I will measure the delay in beta cell Ca^{2+} activation in the presence (intact islet) or absence (dissociated islet) of gap junctions in response to KCl.

Characterization of Polydiacetylene Vesicles for the Visualization of Mechanical Stress

Skye Frank
Sponsor: Tonya Kuhl, Ph.D.
Chemical Engineering

Polydiacetylenes (PDAs) are a class of linear polymers that display a blue-to-red chromatic transition when exposed to external stimuli such as heat or mechanical stress. Initial polymerization is achieved upon exposure of arranged diacetylene monomer to UV light, producing a non fluorescent blue phase polymer. Further exposure to UV light, heat, or mechanical stress will induce a transition to a fluorescent red state. In aqueous solutions, PDAs self-assemble into vesicles which can then be suspended in a hydrogel. When the hydrogel is mechanically stressed, the suspended PDA will undergo a chromatic transition from blue to red, enabling direct visualization of the applied mechanical stress via the fluorescent readout of the vesicles. I will present work on developing 'optimally blue' vesicles for the visualization of mechanical stress on a microscopic scale. Vesicle kinetics and morphology during the chromatic transition are characterized via fluorescent spectroscopy, fluorescent microscopy, and dynamic light scattering. The coupling of rheometry with fluorescent microscopy allows for correlation of the fluorescent response of the vesicles with shear stress applied to the PDA system. Consequently, hydrogel embedded PDA vesicles could enable direct visualization of traction forces exerted by single cells and microorganisms.

Role of Language in Reported Level of Worry About COVID-19 Infection in California

Paulina Frost
Sponsor: Jake Pry, Ph.D.
MED: Public Health Sciences

Previous research has shown that Spanish speakers in the United States have higher rates of COVID-19 infection, exposure, and hospitalization than English speakers. This study leveraged a large state-wide case-control study comparing the reported levels of worry about COVID-19 between those who chose to complete the interview in English or Spanish. Those eligible for study inclusion were recently tested for SARS-CoV-2 in California. The study was conducted by phone interviews between 24 February 2021 and 31 August 2022. Using a regression model, we found that Spanish speakers had significantly higher odds (adjusted odds ratio; 1.98, 95% confidence interval; 1.12, 3.52) of reporting worry about getting COVID-19 compared to English speakers. This research fills in the gaps to show the effect that health disparities have on their perception of personal COVID-19 risk. Ultimately, this study identifies populations disproportionately experiencing anxiety about COVID-19, equipping public health stakeholders to tailor messaging and resources to improve COVID-19 health outcomes in Spanish speakers.

Differential Expression of β-galactosidase Genes in *Bifidobacterium breve* SC95 Grown on Lactose and Lacto-N-neotetraose

Melanie Gallegos-Campos
Sponsor: David Mills, Ph.D.
Food Science & Technology

Breast milk is rich in oligosaccharides known to enrich beneficial bacteria in the infant gut. *Bifidobacterium breve* is a species commonly found in the gut microbiome of breast-fed infants which contributes to the metabolism of milk oligosaccharides. Previous genomic analysis of *B. breve* SC95 identified five β-galactosidase genes that potentially aid in the breakdown of milk oligosaccharides. We examined the involvement of β-galactosidase genes of *B. breve* SC95 in the metabolism of lacto-N-neotetraose (LNnT) and lactose. *B. breve* SC95 was grown on media containing 2% lactose or LNnT. RNA was extracted from the cells collected at mid log phase of growth and cDNA was synthesized. Real-time qualitative PCR revealed genes, *BBRE_01568* and *BBRE_00133* showed significant upregulation while two, *BBRE_0078* and *BBRE_01262*, exhibited low expression during growth on LNnT. These results suggest that two β-galactosidase genes, *BBRE_01568* and *BBRE_00133*, are likely involved in LNnT catabolism. This work provides insight into the specific mechanisms by which different β-galactosidases participate in the metabolism of milk oligosaccharides by infant-borne bifidobacteria. This, in turn, will shed light on methods to promote enrichment of beneficial bifidobacteria within at-risk infants.

To Grow or not to Grow: *B. cinerea's* Ability to Detoxify Glycoalkaloids Related to Functional Genomics

Justin Gambill
Sponsor: Daniel Kliebenstein, Ph.D.
Plant Sciences

Botrytis cinerea is a necrotrophic fungus known for its ability to infect a phylogenetically broad range of plant species. As a potential defense mechanism, plants produce specialized compounds that help to restrict and prevent infection; however, the mechanisms by which such compounds work to prevent infection and damage remains unknown. Tomatine is a glycoalkaloid produced by the leaves of tomato plants known to possess antifungal properties. To identify how this compound may kill Botrytis, we tested ninety-six strains of *B. cinerea* grown on potato dextrose agar containing 200µM of Tomatine. Tracking growth rates and developmental patterns through a series of time associated images, *B. cinerea* displayed two distinct growth behaviors: some strains exhibited growth restriction, while others experienced stimulated growth rates when grown with the toxin. Subsequent genome-wide association analysis of calculated growth rates has linked tomatine detoxification to a RTA1-like protein within *Botrytis*. The full detoxification mechanism remains unknown.

How Sample Characteristics in Scientific Paper Titles Influence Readers' Judgments

Jas Ganev
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Current publication practices within psychology are biased to favor dominant over marginalized samples in the publication process. For example, studies coming from White and western countries are more likely to be published in high-ranking journals compared to those from the rest of the world. The field's tendency to prioritize research conducted with dominant group samples can have detrimental effects, such as neglecting meaningful research and driving the assumption that the psychological experience of a very narrow set of people generalizes to all humans. In response to this problem, some psychology journals are beginning to require authors to specify sample characteristics in their titles. However, in the absence of empirical evidence on how this information affects readers, it is difficult to design effective policies. Our study aims to assess how people from various backgrounds might react to literature titles that include different types of sample characteristics. Participants will see three study titles: (1) a control title with no sample characteristics, (2) a dominant sample title (e.g., "among White participants"), and (3) a marginalized sample title (e.g., "among participants of color"). For each title, they will assess how interesting, important, and applicable they find each study.

Autism in Mice: Using Slide-Free Imaging to Study Autistic Mouse Brains

Nithya Ganti
Sponsor: Richard Levenson, M.D.
MED: Pathology & Lab Medicine

Autism is a developmental disorder that often results in early brain overgrowth caused by unregulated neuronal cell divisions, a consequence associated with the *WDfy3* gene mutation. To view tissue samples at the cellular level, current imaging techniques require hours of preparation time and skilled effort to produce a satisfactory sample that is cut to micron thickness and mounted on microscope slides. We propose the use of a slide-free imaging technique that can instead produce results in a few minutes using thick specimens. Fluorescence Imitating Brightfield Imaging (FIBI) non-destructively and quickly resolves structures on the surface of thick tissue samples, creating images that resemble traditional histology results. Using a variety of staining techniques, we are working with mice heterozygous for the *WDfy3* mutation to look for associated physical variations. Preliminary results found that using FIBI microscopy to analyze brain samples stained with celestine blue and eosin captured features, including fiber bundles not readily visible on typical hematoxylin- and eosin-stained slides, in a faster and more convenient manner. Further study could lead to novel insights and help contribute to future autism spectrum research.

Development of a Model System to Monitor the Autophagy Stress Response During Neurodegenerative Disease Induced Cell Toxicity

Xinyu Gao
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

Autophagy is a cellular pathway that targets damaged organelles and large protein aggregates for degradation in the vacuole or lysosome. The capacity of cells to maintain this homeostatic pathway may become compromised under increased exposure to "stressors," conditions, or events that tax the autophagy pathway. To test this idea more specifically, the Kaplan lab has established a model system to measure autophagy capacity during starvation induced stress in the presence or absence of the neurotoxic protein, alpha-synuclein. Using an mCh-Atg8 fusion, we can determine autophagy levels by measuring the total fluorescence intensity over time. We performed 24 h Rap treatment on wild type cells +/- alpha-synuclein and measured mCh-Atg8 fluorescence. Our preliminary analysis demonstrates that alpha-synuclein limits the autophagy response to rapamycin, reducing the high-end responders in the cell population observed in control cells. We are in the process of reproducing this intriguing observation and extending our analysis to follow individual cell responses over time to better understand how alpha-synuclein affects the autophagy response.

Analysizing the Virulence of *Botrytis Cinerea* through Diet Complexity over Generational Time

Angela Gao
Sponsor: Jordan Dowell, Ph.D.
Plant Sciences

Virulence is the severity of a pathogen to its host, the extent of damage a pathogen can do to its host. In vitro, a pathogen would lose its virulence over time. Observing virulence in vitro draws to conclusions about pathogenicity and mechanisms of fungi traits, one being diet complexity. Not much is known about the processes involved with virulence or methods to control. One way pathogenicity is restored is to rear the pathogen on its preferred host. Thus we hypothesize that one reason for the maintenance of pathogenicity is access to complex nutritional sources. Using different in vitro diet sources, we assess changes in a pathogenicity and growth rate in a common host-generalist necrotrophic fungal pathogen, *Botrytis cinerea*. There is this relationship between diet complexity and time which can bring into question the impacts of virulence over time with these alternate diets to this pathogen that brings alarming concerns to its hosts.

Evaluating pain after disbudding in dairy cattle: Effects of jugular blood draw on behavior

Haley Garcia
Sponsor: Cassandra Tucker, Ph.D.
Animal Science

Research has shown disbudding is a painful procedure in calves that alters behavior like increasing ear flicking, head shaking and tail flicking. However, less is known about the effects of an additional painful procedure on the calves' behavior and heart rate. To evaluate this response, we tested whether caustic paste disbudded calves were more reactive to a routine procedure, blood draw, than non-disbudded calves. We observed 26 heifers, 13 non-disbudded controls and 13 caustic paste disbudded calves. From these treatment groups, we observed 3 behaviors of: hindleg lifts, foreleg lifts, and struggling while the calves were restrained, and a jugular blood draw was performed. Simultaneously, calves wore a heart rate monitor during this procedure and their beats per minute were recorded. While there was no evidence of a significant difference in overall heart rate ($P = 0.4$; mean±SE: Paste = 142 ± 4 beats/min; Control = 148 ± 7 beats/min), disbudded calves displayed hindleg lifts for a greater proportion of time during the blood draw than the non-disbudded calves ($P = 0.01$; mean±SE: Paste = 0.12 ± 0.01 lifts/min; Control =0.06 ± 0.01 lifts/min). This provides evidence that disbudded calves are more responsive to a blood draw than non-disbudded calves.

Viability Testing in Hydrogel-based Bioprinter

Eoin Garcia
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

Bioprinting is an innovative field that extends 3D printing materials containing living organisms. The application space includes printed bioreactors, tissue engineering, and pharmaceutics. Typical research-grade bioprinters can sell for hundreds of thousands of dollars. To make bioprinting more accessible, we are modifying a low cost fused deposition modeling (FDM) 3D printer and turning it into a 3D bioprinter. We have implemented an extrusion based bioprinter design that uses ionically cross-linkable alginate hydrogel as bioink. So far we have accomplished repositioning of the printer's needle to allow printing with an extruder syringe. With an extruder motor body and rail mount, the device's design enables printing shapes according to a specified code in the X, Y, and Z dimensions. We have also characterized the degradation and swelling properties of cell-laden calcium alginate hydrogel to test both viability and cytotoxicity. Our work aims to expand the applicability and customizability of viable 3D bioprinting for biomedical research.

Effect of Testosterone on Mouse Heart Metabolism and Muscle Structure Development

Massie Gardizi
Sponsor: Aldrin Gomes, Ph.D.
MED: Physiology & Membrane Biol

5-month-old male and female C57Bl6 mice were implanted with slow-release testosterone pellets at supraphysiological levels for a period of 21 days. After this period, the mouse hearts were analyzed by a mass spectrophotometer showing changes in cellular respiration and muscle structure development. At the level of respiration, aconitase hydratase (85 kDa) and NADH dehydrogenase (13 kDa) were downregulated while isocitrate dehydrogenase (42 kDa) and oxoglutarate dehydrogenase (115 kDa) were upregulated. Ultimately the upregulation of two of the three irreversible steps of the TCA cycle suggests that testosterone significantly improved respiration in the cardiac cells, which would corroborate previous research on testosterone's significant role in regulating respiration. In regards to muscle structure development: desmin (53 kDa), alpha-actinin-4 (105 kDa), and dystroglycan (97 kDa) all saw significant decreases in activity which was not previously observed in hearts. These proteins are critical to actin and sarcomere stability as well as preventing myocardial damage. Further research is needed to confirm that testosterone is detrimental to the muscle structure development of cardiac cells.

Litigating Climate Change: A Proposed Solution to Surviving Judicial Barriers to Suing the United States Government for Climate Change Harms

Radhika Gawde
Sponsor: Tracy Winsor, J.D.
Environmental Science & Policy

In recent years, there has been a marked increase in litigation seeking to hold the United States accountable for harms caused by climate change, however, it is unclear if existing legal theories have successfully done so. Through analyzing various ongoing, and recent lawsuits endeavoring to hold the United States government accountable for its inactions and actions contributing to global climate change, this thesis seeks to answer two questions: 'Can the legal claims alleging the government's actions exacerbating and failure to mitigate climate change survive standing?' and 'If so, what claims can be used successfully to seek redress for climate change harms?'. This thesis aims to present a legal theory capable of surviving judicial barriers such as standing and to examine whether constitutional law, common law, or statutory claims related to climate-change harms are most likely to allow plaintiffs to successfully hold the United States government accountable for climate change through litigation.

Life Under the Ice: Antarctic Microbial Mat Morphology and Spatial Ecology

David Gee
Sponsor: Dawn Sumner, Ph.D.
Earth And Planetary Sciences

Microbial communities have existed on Earth for the majority of the planet's history, yet we cannot fully explain their formation and ecology. In the perennially-frozen saline lakes of Antarctica's dry valleys, benthic microbial communities are the dominant life forms. These low disturbance environments provide an ideal opportunity to study the connection between life and the physical environment. The communities, mostly cyanobacteria, form "mats" of combined biological material and sediment that build up over time. A key structure present in the mat's topography are pinnacles, which form in part due to cyanobacteria tending to grow towards the direction of light to increase photosynthesis rates. We construct 3D models of microbial mats to statistically analyze the distribution of pinnacles. The distribution reflects patterns associated with community organization and their respective environments. We observe clustered, regularly spaced, and randomly distributed spatial patterning at different sites, suggesting that both competition and mutualism are influential. By investigating modern mat formation and the connection between morphology and environment, we also aim to better understand early life on Earth.

Examining Automaticity of Prediction in Auditory Sentences

Jiaqi Geng
Sponsor: Tamara Swaab, Ph.D.
Psychology

Predictive coding suggests that higher cortical levels make descending predictions on lower sensory representations. However, recent studies indicate that this process of top-down prediction is not necessarily automatic (Brothers et al., 2017; 2019). To address this issue, the present study aims to explore the automaticity of prediction in auditory sentences by manipulating the proportion of sentences with high predictable and low predictable target words. To perform this study, we generated 450 pairs of sentences in which we manipulated two factors: animacy (animate or inanimate) and constraint (high or low predictability with regard to animacy). These standardized sentences will be presented in the auditory modality to 80 participants across two experiments while recording their EEG. In experiment 1, participants will hear 80% high constraint and 20% low constraint sentences. In experiment 2, participants will hear 80% low constraint and 20% high constraint sentences. If the process of prediction is automatic, it should result in a consistently high level of decoding accuracy that is above chance level (50%) in highly predictable sentences regardless of the proportions of sentences manipulated.

Isotopic Variations in Ostrich Eggshells: Cause and Significance

Sophia Gilbertson
Sponsor: Teresa Steele, Ph.D.
Anthropology

With something as small as a fragment of ostrich eggshell from the Namaqualand desert of South Africa, archaeologists can learn about the lifeways of hunter-gatherer groups who lived there for thousands of years. We can reconstruct past climate by analyzing stable isotopes as well as human mobility and trade patterns through the analysis of Strontium isotopes preserved in the ostrich eggshell. But what causes these variations in isotope values? This study attempts to understand what can cause isotopic variations within and between modern ostrich eggshells that have been kiln-heated to different temperatures when the eggs come from the same farm and the ostriches are fed under the same conditions. 60 fragments of ostrich eggshells from five different eggs were kiln-treated in increments of 20° C from 100° C to 220° C, with one control group being left unheated. Our results show that although the eggs came from the same setting they are highly variable in terms of isotopic levels between each other. We are now exploring which variables besides diet affected the isotope values of the eggshells. This study contributes to understanding how people lived and moved thousands of years ago through anything they left behind, including their food scraps.

Trust in Adverse Childhood Experiences (ACE) Screening during Pregnancy: A Concept Analysis

Paige Gilliland
Sponsor: Leigh ann Simmons, Ph.D.
Human Ecology

Adverse childhood experiences (ACEs) have been linked to preterm birth, gestational diabetes, lack of fetal movement, and more biological and psychosocial risks resulting in poor pregnancy outcomes. Current literature suggests that screening for ACEs during prenatal care allows for improved patient-provider relationships and prevention of these known pregnancy outcomes. However, due to the sensitive nature of the ACE screener, a patient's trust - or lack thereof - in their provider may impede screening. I am conducting a concept analysis of trust in prenatal ACE screening using the Rodgers and Knafl (2000) concept analysis method to define the antecedents, attributes, and consequences of this construct. This concept analysis seeks to elucidate the role of trust in prenatal ACE screening to improve patient-provider relationships, increase patient uptake of ACE screening, and ensure that ACE screening is implemented in a strengths-based, trauma-informed way. Findings may be used to enhance patient trust and improve outcomes in prenatal care ACE screening by breaking barriers and misconceptions associated with talking about trauma. Clarifying the attributes of trust will provide physicians, nurses, and other healthcare providers guidance on what patients need for trust to be achieved in this context.

Evaluating the Relation Between Obesity, Breast Cancer, and Outcomes after Bariatric Surgery

Neha Gondra
Sponsor: Victoria Lyo, M.D.
MED: Surgery

Obesity is a significant public health concern affecting over 41.9% of Americans and increases the risk of developing multiple cancers. The mechanism of this association is thought to be from long-lasting inflammation, increased insulin levels, and sex hormones. Obesity is associated with higher estrogen levels in women, which further increases the risk of hormonally active cancers such as breast cancer. While weight loss can reduce the risk of cancer in these patients, bariatric surgery is more effective than diet or exercise for long-term, significant weight loss and increases a patient's life expectancy. After surgery, patients lose adipose tissue, where hormone synthesis occurs and thus may reduce cancer risk. While bariatric surgery is thought to reduce the risk of cancer, these studies are derived from large databases with limited detailed clinical information. This study aims to investigate the relationship between obesity and the effect of bariatric surgery on breast cancer outcomes. We will develop a clinical database created from electronic medical records of UC Davis Health patients who have breast cancer, identified by ICD-10 diagnosis codes, to provide a more comprehensive understanding of the measurable changes in cancer outcomes between patients with obesity compared to those that underwent bariatric surgery.

HapSolo2: New Methods and Code Refactoring of a Leading Optimization Approach for Removing Secondary Haplotigs During Diploid Genome Assembly

Prashansa Goel
Sponsor: Edwin Solares, Ph.D.
Engr Computer Science

Reconstructing diploid genomes, which contain information from both parents, is challenging due to their inherent heterozygous nature, (alternative contigs) which lead to ambiguities in the final reconstruction. Programs like PurgeDups and HapSolo exist to help solve this problem. HapSolo is a recently published method that identifies secondary contigs and defines a primary assembly based on multiple pairwise contig alignment metrics.HapSolo evaluates candidate primary assemblies using highly conserved single-copy genes and classifies alternative contigs based on this information using an AI-based optimization approach. The original implementation uses a random forward walking hill climber to minimize traverse the search space, minimizing the cost function by identifying and removing duplicate single-copy genes, and has been effective at classifying and removing alternative contigs across multiple species. In this project, we refactor the code base, implement a forward-looking hill-climbing optimization search algorithm with random restart, and take advantage of GPU compute for highly parallelizing optimization. This can help accelerate genetic research, by reducing genomic noise and assist in producing more complete and continuous genomes, which can lead to important discoveries in fields such as medicine, agriculture, and biotechnology.

Almond Shell Powder: A Natural Biosorbent for Removal of Phenolics in Food Processing Wastewater

Nadia Gonzalez
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Food Science & Technology

California produces 857,000 tons of almond shell waste annually. Currently almond shells don't have any real market value. The goal of this study was to take this byproduct and use its binding properties to remove phenolics in food processing wastewater, (eg. winemaking/ fruit processing) which can be high in phenolic compounds. Phenolics are potent antioxidants, therefore their recovery from wastewater has potential as value-added products for use in food, cosmetics, and health industries. The structure of phenolics is very similar to lignin; the primary component of almond shells. Following the idea that 'like attracts like' almond shells can potentially be used as a biosorbent to bind phenolic compounds from food wastewater. For this experiment a model winery wastewater containing phenolic compounds was incubated with ground almond shell powder (ASP) for various amounts of time. High performance liquid chromatography (HPLC) was then used to analyze the concentrations of phenolic compounds present in the model wastewater before and after incubation. Outcomes revealed that phenolic compounds are retained by the ASP and that phenolics are recovered quantitatively from the ASP. This research demonstrates that ASP can be used to clean another food processing wastewater, increasing the sustainability of both food processing systems.

Assessing the Capabilities and Limitations of Environmental DNA (eDNA) as a Tool for Monitoring Fish Biodiversity

Cristina Gonzalez
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Environmental Toxicology

Environmental DNA (eDNA) is genetic material shed from organisms into their surroundings, such as through skin cells or mucus. eDNA extracted from water samples can be used to identify species present in the corresponding body of water through metabarcoding, a method that uses primers to amplify regions of DNA that vary among species. These DNA segments are sequenced and compared to a sequence database to determine taxonomy. eDNA is a potentially valuable tool for monitoring fish diversity in Marine Protected Areas (MPAs), without requiring the ability to visually identify species. However, primers and reference sequence databases have limitations that can affect the accuracy of taxonomic assignment. In this study, eDNA samples were collected alongside the California Coastal Fisheries Research Program's annual angling survey of California MPAs. To validate the approach, 8 eDNA samples were collected from two tanks housing Northern California marine fish. Nineteen fish species were identified in the tank samples. Of 11 rockfish species (*Sebastes* spp.) listed as present in the tanks, 4 were not identified by eDNA. These preliminary results indicate that eDNA has the ability to provide species-level identification of Northern California marine fishes, but is restricted in its capacity to identify closely related rockfish species.

Creating a Trait Database of Edible Trees for Climate-Ready Urban Food Systems

Kelly Graziadei
Sponsor: Alessandro Ossola, Ph.D.
Plant Sciences

In an urbanizing world, urban food systems are essential. Most of the global population lives in or near an urban center. Urban food systems have the potential to combat food insecurity and improve human nutrition. Climate change threatens these systems to an extent unknown to date. For urban farmers and communities that most rely on these cropping systems, for instance by planting edible and fruit trees, the challenge remains on how best to select for crops that are climate-resilient. In this study, over 4000 commonly planted urban trees across 755 U.S. cities and 17,793 U.S. towns – mined from urban big data – will be analyzed for the suitability to future climates. Their potentials for long-term urban food production will be assessed and modeled by incorporating data on the nutritional values of tree organs (e.g., leaves, fruits, bark). Outcomes of these data and analyses will allow the creation of a new tool on urban tree traits to aid urban farmers and communities in selecting and planting climate-appropriate urban food trees. This will hopefully diversify urban food systems, build resilience within and across communities, and add to the growing knowledge on ecologically-sound solutions for a changing climate.

Fate and Healthcare: Fatalism as a Pejorative and the Intersections Between Islamic Fatalism and the COVID-19 Pandemic

Emma Griffis
Sponsor: Mairaj Syed, M.D.,Ph.D.
Religious Studies

Western scholarship has historically categorized Islam as a fatalistic religion—fatalism denoting a view in which God predetermines the time and manner of death. Moreover, medical scholarship frequently proposes that fatalism negatively affects Muslim patient's health outcomes, positing that it dissuades them from seeking preventative health measures due to the belief that only God holds power over life and death. In order to discern how health intersects with fate in Islam, I investigate the manner in which Muslim texts treat fatalism as it relates to illness and healthcare. During the COVID-19 Pandemic, Islamic scholars and religious leaders encouraged their communities to seek treatment and practice social distancing, often at the expense of religious gatherings. In a survey of twenty-seven English *fatwas* surrounding the COVID-19 pandemic, references to fatalism appeared in ten sources, frequently citing *hadith* in which the Prophet refutes passive acceptance of disease while affirming God's determination of fate. Moreover, appeals to fatalism frequently emphasized medications and medical treatments tools of God that Muslims are obligated to seek out in order to preserve their health. While discussions of fatalism occasionally acknowledged the possibility of despair, religious leaders emphasized the hope and tranquility of placing trust in God's will.

A Whole Genome Sequencing Study to Identify Variants Associated With Deafness in Blue-eyed White Alpacas (*Vicugna pacos*)

Anna Grulikowski
Sponsor: Felipe Avila, Ph.D.
Veterinary Genetics Lab

Alpacas are important for fiber production, which is softer, warmer, finer and less allergenic than sheep's wool. Alpaca fiber comes in 16 officially recognized colors, but white is most desirable because it can be dyed to produce any color. Therefore, breeders have traditionally used phenotypic selection to increase the frequency of white alpacas in their herds. White alpacas can be born with blue eyes, and these individuals are unilaterally or bilaterally deaf, but the genetic basis of deafness in blue-eyed white (BEW) alpacas is not yet understood. To identify causal variant(s) for this phenotype, whole genome sequencing data from 5 BEW alpacas was compared to data from alpacas of various colors (n=5). Candidate pigmentation genes (n=667) were assessed for coding variants. Variants homozygous or heterozygous in cases and absent in other alpacas were prioritized for further investigation. Missense variants were identified in CDK2RAP5, KIT, LMO7, and REST. These genes have been implicated in deafness associated with hypopigmentation phenotypes in other mammals. Analysis is ongoing to validate the association of these variants with the phenotype by screening 96 unrelated alpacas of various colors. Our goal is to develop genetic tests to support informed decisions in alpaca breeding.

Archives & Social Abandonment in the Triangle District

Santana Guerra
Sponsor: Marisol De LaCadena, Ph.D.
Science & Technology Studies

Since the early 2000s, the City of Sacramento has engaged in developing Oak Park, a racialized neighborhood that has been narrated as impoverished and violent. I intend to consider how these processes of development and gentrification, in a historically Black and Brown neighborhood, affect the lives, placements, and forms of meaning-making for Oak Park's traditional residents. Broadly, anthropology, sociology, and ethnic studies have discussed how gentrification may be experienced as a racialized form of state violence. Based on ethnographic encounters, city archives, and community street archives, I explore relationships between local state, corporate, and community imaginaries on what constitutes Oak Park. My research seeks to understand contested narratives of belonging in Oak Park through considering how local community archives and official state archives make possible the constructions of the city space amid tensions between development and gentrification. It is the primary concern of this study to explore potential contrasts between local state archives and community street archives, while considering how life-making narratives may emerge to assert senses of Black and Brown belonging. In this manner, I hope to show how archives assert an existence on their own terms, and thus constitute a form of power in everyday life.

Evaluating a Novel Radio Frequency-Based Soil Moisture Sensor Under Saline and Imperfect Installation

Aaron Guerra
Sponsor: Isaya Kisekka, Ph.D.
Biological & Ag Engineering

This paper examines a novel Radio Frequency (RF) soil moisture sensor that uses delay time in radio wave propagation through soil to derive the dielectric constant of the soil and consequently the soil volumetric water content. Potential benefits of this sensor include resistance to high salinity levels and air gaps due to imperfect installation, which affect some currently available soil moisture sensors. The experimental setup for the sensor calibration includes varied soil volumetric water content (θ) and salinity levels (dS/m) over two major California soils and glass beads as a laboratory standard. Additionally, the novel sensor is compared with and without a simulated air gap, created using polyvinyl chloride electrical tape wrapped around the sensor prongs. A time domain reflectometry (TDR) sensor and gravimetric measurements of θ were used to validate the sensor. Results showed a high correlation between delay time and soil water content regardless of salinity level, while the presence of an air gap presented a slight reduction in RMSE. Soil-specific calibration was also found to reduce the error for all soils. Results indicate that the sensor performs as intended and would aid regions containing saline soils or soils that are subjected to intermittent drought.

Ibuprofen Alters Cellular Function Correlated with Oxidative Stress in Liver Tissue and Cardiac Cell Lines

Timothy Gutierrez
Sponsor: Aldrin Gomes, Ph.D.
MED: Physiology & Membrane Biol

Oxidative stress describes the imbalance in production of reactive oxygen species (ROS) and antioxidants. Prolonged oxidative stress is linked with pathological conditions. The mechanisms by which ibuprofen causes its side effects might be explained through induction of oxidative stress. Therefore, I examined markers of oxidative stress in mice treated with ibuprofen. Control mice were provided with water. Mice in the experimental group were administered ibuprofen in drinking water at a concentration of 100 mg/kg/day for seven days. This dosage approximates human consumption of 486 mg/day. Lipid Peroxidation Assay, with a control group of n=4 and an experimental group of n=5 was performed on a 96-well fluorometric plate to measure lipid peroxidation in liver tissue. Glucose-1-Phosphate Assay with a control group of n=5 and an experimental group of n=5 was performed on a colorimetric plate to measure glucose-1-phosphate levels. H9c2 cells were harvested and used for ROS assays. In the ROS intensity assay, cells in the experimental group were treated with a dosage of 400μM (micromolar) ibuprofen. Equal amounts of protein (20μg) were separated on 4-20% TGX precast gels and transferred to membrane. Across all markers, the Ibuprofen-treated groups displayed increased markers of oxidative stress thus supporting the hypothesis.

An Ecological Model of Resources and Services for Navigating Pregnancy After Sexual Assault

Stephanie Ha
Sponsor: Leigh ann Simmons, Ph.D.
Human Ecology

While access to sexual and reproductive healthcare exists in the United States, many pregnant people who experienced sexual assault encounter barriers that prevent them from receiving comprehensive care. This study seeks to explore the barriers to accessing services and resources at multiple levels of influence for pregnant individuals who experienced sexual assault to understand current gaps in care. Using Bronfenbrenner's ecological theory of human development, we review peer-reviewed literature to understand how factors at the individual-level, microsystem, mesosystem, exosystem, macrosystem, and chronosystem affect available services and resources for pregnant sexual assault survivors for the following age groups: 17 and under, 18 to 25, 26 to 35, and 36-49 years. At the exosystem level, pregnant individuals 17 and under may encounter unique challenges, such as parental involvement and lack of confidentiality in obtaining medical services, due to their age. At the macrosystem level, the post-trauma recovery of pregnant individuals of all ages may be influenced by a rape-prone culture that condones sexual violence, while also placing blame on the victims. These findings will inform recommendations for improving access to comprehensive sexual and reproductive healthcare among sexual assault survivors, ultimately contributing to the advancement of the United Nation's Sustainable Development Goal 5.

Quantification of the Host and Viral Response to Zika Virus Infection

Sophia Haggard Arce
Sponsor: Priya Shah, Ph.D.
Chemical Engineering

Zika virus (ZIKV) is a mosquito-borne flavivirus which ravaged Central and South America between 2015-2016, as *in utero* infection can cause microcephaly and other birth defects. ZIKV proteins interact with host proteins to replicate and cause disease. Previously, we used proteomics to identify ZIKV-host protein-protein interactions. This identified the interaction between ZIKV NS4A and the host protein ANKLE2, a protein associated with congenital microcephaly. We have previously demonstrated that NS4A induces microcephaly in an ANKLE2-dependent manner. My lab is now interested in identifying the role ANKLE2 might play in ZIKV infection. To test this, we generated ANKLE2 knockout cells. I will use RT-qPCR to compare the changes in virus replication in these cells, compared to control. In addition, I will investigate changes in immune response genes that might contribute to changes in replication. For example, I will evaluate the expression of NF-kB, which is an important part of the antiviral immune response because of its role in the pro-inflammatory immune pathway. This work will enhance our understanding of the ZIKV-ANKLE2 interaction and demonstrate the importance of ZIKV-host protein interactions and their roles in facilitating ZIKV replication. This may later lead to an increased understanding of flavivirus replication as a whole.

Effects of Maternal Environment on Seedling Traits and Drought Performance in Squirreltail Grass (*Elymus Elymoides*)

Simone Haggerty
Sponsor: Jennifer Funk, Ph.D.
Plant Sciences

Droughts are becoming more frequent and severe, negatively affecting many ecosystems. As the global climate changes, restoration interventions are increasingly important to maintain biodiversity and ecosystem services such as reducing erosion, nutrient cycling, and carbon sequestration. Within restoration sites, seedling establishment and early survival are extremely important. Maternal plant environment may affect offspring traits and success through resource allocation to seeds and transgenerational epigenetic inheritance. This study seeks to examine how maternal environment affects seedling traits and response to drought in Squirreltail grass (*Elymus elymoides*), a perennial bunchgrass prevalent across the western United States. It is particularly valuable in restoration efforts due to its ability to tolerate dry climates and compete with invasives. Seeds were collected from maternal plants subject to wet, dry, or control conditions and grown in a greenhouse with normal or reduced watering before collection and trait measurements. Our predictions include that seedlings collected from maternal plants grown in dry conditions will have root traits that align with methods of resource conservation, and therefore will be more drought-tolerant. This research will help inform future restoration efforts by showing how maternal traits affect seedlings, and how we can apply this knowledge to sourcing seeds to maximize plant survival.

Vibrational Shaker Testing on CubeSats

Jonathan Hale
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

Technology Readiness Levels (TRL) are numbers (ranging from 1-9) used to determine a device's maturity level. CubeSats typically need a TRL above a 7 to be considered for space missions. To increase its TRL score, further testing must be done on the ground to prove that it can withstand conditions on an actual mission. This research aims to increase the TRL of a CubeSat, so that it may be used for a future space mission, through environmental testing. The CubeSat will undergo vacuum, thermal vacuum, and vibrational shaker testing, to make sure that the CubeSat is adept for space travel. In this research, vibrational shaker testing will be the main focus. To get started, testbeds and rails will be machined to meet the specifications of the shaker, vibrating the CubeSat separately in each 3-axis. The frequency and amplitude of the vibrations used will be determined based on the typical vibration parameters from a rocket launch on Earth.

Older Human Subjects Exhibit Reduced Representation of Single Trial Movement Perturbations

Katelyn Haly
Sponsor: Wilsaan Joiner, Ph.D.
MED: Neurology

Movement feedback control is the ability to correct a motor error during or after it occurs. Force-pulse perturbations produce position and velocity changes during arm-reaching movements to examine this feedback response. Previous studies show that aging impairs sensory processing and motor execution, resulting in slower reaction times during arm movements. We hypothesized that older subjects would have reduced movement state representations (position and velocity) in response to both early and late perturbations compared to young subjects, resulting from impaired feedback control. Subjects completed one session making arm movements with the KinARM robot which measures hand position, velocity, and force. Results showed that limb movement trajectories, curvatures, and movement displacements were similar between young and older subjects. Measured temporal force profiles showed that young subjects utilized the velocity motion state to compensate for early perturbations and position for late perturbations. In contrast, older subjects utilized velocity for early perturbations but did not exhibit a clear representation of either motion state for the late perturbation. This suggests that older subjects have reduced movement representation in response to late perturbations resulting from impaired feedback control, supporting our hypothesis. Future studies will compare these preliminary results to movement feedback control in Huntington's Disease patients.

Noble Gases in Speleothems as Paleoclimate and Geochronology Proxies

Natasha Hanna
Sponsor: Sujoy Mukhopadhyay, Ph.D.
Earth And Planetary Sciences

Reconstructions of past climates inform our prediction of future climates by demonstrating natural climate forcings independent of anthropogenic influence. While sea surface temperature reconstructions in the geologic past have been done successfully, land surface temperature reconstructions have proven to be difficult. Recent work suggests land temperature reconstruction may be possible using tiny amounts of water trapped inside speleothems. Noble gases dissolve in these water bubbles based on the cave air temperature and thus, act as a paleothermometer. To understand how rapidly climate signals get locked into water bubbles in speleothems, we investigated whether atmospheric tritium produced from nuclear bomb testing might be recorded in a modern stalagmite from Guam through analyses of ^{3}He, the radioactive decay product of tritium. We observed a $^{3}He/^{4}He$ signal far exceeding that of normal air (7 times the atmospheric value) in a layer corresponding to the peak in bomb testing. This indicates that water pockets in speleothems can accurately reflect atmospheric conditions at the time of formation and provides a basis for the use of dissolved noble gases as paleoclimatology and geochronology proxies. Particularly, tritium produced ^{3}He as a geochronometer and Ar, Kr and Xe as precipitation-independent paleothermometers.

Soil Drivers of Mycorrhizal Colonization of Grapevine Roots

Alicia Hans
Sponsor: Maria Lazcano Larkin, Ph.D.
Land Air & Water Resources

Mycorrhizal fungi form mutualistic relationships with more than 90% of terrestrial plant species, including grapevines, to help them tolerate stresses such as nitrogen (N) limitation. In low-input systems like vineyards, N availability may depend on microbial mineralization of organic N sources. I propose using the ratio of potentially mineralizable nitrogen (PMN) to microbial respiration as a proxy for stress from N limitation. I investigate the correlation of mycorrhizal colonization of grapevine roots with this proxy and grapevine water stress, leaf respiration, and leaf N content. Soil samples were collected from twelve vineyards across an edaphoclimatic gradient from California to Oregon, containing a range of PMN. They were sieved, and subsamples were analyzed for PMN. Dry subsamples were analyzed for microbial respiration. Root samples were collected from the vineyards, from three vines per treatment. Roots were washed, stained for mycorrhizal fungi using trypan blue, and colonization was quantified using a microscope. I hypothesize that where the ratio of PMN to microbial respiration is higher, there will be more mycorrhizal colonization, and vice versa. If the proposed proxy has a strong correlation with mycorrhizal colonization, it could be used to study the impacts of management practices on plants and soil in agriculture.

Intramuscular allopregnanolone as a treatment for soman-induced status epilepticus

Vishal Harnoor
Sponsor: Michael Rogawski, M.D.,Ph.D.
MED: Neurology

Allopregnanolone (ALLO) is a powerful antiseizure molecule that acts as a positive allosteric modulator of GABA-A receptors. This study investigated if ALLO can terminate benzodiazepine refractory status epilepticus (SE) produced by administration of the nerve agent soman in an animal model. I developed a new electroencephalographic (EEG) approach to assess the impact of the treatment in which the occurrence of SE was determined using recent published EEG definitions for human nonconvulsive SE. Rats were challenged with soman (121 µg/kg, SC) and 30 min later were administered midazolam (MDZ) (0.65 mg/kg, IM) or ALLO (12 or 24 mg/kg, IM). Spikes were identified in the EEG record using commercial software. I wrote an algorithm in which a 10 s window walked the record in 1 s steps to score the segment as no-seizure or seizure. I then determined the seizure burden in 30 min increments. Seizure burden of 20% or more was considered SE. MDZ did not reduce the seizure burden. ALLO (12 mg/kg) transiently stopped SE for 60 min after dosing. ALLO (24 mg/kg) eliminated SE during the entire 4 hour recording period (mean seizure burden of 1.028%). High dose ALLO has promise in treating soman-induced SE.

Are Forever Chemicals in Food a Cause for Concern? A Dietary Risk Assessment of Select PFAS in the United States

Mahmood Hashimi
Sponsor: M. elizabeth Marder, Ph.D.
Environmental Toxicology

Humans are widely exposed to a variety of “forever chemicals” from the class of over 9,000 per- and polyfluoroalkyl substances known as PFAS. Available data suggest that diet is a major human exposure pathway for at least some PFAS, though there is considerable variability. Regulatory and public health agencies increasingly recognize that PFAS may cause adverse health effects, but evaluation of risks related to the presence of PFAS in food has been limited by data available to inform key elements of the traditional risk assessment process. However, there are a subset of PFAS for which draft or final toxicity assessments have been developed by authoritative entities such as California EPA’s OEHHA and the federal EPA’s Integrated Risk Information System program (IRIS). In recent years, studies of domestic foods and drinking water have detected these and other PFAS in both market basket samples and samples from regions with known PFAS contamination. Relevant concentration data, summarized here, were used to inform estimates of dietary PFAS exposure for overall and population-specific consumers of each food. These exposure estimates were then used in conjunction with health guidance values to assess risk posed by presence of these PFAS in foods, including aggregate and cumulative risks.

Proper Temperature Cycling Promotes Longevity in *Drosophila melanogaster*

Cheryl Heng
Sponsor: Fumika Namekawa, Ph.D.
Neuro Physio & Behavior

Previous scientific research suggests that circadian rhythms are often affected by environmental temperature. As an ectotherm, internal temperature regulation in *Drosophila melanogaster* is dependent on its external environment, allowing us to consider the impact of body temperature. Body temperature rhythm plays an important role in homeostasis in *D. melanogaster*. Would maintenance of a constant temperature or a proper cycle of temperatures support a longer lifespan? Based on our past research on the temperature preference rhythms (TPR) of *D. melanogaster*, we investigated the effect during day (7AM-7PM) and night (7PM-7AM) phases of the proper temperature cycle (TPTC, 21?:27?:21? at 7AM:7PM:7AM), inversed temperature cycle (TITC, 27?:21?:27? at 7AM:7PM:7AM), and constant temperature (TC, 25? at all times) on the lifespan of *D. melanogaster.* Unexpectedly, *D. melanogaster* incubated at TPTC displayed a longer lifespan than those at TC. Incubation at TITC and TC presented a similar pattern of longevity. The results propose the attribution of the longevity of *D. melanogaster* to a thermally affiliated gene intrinsically linked to its circadian rhythm.

Convergent Evolution of a Specialized Feeding Mechanism in Zooplanktivorous Fishes

Marta Hess
Sponsor: Peter Wainwright, Ph.D.
Evolution & Ecology

Zooplanktivory has convergently evolved multiple times in marine and freshwater bony fishes. However, little is known about the feeding novelties associated with making the evolutionary jump to zooplankton feeding. I am comparing lineages of fish that have evolved zooplanktivory and a related novelty: the ability to protrude their upper jaw beyond their lower jaw. In many suction-feeders, the upper jaw protrudes from the head but is limited. As extreme upper jaw protrusion may be advantageous for feeding on small, elusive prey such as zooplankton, I am investigating the mechanism of jaw protrusion in the lineages Cichlidae, Haemulidae, and Serranidae. Within each lineage, I am comparing a zooplanktivorous species to two outgroups, close relatives of the zooplanktivore with a more benthic feeding ecology. I am analyzing high-speed fish feeding video, using computer digitization to create kinematic plots of the movement of various bones. My preliminary results indicate that zooplanktivores have greater premaxillary protrusion, greater maxilla rotation, and less head elevation, suggesting that these novelties are linked to extreme upper jaw protrusion. Feeding strategies are core components of functional morphology, showing how ecology can result in anatomical specialization. Furthermore, studying large fish families can expand our knowledge of evolution in less-studied fish.

Comparison of Proteases Used in Histone PTM Analysis of Mozambique Tilapia Gills

Shae Hill
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Proteases have practical use in histone post-translational modification (PTM) analysis, particularly using liquid chromatography mass spectrometry methods. It is beneficial to know what protease will be the most effective at revealing the desired histone PTMs in a given study. Four proteases were identified to have promise in revealing unique histone PTMs. We used Trypsin platinum, ProAlanase, Thermolysin, and Pepsin to digest Mozambique tilapia (*Oreochromis mossambicus*) gill tissue samples. The *O. mossambicus* samples were obtained from fish that had experienced two different salinity treatments. One group of fish had experienced freshwater (0 ppt) conditions and the other group had experienced seawater (30 ppt) conditions. All gill samples were aliquoted and processed using each of the four proteases. A second goal of the experiment was to investigate the differences in the global histone PTM landscape between fish inhabiting freshwater versus saltwater conditions. By comparing these proteases' effectiveness in revealing desired histone PTMs we establish which is the most beneficial to use.

The mismatch detection complex Msh2-Msh6 prevents rearrangements caused by a highly mutagenic recombination pathway involving divergent repeats.

Cameron Hom
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

Msh2-Msh6 is a mismatch detection complex that regulates homologous recombination (HR), a high-fidelity DNA repair pathway that can repair DNA double-stranded breaks and ssDNA gaps. A significant fraction of endometrial, colon, stomach, and bladder cancers have alterations in the human *MSH2* and *MSH6*. During HR, Rad51 forms a filament on the damaged ssDNA, and pairs it with an intact DNA strand that perfectly matches it. This intact DNA strand will serve as the template to fill in information lost when the DNA was damaged. Msh2-Msh6 regulates HR to prevent recombination between mismatched sequences. Recombination between mismatched sequences can cause rearrangements and information loss, but Msh2-Msh6 stops this by recognizing mismatches between the strands in the pairing intermediate, recruiting other proteins to disassemble the intermediate. We investigated whether Msh2-Msh6 also prevents rearrangements from a form of highly mutagenic recombination between repeats called multi-invasion recombination (MIR) that occurs when the Rad51 filament engages two or more templates, instead of the typical one. We found that Msh2-Msh6 suppresses MIR between mismatched DNAs. Since, the resolution of multi-invasion intermediates differs substantially from that of normal recombination intermediates, our findings provide insight into the step in the recombination pathway at which Msh2-Msh6 act.

Efficacy and Ecological Impacts of Releasing Transgenic *Anopheles gambiae* with Gene Drive

Ariana Hosseini
Sponsor: Gregory Lanzaro, Ph.D.
VM: Pathology, Micro, & Immun

Malaria is a deadly disease caused by the *Plasmodium* parasite, carried by *Anopheles* mosquito hosts before transmission to humans. The University of California Malaria Initiative (UCMI) is taking a new approach to eradicate malaria by inserting two beneficial synthetic genes into the mosquito genome that block *Plasmodium* parasite development. Paired with gene drive technology, the desired genes can rapidly spread throughout the target population. To better understand potential ecological impacts of releasing genetically modified mosquitoes (GEMs) we compare predator avoidance between wildtype *Anopheles gambiae* and GEMs and the impact on growth of consuming GEMs on a common co-occurring predator, *Gambusia affinis*. Predator avoidance was assessed by placing mosquito larvae in an aquarium with one *Gambusia affinis*, and after one hour, the remaining larvae were surveyed. To test impacts of larval diet on predators, *Gambusia affinis* fry were fed *ad libitum* with wildtype or GEM larvae and growth was monitored until the age of sexual differentiation was reached. No difference in predator avoidance abilities of mosquito larvae, or in predator growth rates were found. Our results suggest that GEMs will likely be successful in the wild, have no adverse effects on co-occurring organisms, or negatively impact the UCMI vector control strategy.

Using yeast, *Kluyveromyces lactis,* to express casein protein for real vegan cheese production

Kenta Hsu
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

We aspire to reduce the environmental impacts of traditional cheese making by exploring cow-free methods to produce milk caseins. These proteins help give cheeses produced from milk distinctive tastes and textures that non-dairy cheese alternatives have yet to replicate. Our research explores the challenge of using the yeast organism *Kluyveromyces lactis* as a more environmentally responsible and economically viable production host for the synthesis of bovine casein proteins in cheese production. We have designed and are building genetic constructs to express the four main subtypes of casein proteins (αs1-casein, αs2-casein, β-casein, and κ-casein) each with and without the presence of alpha mating factor in *K. lactis*. Recent developments include confirming genetic constructs encoding αs1-casein and αs2-casein with Sanger sequencing. Therefore, we are planning our next experiments to test the expression of these genes in *K. lactis* and to evaluate what yield and purity can be achieved in a simple laboratory scale study.

Evaluating the Relationship between Network-Specific Cerebrovascular Reactivity and Age using Resting-State Functional MRI

Claire Hsu
Sponsor: Audrey Fan, Ph.D.
MED: Neurology

Alzheimer's disease (AD) is a neurodegenerative disease that is difficult to diagnose. However, studies have shown that cerebrovascular reactivity (CVR), the ability of blood vessels to dilate in response to vasoactive stimuli, can be a biomarker for AD. In this study, we calculate CVR using the blood-oxygen-level-dependent (BOLD) signal of functional magnetic resonance imaging (fMRI). By studying resting-state CVR (RS-CVR) in aging, we can identify regional CVR changes associated with cognitive decline. We hypothesize that RS-CVR is inversely proportional to age in the Posterior Default Mode (pDMN), Anterior Default Mode (aDMN), Right Fronto parietal (rFPN), and Left Fronto parietal (lFPN) Networks. Using fMRI scans from the Alzheimer's Disease Research Center, RS-CVR maps were generated through MRICloud, an online CVR processing pipeline, for 20 participants. Average RS-CVR values were calculated for the pDMN, aDMN, rFPN, and lFPN networks and regressed against age. We observed a negative trend with age in aDMN (m=-0.0013, p=0.54), pDMN (m=-0.0056, p= 0.32), and lFPN (m=-0.0013, p=0.68), but a positive trend in rFPN (m=0.0013, p=0.68). Although our correlations are not statistically significant, the negative trends support our hypothesis. In the future, we will increase our sample size to better understand the correlation between RS-CVR, age, and cognition.

Chlamydomonas reinhardtii as a Sustainable Platform for the Biomanufacturing of Human Insulin

Annie Hu
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

As the price of therapeutic proteins continues to rise, access to potentially life-saving medications becomes increasingly difficult for many patients around the world. The most common chassis organisms used to produce these proteins, such as *E. coli* and *S. cerevisiae*, utilize inputs that come at a significant environmental and economic cost. Our goal is to use *Chlamydomonas reinhardtii* to produce a recombinant proinsulin protein for use in diabetes patients. *C. reinhardtii* is a single-celled eukaryotic microalgae that has been shown to be capable of therapeutic protein production. By only requiring light, trace minerals, buffer, and a nitrogen source, microalgae provides a low-cost solution for proinsulin production that is also ecologically sustainable. We report our progress towards the design and assembly of the plasmid vector we will use to genetically engineer *C. reinhardtii*. We will also discuss the optimization of existing microalgae transformation protocols. The Algae to Insulin team is a part of BioInnovation Group at UC Davis, which provides undergraduate students the opportunity to coordinate and innovate in biotechnology research.

Cell Morphogenesis and Fatty Acid β-Oxidation Pathway Effects Revealed in Proteomic Expression of Long-Living Ames Dwarf Mice

Tan Hua
Sponsor: Aldrin Gomes, Ph.D.
MED: Physiology & Membrane Biol

Ames dwarf mice exhibit extended lifespan due to an autosomal recessive mutation that impacts their longevity and physiology, raising the question of what pathways are altered with a focus of interest on the heart. The study determined if expression of various proteins in the cell morphogenesis and fatty acid beta-oxidation pathways were altered in Ames mice through protein analyses using mass spectrometry from Ames and control mice heart samples. A peptide threshold rate of 1% false discovery rate (FDR) and log-ratio were used to assess the protein expression of genes and pathway components. Beta-oxidation component results revealed downregulation of the fatty acid binding protein in the heart (15 kDa) and long chain-fatty-acid-CoA ligase 1 cluster (78 kDa), and upregulation of the long-chained fatty acid protein 1 cluster (71 kDa) and fatty acid synthase (272 kDa). Cell morphogenesis pathway components revealed upregulation of ezrin (69 kDa), radixin clusters (69 kDa), and adenylyl cyclase-associated proteins 1 (52 kDa) and 2 (53 kDa). Downregulation appeared for the disheveled-associated activator of morphogenesis (123 kDa) and myotilin (55 kDa) levels. Some cell signaling changes have been consistent with prior literature, while other findings add to the understanding of protein expression changes in Ames dwarf mice.

Impact of Proton Pump Inhibitors (PPIs) on Starch Breakdown and Gastric Emptying in the Human Gastric Simulator (HGS)

Melissa Huang
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Biological & Ag Engineering

PPIs are among the most prescribed drugs in the US. They suppress stomach acid production, raising intragastric pH from 1-2 to 4-6. Elevated intragastric pH may increase starch breakdown of meals due to the pH sensitivity of alpha-amylase. Currently, however, the effect of PPIs on gastric digestive parameters has not been well characterized. The objective was to assess the impact of abnormal gastric conditions mimicking PPI use, *in vitro*, on the breakdown and digestibility of meals with either whey, egg white, or almond protein. Each of the three meals underwent two 180-minute gastric digestions under normal and PPI-conditions followed by a 180-minute intestinal digestion. Cumulative starch breakdown increased in all three meals under PPI-conditions from 34.479±3.302g to 39.563±3.009g, 30.793±1.615g to 35.249±0.919g, and 24.723±2.315g to 31.049±3.636g respectively. The half-emptying time for whey and egg white meals decreased under PPI-conditions (63min to 53min and 83min to 53min) while the almond meal emptied similarly (61min to 62min). This study demonstrated an impact of elevated intragastric pH on starch breakdown and gastric emptying. Future work should assess more protein sources and meals to further characterize how elevated intragastric pH affects digestion.

Characterization of Novel Genes Associated with the Regulation of NAD+ Metabolism in the Model System *Saccharomyces cerevisiae*

Katie Huang
Sponsor: Su-ju Lin, Ph.D.
Microbiology & Molec Genetics

Nicotinamide adenine dinucleotide (NAD^+) is an essential metabolic cofactor involved in redox reactions, cellular signaling, and regulation. Abnormal levels of NAD^+ and its precursors have been shown to play a role in several age-related human disorders, therefore, these metabolites are an emerging therapeutic target to mitigate cellular damage. However, due to the complexity of its metabolic pathways, NAD^+ synthesis and regulation are not well understood. Our preliminary NAD^+ precursor-specific genetic screen using *Saccharomyces cerevisiae* as a model organism highlighted multiple genes that impact NAD^+ intermediate homeostasis. A secondary screening to validate the resultant phenotypes is ongoing. As an example, the overexpression of *BNA1*, a dioxygenase that functions in the de novo biosynthesis pathway of the precursor quinolinic acid (QA), showed an unexpected notable release of nicotinic acid/nicotinamide (NA/NAM) intermediates, though only increased levels of QA were expected. As increased levels of NA/NAM release have been correlated with mitochondrial dysfunction and increased autophagy in some of our yeast mutants, our studies can help understand the mechanisms of the regulation of NAD^+ metabolism and aid in the development of therapeutic strategies for metabolic disorders related to abnormalities in NAD^+ metabolism.

Relationships between Health Information Exposures and COVID-19 Vaccination Belief in the United States: A Survey Research

Qihua Huang
Sponsor: Jingwen Zhang, Ph.D.
Communication

According to the Center for Disease Control and Prevention (CDC), 90% of U.S. adults have been vaccinated for COVID-19 as of June 2022. COVID-19 vaccination is essential for reducing risks of COVID infection, hospitalization, and death. However, factors related to the sources of vaccine information that individuals are exposed to can influence individuals' vaccine attitudes and behaviors. There is a significant prevalence of misinformation exposure in various vaccine sources that lead to vaccine hesitancy, especially when the sources emphasize severe vaccine side effects. This research study aims to identify where individuals obtain sources of COVID-19 vaccine information and analyze the extent to which these different sources of COVID-19 vaccine information influence individuals' attitudes and behaviors for acquiring COVID-19 vaccination. Based on the 100 survey responses, approximately 40% of individuals received resources from CDC, and 45% of individuals perceived CDC as credible sources of COVID-19 vaccine information. However, 56% of individuals held misbelief when they sought vaccine information, and at least 39% of individuals reported that they are uncertain about identifying misinformation regarding side effects. The survey results are significant because the public health policies are informed to provide accessible and reliable COVID-19 vaccine information and guidelines to the public.

Examining Adversity, Resilience Factors, and Diurnal Cortisol Slopes in Mexican-Origin Women

Angie Huitrado
Sponsor: Leah Hibel, Ph.D.
Human Ecology

Cortisol, a stress sensitive hormone, is released across the day with high levels in the morning and low levels at night. Flatter diurnal cortisol slopes likely mediate the association between experiencing chronic stress and poor health outcomes. However, the interpretation of stressors by the brain and how stressors impact physiology is largely shaped by cultural and social contexts. Mexican-origin (MO) women disproportionately face adversities and chronic stressors. To help close these health disparities, more research needs to be conducted on the contextual resilience factors specific to MO women with the potential to buffer the impact of stress on health. Currently, I am examining the extent to which neighborhood cohesion moderates the relationship between financial stress and diurnal cortisol slopes in MO women. To investigate this, a sample of approximately 100 MO women completed self-reported questionnaires on financial stress and neighborhood cohesion. Salivary samples were collected three times a day over three consecutive weekdays, then analyzed for cortisol. We hypothesize that financial stress will be associated with flatter diurnal cortisol slopes. In addition, neighborhood cohesion will attenuate this effect. This work will help develop effective intervention programs that are specific to helping MO women and their families.

Perception and Memory of Scientific Findings in Social Media Versus News Articles

Miranda Huntsinger
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Psychologists have recently been communicating scientific findings through social media, as a way to reach a wider, more general audience. Educating wider audiences on matters of scientific discovery is a matter of importance, therefore how platforms influence recognition is imperative. Trust in social media and news platforms is subjective so the perception of these platforms is crucial to access trust in the communication of science. The present study aims to assess the perception and memory of scientific findings presented in social media compared to general news articles. Participants will be asked to take a series of questionnaires assessing the perception and memory of scientific findings. Utilizing design elements to feign the presentation of social media and news articles, the present study aims to measure trust in scientific research and memory for scientific findings when research is communicated over different communication platforms. We predict that participants will have greater recall of scientific findings presented on social media than news platforms, while research findings presented on news platforms will gain more trust than those on social media posts. Our results may provide insight into more effective scientific communication.

An Analysis of Educational Resources Relating to the Prevention and Treatment of Sexually Transmitted Infections in the Perinatal Period

Muheema Husain
Sponsor: Leigh ann Simmons, Ph.D.
Human Ecology

Pregnant people with sexually transmitted infections (STIs) can infect their children, resulting in a range of outcomes, including stillbirth, brain damage, and deafness. The purpose of this study was to analyze information online pertaining to STIs, including: vaccination, STI testing, physical exams, infection types and symptoms, contraception, transmission risk, and treatment. For each information source, the following domains were evaluated: target audience (women, pregnant individuals, postpartum people), accessibility of information (language, vocabulary, keywords), and inclusivity (inclusive language, pronouns, diverse media). We have identified 15 unique sources including Mayo Clinic, Cleveland Clinic, and Tommy's.The topics least described were physical exams (40%), vaccination (46.7%), and transmission risk (53.4%). Contraception and infection descriptions were most often included (73.4%). All resources were primarily designed for cis-hetero couples. 87% included LGBTQ+ family planning or reproductive health, but none were written with LGBTQ+ people as the primary target audience. Continued effort is necessary to evaluate the lack of information about the impact of STIs on pregnancies. Most concerning is the limited information regarding transmission risk since this knowledge might encourage people to seek essential treatment or change birthing plans. Additionally, information about STI prevention should be promoted to prevent transmission altogether.

How Stress-Related Social Behaviors Mediate Differential Oxytocin Expression in the Anterior and Posterior Paraventricular Nucleus

Hannah Hyland
Sponsor: Brian Trainor, Ph.D.
Psychology

Oxytocin is a neuropeptide, known for its association with varying social behaviors, such as social approach and social avoidance. The paraventricular nucleus (PVN) synthesizes and secretes oxytocin, ultimately leading to some neurons projecting to the median eminence. Oxytocin is then released to the posterior pituitary gland for further expression into the blood, or it can also be released within the brain. Here we aim to discover how different stress-related social behaviors may affect oxytocin production and projection patterns. Using viral tracing, we expressed the fluorescent protein Venus in oxytocin neurons to map the distribution of axonal fibers. Venus positive fibers from the anterior PVN were found in the median preoptic nucleus (MnPO), an area associated with regulating many physiological homeostatic behaviors. These results suggest that the effects of social stress on oxytocin neurons in the anterior PVN could also alter physiological mechanisms, such as appetite, which are modulated by the MnPO.

Using Asymptotic Analysis to Construct Phase Response Curves of Relaxation Oscillators

Zachary Ibarra
Sponsor: Timothy Lewis, Ph.D.
Mathematics

Many mathematical models of physical, chemical, and biological processes, such as the dynamics of the membrane potential of a nerve cell, fall under the class of relaxation oscillators. Relaxation oscillators are characterized by oscillatory activity with dynamics on drastically different time scales, i.e. intervals of fast changes separated by intervals of slow changes. Phase response curves characterize an oscillator's response to external input and how the oscillator synchronizes in a network of coupled oscillators. For smooth (non-relaxation) oscillators in which there is not drastically different time scales, reliable methods exist for computing phase response curves. However, challenges arise when directly extending these methods to relaxation oscillators because of their processes on drastically different time-scales. Here, we use asymptotic analysis to overcome these challenges. Specifically, asymptotic analysis allows us to study the phase response properties during the intervals of fast and slow dynamics separately and then piece them together to generate the full phase response curve for a relaxation oscillator. In particular, we construct the phase response curve for the van der Pol oscillator, which is a canonical relaxation oscillator.

Histological Evaluation of a Murine KZFP Function in Spermatogenesis

Numa Islam
Sponsor: Satoshi Namekawa, Ph.D.
Microbiology & Molec Genetics

Transposable elements (TE) co-evolved with the host genome and can serve a gene-regulatory function in tissue- and cell type-specific manner. They are involved in gene activation in mammalian spermatogenesis, but it is still largely unknown how they are regulated. The KRAB family containing zinc finger proteins (KZFPs) are transcription factors that can control TE activity in culture cells. KZFPs show a rapid change in expression during meiosis, implying their involvement in TE regulation during the mitosis-to-meiosis transition. In order to evaluate the function of KZFPS, we used transgenic mice which express *Gm14326*, a member of the KZFPs, continuously throughout gametogenesis. In the wild type, the expression of *Gm14326* peaks at pre-meiotic stages, whereas we can expect to see a similar level even after entering meiosis in transgenic mice. Through a series of histological analyses, we compared the morphology between the wild type and the transgenic mice to investigate the physiological significance of *Gm14326* in male gametogenesis. Today, we will present the data from our observations and propose the function of *Gm14326* in the murine male reproductive system.

Understanding Neural Correlates of Joint Attention in Infants

Kriti Iyer
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Interactions between infants and their social partners, usually a primary caregiver, may indicate healthy brain development and maturation, and demonstrate the capacity for social information exchange. Joint attention is one such phenomenon where an infant engages in matching their attention with that of their social partner in relation to a third object. Though it is known that infants engage in joint attention, the specific neural correlates governing infant joint attention have yet to be uncovered. This longitudinal study seeks to analyze instances of joint attention in 4- and 12-month old infants, and predict neural correlates based on caregiver interactions with infants. Infants and their mothers will participate in a triadic interaction task, with mothers explaining pictures to their infants in 30-second intervals. Attention shifts will be coded as changes in the infant's eye gaze to inform the appropriate marking of EEG data, which will be analyzed to determine areas of brain activity. We hypothesize that infants will exhibit neural activity as a result of this joint attention task, which may predict their joint attention at 12 months. This study will discern the presence of a "social brain" in infants, and the importance of caregiver interactions on developing the "social brain."

Effects of Deferoxamine, a HIF-1α Stabilizer, on Traumatic Brain Injury Sequelae

Corinne Jabba
Sponsor: Lillian Cruz-Orengo, Ph.D.
VM: Anat Physio & Cell Biology

Traumatic brain injury (TBI) sequelae, which include cognitive decline and mood and mobility disorders, have been linked to secondary neuroinflammation. The main culprit of neuroinflammation is damage to the neurovascular unit (NVU), which causes a breach to blood-brain barrier (BBB) function by allowing blood-borne agents to gain access to brain tissue. Hypoxic conditioning (HC) has been shown to promote HIF-1α-mediated NVU repair in stroke, glaucoma, and retinopathy. We posit that HIF-1α may induce similar benefits after TBI. During normoxia, HIF-1α is degraded in a Fe^{2+}-dependent process. This mechanism can be halted with the FDA-approved iron chelator deferoxamine (DFO), enabling HIF-1α stabilization. We hypothesize that DFO will sustain HIF-1α-mediated effects without HC, improving NVU repair and reducing TBI sequelae. We are performing controlled cortical impact or sham procedures on mice and comparing TBI and uninjured groups receiving DFO or saline daily. We are evaluating therapeutic effectiveness using behavioral assays until 14 days post-injury (DPI). We are also assessing BBB permeability via Na-fluorescein assay and HIF-1α levels via Western blot at 14 DPI. We expect improved behavioral outcomes, lesser BBB permeability, and higher levels of HIF-1α in DFO-treated injured mice, suggesting that HIF-1α aids NVU repair and ameliorates TBI sequelae.

Investigation of gravitational lens candidates with Keck Spectroscopy

Francisco Jackson
Sponsor: Christopher Fassnacht, Ph.D.
Physics

The rate of expansion of our Universe is described by a paramter known as the Hubble Constant (H_0). The two most prominent techniques for measuring H_0 disagree at a significan level. To investigate the cause of this disagreement we are measuring H_0 with a third, completely indepen- dent, technique known as strong gravitational lensing. Strong gravitational lensing occurs when a massive object (deflector galaxy) bends light from a quasar (bright center of a galaxy) behind the deflector galaxy, creating multiple images of the quasar on opposite sides of the deflector. We are adding to the sample of known lenses by determining if newly-discovered potential lens candidates are real or are, instead, false positives. We have obtained spectra of potential lenses with the Keck telescopes. We process these data through our pipeline, then extract the spectra of the two bright objects. If the two objects have matching spectra, the candidate is likely to be a real gravitational lens system. For those systems that are good candidates, we also attempt to extract the faint deflector galaxy spectrum. We find that *16* of the *20* candidates are probable lenses based on their spectra. Additionally, we have measured deflector redshifts for *2* of the *16*.

Development of Attitude Determination and Control System Software for Low Cost Satellite Control Methods

Yuvraj Jadav
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

Our poster discusses the Attitude Determination and Control System (ADCS) software architecture for REALOP, UC Davis' first, and completely undergraduate-led, CubeSat mission. Once launched into space, the CubeSat will rotate in an unpredictable manner, known as tumbling. ADCS is in charge of detumbling and pointing the Raspberry Pi camera on the satellite towards the Earth. While in orbit, Sun and magnetic field sensor data is used to determine the orientation of the satellite. Once the current orientation is determined, the ADCS software calculates how to best control the actuators, which are the hardware mechanisms used to point the satellite in the desired direction. These actuators include magnetorquers, which are used to reduce tumbling in the satellite, as well as reaction wheels and hard disk drives (HDDs), which are used to rotate the satellite about one axis to point toward the Earth. Combined with additional subsystems, ADCS will be used to demonstrate the feasibility of low-cost satellite control methods.

Utilizing AI to Detect Wildlife in Trail Camera Images

Sanskriti Jain
Sponsor: Gary Bucciarelli, Ph.D.
Natural Reserve System

Trail cameras capture images of wildlife by detecting changes in heat or motion. A known issue is that trail cameras generate huge volumes of data and have an abundance of noise or irrelevant data. This causes researchers to use a vast amount of time and resources to sort through the images manually. We hope to reduce this burden by using images collected from the University of California Natural Reserve System (UCNRS) to create a user-friendly pipeline and identify metrics that could eventually be used to detect wildlife all over California. We plan to use deep convolutional neural network models to first determine if animals appear in an image or not, and then we will research more advanced deep learning strategies to classify animals in the given image. This will have a significant impact on protecting wildlife as it optimizes the work flow of researchers, enabling better detection of animals and better population estimates for endangered and at-risk species. We believe this image analysis pipeline will help create better protection and policy measures for wildlife conservation.

Development of Shock Physics Web App

Shaheen Jalali
Sponsor: Sarah Stewart-Mukhopadhyay, Ph.D.
Earth And Planetary Sciences

Impedance matching is used to solve for parameters such as pressure and energy when a propagating shock wave reaches a material interface. Energy, momentum and mass must be conserved across interfaces. Thus, we can describe shock parameters by finding the intersection between each material's shock Hugoniot, which describes the possible shock states for a given initial state. An older impedance matching calculator was written in PHP and now a new tool will be written using Python through Jupyter Notebook and the associated application in Django, a web development tool for Python. This tool will also be designed modularly to ensure it can be easily expanded to aid future development. Having the web application written in Python makes for easy readability as many students have already learned this language. It also makes for a great learning opportunity to discover more about the fundamental concepts of shock physics as well as Python.

Biosynthetic Production of Biopolymer Precursors From CO_2

Elika Javaheri
Sponsor: Shota Atsumi, Ph.D.
Chemistry

Greenhouse gasses like carbon dioxide (CO_2) pose an enormous threat to biodiversity and human life by exacerbating climate change. Greenhouse gasses are released by the production of plastic, which requires the burning of fossil fuels. In order to minimize the amount of greenhouse gasses released into the atmosphere, we sought to find an alternative method for synthesizing plastic. Specifically, we sought to engineer the metabolism of cyanobacteria to produce biopolymer precursors. Since cyanobacteria can incorporate CO_2 from the atmosphere and unprocessed waste sugars into their metabolism, this method uses highly sustainable sources of fuel. Furthermore, the synthesis of biopolymer precursors facilitates the creation of biodegradable bioplastics. We used genomic engineering techniques to edit the genome of cyanobacteria with the goal of producing biopolymer precursors efficiently. To test the efficacy of the modifications, we measured the titer of biopolymer precursors produced and the ability of the cyanobacteria to thrive with optical density measurements. Through the genomic engineering efforts, we have developed strains of cyanobacteria that are highly efficient at producing biopolymer precursors and offer a more sustainable method of producing plastic.

Assessing the Needs of Undocumented College Students Across Racialized Groups

Jasmine Jeon
Sponsor: Caitlin Patler, Ph.D.
Sociology

Research has established that undocumented students experience significant barriers in higher education. Although existing research provides academic context about the undocumented student experience, there is little research done about the non-Latinx undocumented student population in higher education. Through analysis of in-depth interviews, this paper will investigate how racial/ethnic backgrounds influence the ways in which undocumented students choose to engage with campus resources, and how academic institutions can take their intersectional identities into consideration in order to create a more inclusive and equitable environment. Understanding the importance of intersectional identities, this paper focuses on the intersections between immigration status and race, and how it shapes one's identity and social mobility through the spaces they occupy. Findings show limited resources, opportunities, and fear of deportation impact undocumented immigrants' educational attainment and success which results in higher stress and feelings of exclusion. Internalized pressure, such as dismantling negative stereotypes regarding their race and immigration status are one of many factors undocumented students may navigate through their educational journey.

The Role of The Hippocampus in Auditory Working Memory

Edward Jenkins
Sponsor: Andrew Yonelinas, Ph.D.
Psychology

Previous research has established that the hippocampus, which is a brain region damaged in numerous neurological populations, plays a critical role in visual working memory (WM), but whether the hippocampus is involved in auditory WM is not yet known. The goal of the current study is to identify test conditions in a new auditory working paradigm that will lead to performance levels that are comparable to those observed in prior tests of visual working memory, so that these procedures can then be utilized in future patient studies. In the current study a group of 24 young adults performed an auditory change-detection task in which two tones were presented one after another, and participants made a confidence judgment indicating whether the tones were the same or different. Several groups of participants were asked to discriminate tone changes at 10hz, 12hz or 20hz. It was determined that healthy controls could consistently discriminate pure tone changes of 12hz at acceptable levels of performance. The next step will be to examine performance in aged subjects and participants with selective hippocampal damage to determine if these groups are impaired relative to young controls.

Natural Language Processing of Textual and Biomedical Data to Delineate, Quantify and Rank Protein Biomarker Candidates in Cardiovascular Disease Using Phrase-Mining CaseOLAP Algorithm

Shraddha Jhingan
Sponsor: David Liem, M.D.,Ph.D.
MED: Int Med Cardiology (davis)

In a sea of over 33 million manuscripts on Pubmed, a research hub for biomedical journals where new findings are accumulating daily, there has been an unmatched opportunity to apply computational Text Mining and Natural Language Processing techniques to these publications to draw insights from them regarding cardiovascular diseases(CVDs) and their associations with different proteins. Using the cloud based computing algorithm CaseOLAP, we quantified, ranked and delineated 8,325 cardiovascular categorized proteins where 3,174 proteins were found to have a significant correlation to 6 CVDs. Through extracting baseline files from the National Library of Medicine (NLM) where each is tagged with a unique PMID identifier, each file is parsed into a dictionary data structure which allows us to assign each protein a score between zero and one depending on its integrity, popularity and distinctiveness. Those with a score greater than 0.15 were defined as being largely correlated to one CVD, aiding us in statistical analysis to draw connections between proteins and CVDs . These phrase-mining applications achieve exponentiated efficiency and accuracy and have widespread applications that can allow us to develop new drugs targeting the specific CVD and help identify relationships between proteins, diseases and therapies.

Regulation of Recombinational DNA Repair Through the RAD54-RAD54B Interaction

Shiyu Ji
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

Double-stranded breaks (DSBs) are one of the most toxic DNA lesions to cells. Homologous recombination (HR) provides high-fidelity repair to DSBs using the homologous template DNA. The mechanism of HR is through RAD51 directing the ssDNA filament to invade a homologous DNA duplex. RAD54 stabilizes the ssDNA-RAD51 nucleofilaments and removes RAD51 after the invasion occurs. RAD54 paralog B (RAD54B) has similar biochemical properties to RAD54, but its function in HR needs to be better understood. We hypothesize RAD54B binds to RAD54 to regulate its function. We show that RAD54 interact with RAD54B *in vitro*, and this project aims to map their interaction sites. To define the interaction sites within the RAD54B sequence, we cloned and expressed in insect cells the N-terminally tagged N-terminal, motor, and C-terminal domains of RAD54B. We will test which domain of RAD54B can interact with full-length RAD54 through pull-down assays. We intend to determine the minimal amino acid residues within the RAD54B sequence required for both proteins to interact. Then, we plan to generate mutant versions of RAD54B that no longer interact with RAD54 to investigate how the lack of their interaction affects the HR-mediated DSB repair.

Catholic Church and Community Involvement in the Farah Strike

Karina Jimenez
Sponsor: Rachel Jean-Baptiste, Ph.D.
History

From 1972 to 1974 in El Paso, Texas, Chicana women partook in a strike against the Farah Manufacturing Company due to unfair labor practices. As one of the main goals of the striking workers was to unionize, they received the support of the Amalgamated Clothing Workers of America (ACWA). The Farah strike encapsulates the struggle for Chicana women's labor rights in the Southwest of the United States and shows a continuation of the broader Chicano movement taking place in the country. This study analyzes various media sources including oral histories, newspapers, pamphlets, and news documentaries/films. While most articles have focused on Farah, ACWA, and the striking women, an analysis of outside involvement as that of the Catholic Church and strike support committees have been missing from the story of the strike. As part of the strike and boycott efforts, Catholic Bishop Sidney Metzger and various Farah Strike Support Committees across the nation played a key role in garnering support for the strikers. The role of the Church and Farah Strike Support Committees shows general American interest in continuing equity for minorities across class, gender, and labor lines.

Near-peer Mentoring: Bridging the Gap Between Community College and UC Davis

Stephanie Jimenez
Sponsor: Marcela Cuellar, Ph.D.
Education

Although the University of California, Davis possesses initiatives to promote transfer students' retention and success, such as the Transfer Edge Program, they are typically costly and limited capacity. Several studies have found that peer mentoring is an effective and low-cost approach that promotes student retention. This project investigates best practices for establishing a summer near-peer mentoring program for transfer students by connecting current UC Davis transfer students with community college students planning on transferring and submitting a Statement of Intent to Register (SIR). At biweekly meetings, mentors and mentees are encouraged to discuss topics that address their needs and interests based on survey responses collected. In collaboration with the UC Davis Transfer and Reentry Center (TRC), the project aims to equip prospective historically underserved transfer students with the information, confidence, and resources needed to expand their network once they transfer to a four-year institution. As a result, students can overcome phenomena such as transfer shock and imposter syndrome while increasing retention rates. This program aims to promote transfer-receptive culture and more transfer initiatives on campus. Additionally, it aspires to become a universal program for the University of California system.

The Willow Clinic Behavioral Health Team: A Model for Reducing Mental Health Care Accessibility Barriers

Elle Jin-Phan
Sponsor: Kate Richards, M.D.
MED: Family & Community Med

This innovative quality improvement study uses depression screening to evaluate the Behavioral Health Team (BHT), offered in Sacramento through two student-run clinics, as a model for addressing health disparities and reducing obstacles to mental health care for people experiencing homelessness and people who inject drugs. Unhoused People are disproportionately affected by trauma and depression yet face unjust barriers to mental health treatment. At two of the UC Davis Health student-run clinics serving diverse populations, every person is offered a Patient Health Questionnaire-9 (PHQ-9), a standardized depression screening. A medical provider reviews all questionnaires for crisis intervention, and people at risk for moderate or severe depression are connected, if interested, to BHT, which offers direct psychiatric services and supportive resources. This study evaluates BHT as a model for decreasing obstacles to mental health care for people experiencing homelessness through evidence-based, person-centered care integrated within two student-run clinics by measuring depression screening rates and using outcome data and reiterative changes to address health disparities and promote equitable practices. Through depression screening at student-run clinics, the Behavioral Health Team provides accessible, evidence-based care and highlights the importance of understanding disparities in behavioral health resources.

The Proteomics of "Tuna Meat": What's really in it?

Melinda Joe
Sponsor: Gabriela Grigorean, Ph.D.
UC Davis Genome Center

Proteomics has allowed for efficient protein sequencing by accurately measuring the molecular weight of peptide fragments through a mass spectrometer. Proteomics has the ability to identify an organism's proteome, which can reveal complexities in life not directly specified in genetic code alone. For example, the discovery of disease bio markers through proteomics has provided valuable information regarding protein interactions and various disease pathways. This efficiently helps regulate drug development, which is expanding faster each and every year. We decided to identify and quantify a different number of proteins that may be found in "one hundred percent tuna meat" using liquid chromatography and mass spectrometry. We searched for expected proteins like tuna, but also some unexpected ones such as chicken, pork, mackerel, cod, mouse, and insect larvae. After we compare our sample to our selected proteomes, we present our findings of the breakdown of multiple proteins in what is claimed to be one hundred percent tuna meat.

An Autoethnographic Study of Linguistic Discrimination and Insecurity in Francophone Culture

Lara Johannson
Sponsor: Eric Russell, Ph.D.
French & Italian

Glottophobia was coined by Blanchet in 2008 and soon after in 2020, the French penal code was modified to add accent discrimination as a legally punishable offense. This study illustrates how discrimination can affect the way individuals feel about speaking their native language. This autoethnography analyzes my personal experiences as a native French speaker from Alberta, Canada. In particular, my development of linguistic insecurity, insecurity around my accent, will be analyzed in real world situations in Canada, France and the United States. In these cases, my linguistic insecurities stem from discrimination that is perpetuated through comments, actions, and attitudes that are rooted in French institutions and culture. This insecurity is described as a feeling that my accent is inferior, not as accepted, or legitimate. This results in feeling discomfort when speaking as well as experiencing fear, nervousness, embarrassment and shame which finally result in the avoidance of speaking. These results are meaningful because they indicate a need for change in the way linguistic differences are treated and how as a culture, there is much work to be done in order to be more accepting and inclusive.

Investigating a Strategy for Dispersible, Dry Cellulose Nanocrystals Using Hydrophobins, a Fungal Biosurfactant

Morgan Johnson
Sponsor: Tina Jeoh, Ph.D.
Biological & Ag Engineering

Cellulose Nanocrystals (CNCs) have become an attractive potential material in many industries: paper, food, electronic, pharmaceutical, and others. In products such as paints, cosmetics, packaging, and plastics, CNCs offer a sustainable alternative to petroleum-based additives. Once produced, CNC is stored as a dilute aqueous suspension to prevent aggregation of the nanocrystals, which eliminates the advantageous properties associated with their nano size. Because the dilute suspension contains mostly water, transportation costs of CNC are immense. Therefore, finding a way to dry the CNC without losing the favorable qualities that come with being nanosized is essential to making this product more commercially viable. It is speculated that hydrophobins, proteins expressed by filamentous fungi concurrently with cellulase enzymes targeting cellulose, may be able to stop aggregation by self-assembling at the nanocellulose interfaces and preventing cellulose-cellulose associations. This work explored generating a hydrophobin-mediated, dispersible dry powder of nanocellulose by spray drying, a low-cost and industrially scalable process.

Impacts of the Covid-19 Pandemic on the Secondary Socialization of Adolescents and Instances of Bullying

Kiara Jones
Sponsor: Jacob Hibel, Ph.D.
Sociology

In recent years students have had to quickly adapt to rapidly changing public health mandates during the Covid-19 pandemic. Throughout this period, children have experienced much lower levels of interaction with their peers, teachers, and formal school settings. Secondary socialization often takes place within formally structured groups and institutions of education, and is an important aspect for developing one's sense of self and internalizing the expected behavior within a group. Very few studies have been conducted on the interaction between secondary socialization, the Covid-19 pandemic, and how both have impacted bullying behaviors. To bridge this gap, I am analyzing quantitative data from the past four years of the California Healthy Kids Survey to understand how the pandemic has impacted the secondary socialization of adolescents as they participate in distance learning and returning to in-person classes, specifically their interactions with peers and instances of bullying. The results of this study will serve the educational interests of these students by providing educators and administrators with information on how their students were impacted by the pandemic, which will allow them to better support them on their academic journeys and plan for any future disruptions to in-person learning.

Evaluating Transcriptional Regulation of the Pyruvate Dehydrogenase Complex

Richa Kakde
Sponsor: Daniel Kliebenstein, Ph.D.
Plant Sciences

To better understand metabolic regulation, we are studying gene regulation in the PDH complex, an enzyme that connects glycolysis and the TCA cycle. Specific transcription factor binding sites in the promoters for the genes in this enzyme complex are targeted to understand how promoter elements coordinate metabolism of the model plant *Arabidopsis thaliana*. The first step is to use CRISPR-Cas9 to delete specific sites regulating transcription binding sites in PDH enzyme promoters. Then, mutated seeds are screened and grown. Next, DNA extraction of the mutated plants followed by amplicon sequencing is performed to confirm the deletions. The PDH complex is critical to plant defense, and we are testing if these promoter mutations alter the plant's resistance to *Botrytis cinerea* in detached leaf assays. Large lesions on the leaf surface could indicate compromised metabolism caused by certain combinations of mutations. In addition to measuring lesions, rosette growth, metabolite production and transcriptomics will be analyzed to evaluate the overall importance of these regulatory interactions.

NYT MEDIA PROJECT: The Representation of Arab Men in the New York Times in the 1940's

Kavika Kapoor
Sponsor: Suad Joseph, Ph.D.
Anthropology

How does the *New York Times* (NYT) depict Arab men in the 1940s? To answer this question, I used Proquest to search the terms Arab* AND men in the *New York Times* archive. Of the 1,549 articles, 218 were relevant to this project. The depiction of Arab men in the 1940s by The New York Times evolved as the idea of Arab autonomy and decolonization gained traction. The term "Arab" was often used loosely, accompanied by terms like "Arab leader." In that context, Arab men were favorably represented. Recognizable figures such as King Ibn Saud of Saudi Arabia and Haj Amin el Husseini are frequently mentioned in articles. In 1947, with the rise of the "Palestinian Problem," the focus shifted to the settlement of Jews and Arabs in Palestine. In this context, Arab men were portrayed as inferior to Western men and failures of modernity. They were subjected to misrecognition, racialization, and politicization. This paper is part of a long-term analysis project of the NYT from 1850-present from the Suad Joseph Lab that analyzes the representation of Islam and Muslims over a 150-year period.

Differences in Development of Adaptive Skills in Males and Females with Fragile X Syndrome

Liyana Karim
Sponsor: David Hessl, Ph.D.
MED: Psychiatry & Behav Sci

Fragile X syndrome (FXS) is an x-linked genetic condition with greater prevalence and severity in males compared to females. Though males with FXS often experience more severe global impairments, less is known about how sex may differentially affect changes in their adaptive skills over time. The present study investigated changes over a 2-year period (m = 2.19 years, SD = 0.36) in the adaptive behaviors of males versus females with FXS, with a focus on their communication, daily living, and socialization skills. Participants included 47 males and 18 females with FXS (m_{age} = 18.28 years, SD_{age} = 4.82). Adaptive behavior was measured by Vineland-3 domains of communication, daily living, and socialization. IQ was controlled for and measured using Stanford Binet 5 deviation z-scores. Results of repeated-measure ANOVAs indicated that individuals with FXS experienced significant improvements over a two-year period in their communication ($F(1,57) = 6.29$, $p = 0.015$), daily living ($F(1,57) = 11.51$, $p = 0.001$) and socialization skills ($F(1,57) = 6.36$, $p = 0.014$). However, no sex differences were observed across these domains. Results indicated that sex on its own did not impact developmental change in the adaptive skills of individuals with FXS.

Thermal Characterization and Modeling of a CubeSat in Low Earth Orbit

Ryan Karpinskas
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

The Space and Satellite Systems (SSS) club's REALOP mission is to create a 2U CubeSat which is designed to deploy out of the ISS. As a sub-department of SSS, Structures Thermal Analysis' (STA) goal is to simulate the thermal environment of a transient orbit around the Earth to verify CubeSat nominal temperatures. To create the simulations, STA utilizes Thermal Desktop to build a thermal model of the CubeSat. These simulations will help determine which components aboard the CubeSat need to be adjusted or reinforced thermally. The software CES Edupack is used to gather optical and thermophysical properties required to fully detail the CubeSat model. STA is in the process of modeling the entire structure with internal components to understand the temperature changes the CubeSat will undergo as it is exposed to the extreme space environment. This will showcase the effects of radiation on the external faces of the structural frame, as well as internal heat transfer between the inner components/faces of the frame. The overall goal of the STA team is to ensure the CubeSat stays thermally safe throughout its operational lifespan.

Sharada Karthik
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

We aspire to reduce the environmental impacts of traditional cheese making by exploring cow-free methods to produce milk caseins. These proteins help give cheeses produced from milk distinctive tastes and textures that non-dairy cheese alternatives have yet to replicate. Our research explores the challenge of using the yeast organism *Kluyveromyces lactis* as a more environmentally responsible and economically viable production host for the synthesis of bovine casein proteins in cheese production. We have designed and are building genetic constructs to express the four main subtypes of casein proteins (αs1-casein, αs2-casein, β-casein, and κ-casein) each with and without the presence of alpha mating factor in *K. lactis*. Recent developments include confirming genetic constructs encoding αs1-casein and αs2-casein with Sanger sequencing. Therefore, we are planning our next experiments to test the expression of these genes in *K. lactis* and to evaluate what yield and purity can be achieved in a simple laboratory scale study.

Understanding How Fire Triggers Seed Germination Through Structural Analysis of SMAX1

Sabrina Katz
Sponsor: Nitzan Shabek, Ph.D.
Plant Biology

Wildfires have become an increasingly urgent issue across California as the climate has grown drier and rainfall scarcer. As people's lives are uprooted, wildfires have become synonymous with total loss. Despite its destruction there are numerous benefits that fire, primarily its smoke, provides to the environment. Smoke produced from burning plant material releases the small molecule Karrikin, a butenolide compound that can break seed dormancy, promote germination, and reduce inhibitory effects of environmental stressors on germination. Karrikins have been found to be a part of a larger signaling system—the Karrikin Signaling Pathway—that consists of the karrikin receptor KAI2, ubiquitin ligase MAX2, and transcriptional corepressors SMAX1 and SMXL2. SMAX1 has been determined to be made up of three major domains: N, D1, and D2; however, the exact properties of its structure are yet to be uncovered. Understanding the structure of a protein is vital to elucidating its function. Therefore, the goal of this project is to assemble the individual components of SMAX1 to better understand its physical properties that aid in the post-fire seed germination pathway through protein expression and purification, and x-ray crystallography.

Shawna Katz
Sponsor: Satoshi Namekawa, Ph.D.
Microbiology & Molec Genetics

During spermatogenesis, undifferentiated spermatogonia commit differentiation and undergo mitosis and meiosis to produce haploid sperm. Gene expression patterns change to support this process. Chromatin remodeling is a mechanism that allows DNA to become accessible and undergo change, making it a necessary component for gene regulation. While SNF2H is a chromatin-remodeling enzyme, its role in spermatogenesis is unknown. To determine the role of SNF2H in spermatogenesis, we bred *Snf2h*-floxed mice with the *Ddx4-Cre* mouse line to create *Snf2h conditional*-knockout mice. The *Ddx4-Cre* mouse line is only expressed in germ cells and we want to delete *Snf2h* only in germ cells. To test the efficiency of the knockout, immunostaining was performed. It was confirmed that the SNF2H protein was depleted in most of *Snf2h* conditional-knockout spermatogonia. The 8-week-old sample lacked germ cells, indicating that SNF2H is necessary for mouse spermatogenesis. It is still unknown which phases of spermatogenesis are affected by *Snf2h* depletion. Fluorescent staining was repeated and indicated that the number of undifferentiated stem cells remained constant between control and knockout samples, while the number of differentiating spermatogonia in the knockout mouse sample was far less. Our conclusion is SNF2H is required for undifferentiated spermatogonia to become differentiated spermatogonia.

Drivers Influencing the Establishment of Invasive Grasses in Post-Wildfire Mixed-Conifer Forests

Kara Kaur
Sponsor: Andrew Latimer, Ph.D.
Plant Sciences

An understudied phenomenon is the interaction between invasive grasses and forest vegetation in post-fire landscapes. While grasses are common a few years after a disturbance, historically, they were often replaced by woody vegetation as succession progresses. However, climate warming has made conditions less suitable for conifer regeneration, and thus non-native grasses, such as cheatgrass, may outcompete conifer seedlings for limited resources. This project investigates annual grass cover in post-fire landscapes. In addition, we analyze potential invasion drivers, including precipitation and distance from managed sites. We monitored vegetation in post-fire sampling plots approximately 5 and 15 years following severe fires in California forests, and then examined how grass cover changed over time. We found little evidence that invasive grasses were decreasing across our 49 sample sites, with an average increase of 0.47%. However, our data were highly variable and some plots exhibited high increases in grass cover over time while others had no change. We expect that early-spring precipitation and surrounding management may have a positive effect on grass dispersal. These results can help inform future management practices to reduce the spread of invasive grasses after fire and promote forest resilience.

Investigating the Association Between Non-alcoholic Fatty Liver Disease and Four Specific Sleep Disturbances: A Population-based Study

Manpreet Kaur
Sponsor: Valentina Medici, M.D.
MED: Int Med - Gastroenterology

Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver condition in the United States. While current evidence shows an association between NAFLD and sleep disorders, there is limited evidence regarding specific sleep disturbances, including snoring, paused breathing, trouble sleeping, and excessive daytime sleepiness. This study examines the association of NAFLD with four sleep disturbances in 2218 adult participants of the National Health and Nutrition Examination Survey (NHANES) 2015–2016. NAFLD was defined as having a U.S. Fatty Liver Index ≥30 in the absence of heavy alcohol consumption and viral hepatitis. NAFLD patients were more likely to snore ≥5 nights per week, experience paused breathing 1-2 or ≥5 nights per week, and experience excessive daytime sleepiness 16–30 days a month than non-NAFLD controls. After adjusting for age, sex, ethnicity, diabetes, hypertension, smoking, and obesity, individuals who snore ≥5 nights per week had higher odds of NAFLD relative to non-snorers (AOR: 1.79, 95% CI 1.17–2.73, *P*=0.011). The odds of NAFLD were also higher with 1-2 nights of paused breathing per week than 0 after adjusting for obesity (AOR: 1.77, 95% CI 1.03–3.05, *P*=0.039). In conclusion, self-reported snoring and paused breathing are potential predictors of NAFLD.

Whole DNA methylome analysis to investigate multigenerational epigenetic inheritance of autism spectrum disorder

Ray Kawai
Sponsor: Janine Lasalle, Ph.D.
MED: Medical Microbiology & Imm

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder with a complex etiology that is hypothesized to be due to genetic and environmental interactions. Epigenetic mechanisms at the interface of genetic and environmental risk factors have been implicated in ASD. Recent research has focused on effects of exogenous risk factors that alter DNA methylation patterns and gene expression in neurodevelopment. Additionally, certain exposures in the parent and grandparent generation are known to increase risk of ASD in later generations. The multigenerational epigenetic inheritance (MEI) hypothesis states that epigenetic changes can be transferred through multiple generations. To study the effects of MEI in ASD, the CHARGE (Child Autism Risks from Genetics and the Environment) study provided questionnaires to grandparents, parents, and children regarding exposure to multiple types of environmental factors and collected their saliva samples. DNA was then extracted from 349 participants' samples to perform Whole Genome Bisulfite Sequencing (WGBS) and investigate DNA methylation patterns in relation to ASD diagnosis of the grandchildren. Furthermore, the Comethyl package will be used to investigate correlation between methylation markers and environmental variables that are potentially related to the etiology of ASD. This research will improve our understanding behind ASD and improve preventative measures in healthcare.

Investigating CO_2 Reduction Over Metal Chalcogenides in an MEA-Type Electrolyzer Architecture

Ruyi Ke
Sponsor: Jesus Velazquez Mojica, Ph.D.
Chemistry

As renewable electricity becomes abundant and affordable, the electrochemical reduction of CO_2 has a large potential to directly convert this harmful gas pollutant to a variety of value-added chemicals, such as hydrocarbons and oxygenates. Among all catalysts that are capable of electrochemically reducing CO_2, transition metal dichalcogenides and Chevrel Phases have attracted more and more attention due to their unique electronic and structural properties. Herein we report on the electroanalytical characterization of MoS_2 and Mo_6T_8 (T = S, Se, Te) for CO_2 reduction in a membrane electrode assembly (MEA) configuration. At a cell potential of 3.6 V, the gaseous products are H_2, CO, and CH_4. Among them, H_2 has the highest faradic efficiency, which suggests that the H_2 selectivity in CO_2 reduction conditions is not due to diffusion limitations. However, sensible amounts of methanol, acetate, and formate were detected by ^1H NMR in the liquid products. Further characterization will be conducted, and more potential will be tested to ascertain the potential selectivity of MoS_2 and Mo_6T_8.

Genetic Transformation Process in Identifying Virulence Genes of the Generalist Pathogen *Botrytis cinerea*

Joseph Kebets
Sponsor: Daniel Kliebenstein, Ph.D.
Plant Sciences

In the relationship between plants and their pathogens, virulence and host specificity of the pathogen are modulated by certain genes. Statistical analyses such as GWAS allows for the identification of genes that are likely to affect virulence, however, this data needs to be confirmed experimentally. A process for site-directed genome modifications in our pathogen of interest, *Botrytis Cinerea*, helps accomplish this goal by allowing for the analysis of the overexpression and knock-out of specific genes. Three candidate genes for virulence were selected for a low number of haplotypes within virulence associated gene families: transmembrane transporters and a metabolic enzyme, cyp450. We started with two low copy number plasmids (pRF-HU2 & pRF-HU2E) and inserted amplicons of our genes of interest in the plasmids' linearized forms before cloning and transforming them into E. coli for propagation. Selected colonies were then tested for the presence of amplicon insertion and sequenced prior to transformation into *AGL1*, a strain of agrobacterium suitable for transfecting *Botrytis cinerea*. This genetic procedure is currently undergoing optimization to allow for efficient experimental analysis of additional future genes of interest.

A New Molecular Tool for the Detection of Fusarium Crown and Root Rot (FCRR) Caused by *Fusarium oxysporum f. sp. radicis-lycopersici*

John Kelleher
Sponsor: Cassandra Swett, Ph.D.
Anr Plant Pathology

Fusarium oxysporum f. sp. *radicis-lycopersici* (FORL) is a soilborne fungal pathogen causing Fusarium crown and root rot on tomatoes and many other crops. Despite agricultural management strategies to control the pathogen, FORL is becoming increasingly responsible for significant yield losses in tomatoes in California. Identification of FORL via phenotyping (inoculation on FORL-resistant and FORL-susceptible tomato cultivars) is the "Gold Standard", but is laborious, and does not provide a timely diagnosis. Current molecular tools for FORL diagnosis lack resolution and specificity. The overall goal of this research is to develop an accurate and efficient method to detect FORL. From our previous study, where five PCR-amenable loci could classify 327 *F. oxysporum* isolates into 236 groups, we developed a three-locus haplotyping method to distinguish between FORL and other pathogenic isolates that are commonly sampled from diseased tomato tissues. In this study, we validated the method by amplifying the three loci using conventional PCR from 10 FORL isolates that have been confirmed via phenotyping and 20 other *F.oxysporum* isolates that are distinct from FORL. The resulting PCR products are being analyzed by sanger sequencing followed by BLAST analysis to confirm that the methodology developed was an accurate molecular identification tool for FORL.

Exploring the Effects of Oleic Acid on Adipogenic Differentiation of Bovine Embryonic Stem Cells Into Adipocytes

Michael Khade
Sponsor: Anna Denicol, Ph.D.
Animal Science

While most research of cultivated meat has been directed towards muscle differentiation, a robust method for adipose differentiation from pluripotent stem cells remains undefined. This study will focus on the effects of oleic acid on differentiation of bovine embryonic stem cells (bESC) into adipose tissue. Oleic acid is a naturally occurring Omega-9 fatty acid that accounts for the majority of the fatty acids found in bovine adipose tissue. Based on the literature describing differentiation of human induced pluripotent stem cells and ESC into adipocytes, we developed a similar protocol for use with bESC. Using a 22-day culture timeline, bESC will first be aggregated in embryoid bodies (EBs) and exposed to retinoic acid for 3 days (pre-differentiation step). At day 5, EBs will be transferred to maintenance medium for an additional 7 days. After 12 days, EBs will be transferred to an adipogenic cocktail. At this step, we will test different concentrations of oleic acid supplementation. Oleic acid has been shown to improve the efficiency of adipogenic differentiation in adult stem cells; therefore, by including oleic acid in the differentiation media we expect to see an increase in lipid accumulation via Oil-Red-O staining and expression of adipogenic transcript markers via RT-qPCR.

Lipoprotein(a), Chronic Kidney Disease, and Cardiovascular Risk: Findings in the SUGAR Study

MUHAMMAD KHAN
Sponsor: Enkhmaa Byambaa, M.D.,Ph.D.
MED: Int Med - Endocrinology

Elevated levels of circulating fat protein complexes, including lipoprotein(a) [Lp(a)], are risk factors for atherosclerotic cardiovascular disease (CVD). While plasma Lp(a) levels are primarily genetically regulated by a size variation in the apolipoprotein(a) [apo(a)] gene, chronic kidney disease (CKD) has been shown to influence Lp(a) levels. In this study, we investigated the associations between CKD, Lp(a) level, and apo(a) size in 98 individuals (n=37 control; n=58 CKD) enrolled in the Study of Glucose and Insulin in Renal Disease (SUGAR). Lp(a) concentrations were elevated in CKD [as defined by estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m^2] patients vs controls across both, small and large apo(a) sizes; CKD patients with the greatest degree of kidney dysfunction (eGFR <30 mL/min/1.73 m^2) had 2.5 times elevated Lp(a) levels compared with controls [median (IQR): 20 mg/dL (8; 71) vs 8 mg/dL (3; 45)]. Among CKD patients, Lp(a) levels were higher in those with CVD (n=17) vs without CVD (n=37) [median (IQR): 26 (4; 73) vs 11 (4; 43) mg/dL]. In conclusion, CKD influences Lp(a) concentrations across a range of apo(a) sizes, and elevated Lp(a) are associated with CVD in CKD. Further studies are warranted to understand the underlying mechanism of CKD-induced increase in Lp(a) levels.

Characterization of Actin-Microtubule Crosstalk via the Nuclear Envelope Protein Nespirin-2

Aisha Khan
Sponsor: Richard Mckenney, Ph.D.
Molecular & Cellular Bio

Nesprins are linker proteins in the outer nuclear membrane connecting the nucleoskeleton and cytoskeleton. They belong to the spectrin superfamily, wherein nesprin-2-Giant (N2G) is one of the largest members at over 800 kDa. While most of the protein is comprised of spectrin repeats, N2G also contains an N-terminal actin-binding domain and C-terminal region that binds to the microtubule motor protein kinesin-1. If and how N2G may network with the two major cytoskeletal systems in cells, actin and microtubules, remains unclear. N2G is required for normal embryonic growth, differentiation, and organogenesis, and critical roles of N2G in nuclear migration and positioning within cells have been reported. However, the molecular details of N2G's connections with the actin and microtubule cytoskeletons are largely undefined because of its large size and complicated architecture. We have reconstituted a minimal version of N2G and examined its interactions with the cytoskeleton in vitro. We have found that N2G can bind to actin and acts as a cargo-adapter protein that can activate kinesin-1 motility. N2G links kinesin to actin, allowing the motor to transport actin filaments along microtubules. These results provide insight into N2G's function to act as a mechanical crosslinker between actin and microtubules.

The Willow Clinic Behavioral Health Team: A Model for Reducing Mental Health Care Accessibility Barriers

Su Thwe Myo Khin
Sponsor: Kate Richards, M.D.
MED: Family & Community Med

This innovative quality improvement study uses depression screening to evaluate the Behavioral Health Team (BHT), offered in Sacramento through two student-run clinics, as a model for addressing health disparities and reducing obstacles to mental health care for people experiencing homelessness and people who inject drugs. Unhoused People are disproportionately affected by trauma and depression yet face unjust barriers to mental health treatment. At two of the UC Davis Health student-run clinics serving diverse populations, every person is offered a Patient Health Questionnaire-9 (PHQ-9), a standardized depression screening. A medical provider reviews all questionnaires for crisis intervention, and people at risk for moderate or severe depression are connected, if interested, to BHT, which offers direct psychiatric services and supportive resources. This study evaluates BHT as a model for decreasing obstacles to mental health care for people experiencing homelessness through evidence-based, person-centered care integrated within two student-run clinics by measuring depression screening rates and using outcome data and reiterative changes to address health disparities and promote equitable practices. Through depression screening at student-run clinics, the Behavioral Health Team provides accessible, evidence-based care and highlights the importance of understanding disparities in behavioral health resources.

Investigating the role of IGFBP4 upregulation in *TET2* Deficient Pancreatic Cancer

Martin Kim
Sponsor: Changil Hwang, D.V.M.,Ph.D.
Microbiology & Molec Genetics

10% of Pancreatic ductal adenocarcinoma (PDA) cases are hereditary and driven by mutations in genes such as *TET2*, whose protein influences gene expression via DNA de-methylation. To study the role of *TET2* in PDA, I generated *Tet2* knock-out (KO) murine PDA cells using CRISPR/Cas9. *Tet2* KOs sensitized murine PDA cells to inhibitors of PARP (PARPi) and BET (BETi), but the mechanism is unknown. RNA sequencing of these cell lines showed that insulin growth factor binding protein 4 (Igfbp4) was the most significantly upregulated gene, and gene-sets associated with the more aggressive squamous PDA subtype were enriched upon *Tet2* KO. In liver cancer, IGFBP4 is known to suppress HNF4A signaling, a hallmark of squamous PDA. In the future, I will identify a plausible link between Igfbp4 upregulation and enrichment of squamous associated genes, and determine if Igfbp4 upregulation is responsible for the increased sensitivity to PARPi and BETi. These results will give a fuller picture of the pathways that define squamous PDA as well as elucidate the mechanisms behind drug sensitivity of *Tet2* mutant PDA cells, to improve clinical treatments for patients with *Tet2* mutations and squamous subtype of PDA.

Physiological Effects of Hyperosmotic Conditions on *Leuresthes tenuis* Cell Lines

Jina Kim
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

California grunion, *Leuresthes tenuis*, have a unique adaptation: the eggs incubate out of the water on the sandy beaches of Southern California. Due to these novel conditions, the embryos may be vulnerable to fluctuations in this limited-moisture environment. They may naturally experience a wide range of salinities, between 21 and 42ppt. With the continuation of anthropogenic climate change, the interstitial fluid between the sand grains of their environment may evaporate with extreme weather events such as drought, causing their environment to become even more hyperosmotic. Knowledge on their salinity tolerance will be critical to ascertain how this indicator species may fare in the future under such conditions. In this study, we exposed replicates of the first established *L. tenuis* embryonic cell lines to different environmentally relevant salinities, ranging from 300 milliosmol/kg (isosmotic conditions) to 800 milliosmol/kg (hyperosmotic conditions) for 96 hours to determine acute salinity response. After 96 hours, organelle specific fluorescent dyes were used to determine cell proliferation, survival, mortality, and morphological differences amongst treatments. These characteristics are compared for three separately derived *L. tenuis* cell lines established from geographically distinct grunion populations. Funded by NSF MCB- 2127516.

The Ethics and Politics of Digital Disease Surveillance

Sandra Kim
Sponsor: Thorian Harris, Ph.D.
Philosophy

Different countries have experienced varying levels of success in addressing the COVID-19 pandemic. While governments that failed to invest in robust public health infrastructure struggled to control the transmission of the virus, other countries that employed data-driven, community-centered strategies proved more successful. The relative success of nations such as South Korea and Taiwan underscores how critical digital surveillance is for effective crisis management. Despite the advantages of digital disease surveillance, many governments are hesitant to implement such technologies because they consider it overly invasive to citizen privacy. This paper investigates the ethics of digital public health surveillance, focusing on the tension between individual autonomy and collective security. This paper argues that the right to privacy cannot trump national security during public health emergencies and that achieving a transparent, privacy-conscious model of digital surveillance is possible. Lastly, the paper discusses how Confucian Political Philosophy offers an approach to modern governance that may mitigate the moral challenges of leading in times of crisis.

Impact of COVID-19 Recession and Remote Working Flexibility on Female Labor Market During the Recession Recovery

Youngyun Kim
Sponsor: Giovanni Peri, Ph.D.
Economics

During the COVID-19 pandemic and the pandemic recession, the workplace scheme has changed due to the lockdown and public health measures to prevent the disease. Schools and childcare facilities were closed, and many workplaces had remote working. During 2020, the first year of the pandemic, the female population had a greater decline in labor force participation than the male population. It may be caused by the increased demand to stay at home and spend more hours on household activities, which females usually take more responsibility for. So, we track the following two years after the pandemic to observe the trend of recovery by employment to population ratio and gender. The paper also explores the impact of remote working availability on the female labor force. Since flexibility helps the female to balance their work hours and household activities, we test whether a career that allows more remote working options available would have a higher female employment rate.

Gating properties of Connexin 31.3 hemichannels

Aron Kishore
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MED: Physiology & Membrane Biol

Connexin hemichannels are large-pore channels found ubiquitously throughout the body. There are 21 connexin isoforms in humans and it has been shown that they play important roles in physiological and pathological conditions. The wide pore of connexin hemichannels provides a conduction pathway for permeating atomic ions and small molecules, such as ATP. However, the gating mechanisms (i.e. how the channels open and close) of connexin hemichannels remain to be elucidated. Gating of connexin hemichannels can be controlled experimentally by lowering the extracellular Ca2+ or by depolarization of the cell membrane; however, voltage dependence and Ca2+ sensitivity vary largely between connexin isoforms. Here, we focus on hemichannels formed by connexin 31.3 (Cx31.3), a non-characterized connexin isoform expressed in the nervous system. We used Xenopus oocytes as a heterologous expression system to analyze the gating properties of Cx31.3 hemichannels. We evaluated the Cx31.3-mediated ionic currents by the two-electrode voltage clamp technique. Our preliminary data suggest that Cx 31.3 hemichannels have no voltage dependence and are primarily open when calcium concentrations in the extracellular bath are low. These data will be useful to further explore the permeability properties of Cx31.3 and to determine the gating mechanism of connexin hemichannels.

Development of the Multiplex Genotyping PCR for Pancreatic Cancer Mouse Models

Shou Kitahara
Sponsor: Changil Hwang, D.V.M.,Ph.D.
Microbiology & Molec Genetics

Genetically engineered mouse models are vital to biological sciences across many different fields. To generate a relevant mouse model for cancer, common genetic mutations found in cancer patients need to be introduced into a mouse genome to mimic human cancer pathophysiology. For instance, pancreatic cancer is commonly driven by oncogenic mutations in *KRAS* mutations and loss-of-function mutations in *TP53*. In pancreatic cancer research, mice with *Kras* $^{LSL\text{-}G12D/+}$*; Trp53*$^{LSL\text{-}R172H/+}$*; Pdx1-Cre* (KPC) are commonly used because this model faithfully recapitulates human pancreatic cancer pathogenesis. To get the desired genotype of mice, we routinely perform genotyping Polymerase Chain Reaction (PCR) for individual genetically modified alleles. Unfortunately, single-gene genotyping is very time and labor-intensive, making it suboptimal. To increase the efficiency of the genotyping process, we optimized multiplex genotyping of three alleles in KPC mice, enabling us to determine genotypes of KPC mice with a single PCR reaction. In addition, this multiplex genotyping method is compatible with any other mouse models with mutant *Kras G12D* and *Trp53* R172H alleles and other Cre transgenic lines. In conclusion, our new multiplex genotyping PCR for KPC mice will significantly reduce the required time and effort for genotyping.

Dr. BOT: Using AI to Bridge Communication Gaps and Prevent Missed Diagnoses in Healthcare

James Kobrya
Sponsor: Prabhu Shankar, M.D.
MED: Public Health Sciences

The aim of this project is to address the issue of missed medical diagnoses due to miscommunications or underreporting during doctor visits. Many patients lack detailed medical literacy, which can result in unreported signs, potentially leading to serious, even deadly, consequences. Using Chat GPT, the project seeks to create a system that generates unbiased questions and a list of potential diagnoses for patients. The proposed method would create prompts, pinpointing symptoms or signs that patients may struggle to express. It would then put the results from these questions into a database of various diseases, flagging for one if certain combinations of answers were put together. This system would not only allow physicians to rule out certain medical cases, but also provide patients with possible questions that may be relevant. Based on our pre-trial run, it effectively probed for symptoms using individualized speech and provided an accurate list of diagnoses. Providing patients with better tools to communicate their symptoms and generating a list of potential conditions could help prevent missed diagnoses and improve patient outcomes. Additionally, it could save time during pre-screening and help patients feel more at ease by narrowing down options for their condition.

Material Trade Study For Air Bearing Table Surface for Low-Friction Planar Motion Testing of CubeSats

Duncan Koelzer
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

One of the few methods of simulating spacecraft dynamics on Earth is on an air bearing table. On an air bearing table, an air bearing creates a small cushion of air between a model spacecraft and the table, enabling low-friction planar motion and simulating spacecraft dynamics. This provides 3 degrees-of-freedom: 2 translational and 1 rotational. The Human, Robotics, Vehicles Integration and Performance Laboratory (HRVIP) aims to test attitude determination systems using this method. However, attitude testing on an air bearing requires a highly flat and smooth surface, ensuring gravitational effects do not interfere with the CubeSat's dynamics. The glass surface used for previous experiments encountered many problems maintaining a flat surface. We researched two alternative materials that would allow for more accurate measurements, while meeting specified flatness and roughness requirements. While we found that precision epoxy could form a flatter surface, grade B granite would be a more cost-effective solution while still meeting our flatness and roughness requirements. The development of this in-house testing environment provides an accessible and cost-effective method for performing CubeSat research. Furthermore, our trade study analysis is useful for other universities and institutions that need to conduct similar spacecraft research.

Synthesis of Raman-active Core-Shell Nanoparticles for Early Diagnosis of Ovarian Cancer

Anna Kolesov
Sponsor: Randy Carney, Ph.D.
Biomedical Engineering

Ovarian cancer diagnosed at a late stage has a 31% 5-year survival rate, while this rate for an early stage diagnosis is 93%. Therefore, there is a clear clinical need for an earlier and non-invasive ovarian cancer diagnostic technology. Our project aims to create silica-coated gold nanoparticles that will detect cancer-associated-extracellular vesicles (EVs) in a patient sample using a technique known as surface enhanced Raman spectroscopy (SERS). The gold core of the nanoparticle provides plasmonic enhancement, akin to shining a bright light on the cancer biomarkers. A self-assembled monolayer of a Raman-active tag surrounds the core to act as a unique label for each nanoparticle type. A silica shell is added to cap the Raman-tag to the nanoparticle, providing long term particle stability and an adhesive surface for EV targeting agents. Preliminary results show that an aqueous based process is ineffective in creating a consistent silica shell, while an alcohol-based, modified Stöber process can be used to create a gold core nanoparticle with a Raman-active tag and silica shell.

The Role of Dynein in Nuclear Positioning in Diakinesis Spermatocytes

Siri Konanoor
Sponsor: Francis Mcnally, Ph.D.
Molecular & Cellular Bio

It has been previously demonstrated that cytoplasmic dynein, the minus-end-directed microtubule motor protein, plays a role in meiotic spindle positioning and rotation in *Caenorhabditis elegans* oocytes. It is crucial for the spindle to be positioned asymmetrically in oocytes so that half the chromosomes can be disposed into the polar body. However, little is known about nuclear positioning in spermatocytes. When observing male gonads of strains with dynein tagged with GFP, we noticed that dynein is localized on the cell cortex as well as the nuclear envelope. From this, we hypothesized that dynein is responsible for positioning the nucleus in the center of spermatocytes which would lead to centered meiotic spindles. We further hypothesized that a lack of dynein would cause displacement of the nucleus away from the center. Through auxin-induced degradation for 4-9 hours, we were able to knock down DHC-1 (the heavy chain subunit of dynein) in the male gonad. We then quantified nuclear positioning along the axis towards and away from the spermatheca, and along the axis perpendicular to this. Preliminary results suggest that the nucleus is in fact symmetrically positioned in diakinesis spermatocytes, and we are amidst conducting further quantifications for the ones with DHC-1 knocked down.

Child Maltreatment and Disaster: A Systematic Review

Katherine Kovach
Sponsor: Clare Cannon, Ph.D.
Human Ecology

Child maltreatment is a serious public health issue which research indicates increases in prevalence under stressful conditions. Disasters produce significant stress, posing a risk for child maltreatment. In this systematic review, 456 viable articles were found in an initial search of scholarly databases (i.e., PsycInfo, PubMed, Google Scholar). After application of selection criteria, 21 articles were selected for inclusion in this study. These articles were chosen based on accessibility (e.g., English language, full text availability), article type (i.e., literature reviews, non-peer reviewed research articles were excluded) and relevance (i.e., institutional violence, conflict disasters, parental abuse were excluded). In most cases, child maltreatment is seen to increase after disaster, though in areas affected by frequent disasters or high maltreatment rates this correlation is not apparent. Children who experience both disaster and child abuse tend to experience worsened mental health outcomes, such as posttraumatic stress disorder. This finding holds true with survivors of child maltreatment who experience disaster as adults. Additional research studying neglect along with epidemic and technological disasters is needed, especially research from South America and Africa. Given the current research, practitioners need policy support to both reduce child maltreatment and promote mental wellness after disaster.

Exploring the Development of Spatial Play and the Role of Experience in 24- to 42-Month-Old Children Using a Hape Shape Sorter

Emily Kramer
Sponsor: Lisa Oakes, Ph.D.
Psychology

Spatial play is an essential form of play that is associated with the development of cognitive skills, such as mental rotation, spatial awareness, and language (Jirout & Newcombe, 2015, Mohring & Frick, 2013; Walle & Campos, 2014). Bambha et al. (2022) found that across the period from 12 to 48 months, children became more accurate at inserting 3D shapes into a shape sorter. The current project seeks to extend the previous study by examining the accuracy of object insertions in a sample of fifty-eight 24- to 42-month-old children. Participants were presented with a shape sorter and six corresponding solid shapes (circle, square, hexagon, triangle, trapezoid, and semicircle). We also asked parents to complete a questionnaire about their children's experience with spatial toys (e.g., puzzles, blocks). We hypothesize that older children and children with more spatial toy experience will show a higher proportion of correct object insertions, specifically for asymmetrical solids. These results will help us gain more insight into how age and spatial toy experience contribute to the development of cognitive abilities such as mental rotation and spatial skills.

Analyzing Existing Mental Health Screeners to Design and Build a Comprehensive Mental Health Screener for Patients in Primary Care

Samiksha Krishnamurthy
Sponsor: Prabhu Shankar, Ph.D.
MED: Public Health Sciences

The most commonly used measures in Psychological screeners of patients in primary care settings are the PHQ-9, the PHQ-15, and the GAD-7. These screeners measure for depressive symptoms, anxiety symptoms, and suicide ideation, with the addition of a focus on somatic symptoms in extended screeners. However, though these screeners have been found to have somewhat of a helpful effect on the overall patient experience, none have consolidated anxiety, depression, suicide ideation, and basic habits in one short screener, the benefit being a comprehensive and short survey of the most common psychological problems that plague patients today. This paper posits that by building a more concise comprehensive screener, patients can receive overall better care. The multi-factor proposed screener is built based on existing screeners, taking into consideration depressive symptoms, anxiety symptoms, somatic symptoms, and suicide ideation. The intended usage is as an initial screener during primary care appointments, to be then further analyzed and potentially used for referrals. The proposed screener was built out with the support of several psychologists and psychiatrist interviews, and in the future, is intended to be tested out first in a student population, and furthermore in a patient population.

Be Safe, Not Scared – A Poster Series for HIV Status Awareness

Lorelei Kriss
Sponsor: James Housefield, Ph.D.
Department Of Design

The idea for these posters hit me one night in October as I unwrapped a lollipop. I had known from the start of my DES 001 course that I wanted my final project to address HIV and the stigma surrounding it, but I had not yet settled on my creative angle. I set the lollipop wrapper down on my desk, right next to a preliminary sketch of a condom; as I observed their similar shapes, I decided on my theme: "Trick or Treat." These posters combine my experience in the queer community with my love of Halloween and horror, which was a tricky line to toe. I sought out feedback from my peers and mentors in order to finalize designs that had the potential to both shock and evoke humor without perpetuating harmful stereotypes. HIV is not a disease of the past, but it is also not the death sentence it was once considered to be. It is important for everyone on the UC Davis campus, students and staff alike, to know their status.

Characterizing the Effect of a Paternal Folate-Deficient Diet in Spermatogenesis

Rohan Kumar
Sponsor: Satoshi Namekawa, Ph.D.
Microbiology & Molec Genetics

Over 15% of couples have difficulty conceiving a child. Male fertility is conducted through spermatogenesis, which produces sperm from germ cells. In addition to its DNA, the sperm's epigenome is essential for embryonic development. Diet directly affects the epigenome by changing the number of substrates available for chromatin-modifying processes, thus affecting gene expression and development. Our work studies how folate (vitamin B9), a substrate required for methyl groups, in a father's diet can affect offspring health. To close this knowledge gap, we use a folate-deficient mouse model to study changes in the epigenome due to diet-based methyl group deficiency. My work focuses on the characterization between folate-sufficient and -deficient mice. Since previous literature has demonstrated that a folate deficiency does not affect mature sperm production, I hypothesize that a folate-deficient diet will not negatively affect spermatogenesis efficiency. To assess these changes, I utilize FACS to count germ cells, immunostaining to check for histology, and measurement of food consumption between both treatments. The main goal is to provide insight that the paternal diet is as significant as the maternal diet and improve current preconception guidelines

The Cost of Inaction: A Network Analysis of the Impact of the Annexation of Crimea

Quincy Kumfert
Sponsor: Zeev Maoz, Ph.D.
Political Science

Russia's invasion of Ukraine in 2022 shocked the world. To explain Russia's war calculus, some argue that a failure to punish Russia for annexing Crimea emboldened Russia. However, while post-Crimea sanctions clearly did not deter Russia, the total cost of annexation for Russia is less obvious. In this thesis, I perform a comparative interrupted time series study to examine to what extent the international community reacted to the annexation of Crimea and how it impacted Russia's position in the international system. I use social network analysis based on event data to quantify each state's cooperative and conflictual prestige (indegree centrality) from 2010 to 2019. Then, I perform a linear regression on pre-annexation centrality scores, from January 2010 to March 2014, to generate expected scores for post-annexation months and compare them to the observed centrality scores. I find that although Russia experienced slightly greater conflict prestige, it experienced significantly greater cooperation prestige compared to pre-annexation trends. This shows that Russia did not suffer a cost for annexing Crimea. Instead, it received greater cooperation from other countries, indicating that the international community failed to impose a meaningful cost on Russia for annexing Crimea, thus possibly emboldening Russia's aggressive behavior in Ukraine.

Does the Nigerian Government's Response to Violent Conflict Exacerbate Civilians' Fear?

Kiara Kunnes
Sponsor: Lauren Young, M.D.,Ph.D.
Political Science

Policymakers and scholars have long argued that weak states enable insurgents to thrive and victimize civilians, providing instability. In this view, state capacity should mitigate the effects of insurgent violence on civilians. However, this view fails to account for high levels of civilian victimization that occurs at the hands of state agents who fight insurgents with repressive tactics. Civilians, particularly those in identity groups that are perceived as sympathizing with the insurgents, may be more afraid of the violent state response than of the insurgents. This paper asks two questions. First, does the Nigerian government's response to violent conflict exacerbate fear? Second, does the level of fear to the Nigerian government's violent response vary among civilians grouped by their demographic characteristics? I postulate that civilians who have typically been victims of insurgents will experience decreased fear in areas with a greater government presence, and those who have typically been the victims of state repression will, in contrast, experience increased fear. Initial regression analysis suggests those not identifying as Muslim, primarily Christian, experience more fear from increased insurgent violence and decreased government presence. Meanwhile, those identifying as Muslims are indifferent to insurgent violence, state repression, and government presence.

Role of Long Non-Coding RNA in Thermal Tolerance of Marine Invertebrates

David Kwon
Sponsor: Rachael Bay, Ph.D.
Evolution & Ecology

Long non-coding RNA (lncRNA) refers to RNA transcripts that exceed 200 nucleotides but do not code for a protein. Initially presumed as "junk," emerging evidence suggests that lncRNAs are essential for various biological processes, including mediating gene expression. However, the role of lncRNA expression remains largely unexplored for ecologically relevant traits. Of particular interest is whether adaptation to warm environments is associated with divergence in lncRNA expression, affecting critical gene expression changes to achieve thermal tolerance. In this meta-analysis, we examined whether heat-tolerant and sensitive populations differentially express lncRNA during an acute thermal challenge. To identify robust patterns between thermal tolerance and lncRNA expression, we used RNA sequencing data from experiments performed on three marine invertebrate species–a copepod (*Tigriopus californicus*), coral (*Acropora hyacinthus*), and marine snail (*Chlorostoma funebralis*). We customized a genomic pipeline to identify differentially expressed lncRNAs between heat-tolerant and sensitive populations. We test for co-expression of lncRNAs with protein-coding heat response genes. Results from this study will provide insights into a putative conserved mechanism to mediate heat response gene expression across a wide phylogenetic distance among animals vulnerable to climate change.

Novel Autism Candidate Gene, *YTHDF2*, Contributes to Brain Enlargement in Zebrafish Models

Gabriana La
Sponsor: Megan Dennis, Ph.D.
MED: Biochem & Molecular Med

Autism spectrum development (ASD) is a neurodevelopmental condition displaying heterogeneous traits, including restricted and repetitive behaviors, and difficulties with communication and socialization. While there are now hundreds of genes known to contribute to ASD, we do not yet have a full understanding of the genetic landscape of this complex condition. We hypothesized that characterizing disproportionate megalencephaly (DM), a feature enriched in ASD in which affected individuals have enlarged brains, would enable better identification of candidate genes and underlying etiologies. Using whole-genome sequencing, we identified 152 genes with *de novo* mutations in sporadic ASD-DM families likely impacting function. We used zebrafish to evaluate the function of gene *YTHDF2*, which was found duplicated in an autistic proband and encodes an m6A mRNA reader that promotes transcript degradation. Larval zebrafish subject to CRISPR "knockout" of ortholog *ythdf2* exhibited smaller heads, while introduction of *in vitro* transcribed *YTHDF2* mRNAs resulted in larger heads. These results were recapitulated for brain size using a zebrafish transgenic line expressing eGFP in post-mitotic neurons. To test if the m6A mRNA pathway generally contributes to autism etiology, a finding not previously reported before, we are testing additional readers impacted in ASD-DM.

Effects of social stress on neural activity in androgen receptor expressing cells in the brain

Alyssa Lake
Sponsor: Brian Trainor, Ph.D.
Psychology

Anxiety disorder is more commonly diagnosed in women than in men. Studying the monogamous mouse species, *Peromyscus californicus*, allows researchers to study social stress in females. Stress responses in humans are significantly based on sex. Stress responses are studied through the '*Social Defeat'* model. Previous research in *P. californicus* has shown sex differences in stress sensitivity are dependent upon androgen exposure during puberty. An outstanding question is, where in the brain is this androgen acting? We used double label immunohistochemisry to observe if c-fos expression (an indirect marker of brain activity) after social stress exposure overlapped with androgen receptor expression in the the ventral hippocampus, which projects to brain regions that regulate behavioral responses to stress and expresses androgen receptors. Surprisingly, we did not observe c-fos expression in androgen receptor positive cells in the ventral hippocampus. This may indicate that the androgens act outside of the hippocampus or that the androgen receptor expressing cells are more important for regulating later behavioral responses, such as during a post-stress social interaction test. Future studies will assess whether androgen receptors are affected by long term stress, or are more affected by stress in different parts of the brain.

Design and Test Plan of a High-Altitude Return-to-Site Vehicle

Andrew Lam
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

Scientific balloon missions, such as NASA's SuperBIT and TAURUS, collect enormous amounts of data that contribute to the understanding of our solar system. These missions will generate enormous amounts of data; therefore, a data vault recovery system is needed to recover the data safely. NASA's FLOATing DRAGON competition encourages teams of university students to develop prototypes of their data vault recovery systems. Under Dr.Stephen Robinson's Human/Robotics/Vehicle Integration and Performance Lab (HRVIP), HERMES: "High-altitude Experimental Rogallo Mission to Escort Safely" team developed a return-to-site vehicle inspired by NASA research; a folding Rogallo wing designed for safe escort of data vaults from high-altitude balloon experiments. HERMES will be housed and deployed via a high-altitude balloon gondola and enter autonomous GNC flight. HERMES navigates by controlling wing pitch and roll to reach predetermined waypoints, while beaconing basic health information. Various tests will be conducted: glide performance, wing deployment, GNC testing, thermal testing, landing survivability and a final test flight is planned for August 2023 in New Mexico. Such novel technology could then be implemented for data recovery in other systems such as weather balloons.

The Taste of Tangerines

Megan Lau
Sponsor: Claudia Sanchez-Gutierrez, Ph.D.
Spanish & Portuguese

A heritage language is a non-dominant language typically learned and used in the home but not in outside society. Contrary to popular opinion, not all people with a heritage language are fluent; some may be able to speak their language but not write it, while others may have limited listening comprehension. The disconnect between the expectation of communication ability in a heritage language and the lack of such ability may generate feelings of shame and guilt. As such, low proficiency in one's heritage language is not often publicized. To open a discussion on the topic, I drew a digital comic. In it, I tell the story of a heritage speaker whose varying proficiency in English, Cantonese, and Spanish affects their feelings of belonging toward the cultures to which they pertain. Although my comic is largely based on personal experience, I hope to show people who relate to this struggle that there are others like them.

Preliminary Behavioral Analysis of MAR Juvenile Social Dyads Data

Doriana Le
Sponsor: Melissa Bauman, Ph.D.
MED: Psychiatry & Behav Sci

Alterations in the prenatal immune environment are associated with an increased risk of autism spectrum disorder (ASD). Although ASD is a uniquely human disorder, animal models can be used to study the effects of maternal autoantibody-related (MAR) autism on social development, which is typically altered in individuals with ASD. Here we present a preclinical rodent model to investigate maternal autoantibody-related autism as one potential cause of ASD. In this study, we evaluated social development in juvenile rats that had been prenatally exposed to MAR antibodies that target fetal brain proteins. To gather data for the possible effects of maternal antibodies on social behavior, we video-recorded the social interactions of each MAR (N=54) and control (N=27) offspring with an age- and sex-matched stimulus rat in a controlled environment for 10 minutes. Trained observers who were blind to experimental conditions then quantified the amount of time the animals spent socially interacting, playing, self-grooming, or alone. These data will be used to determine if prenatal exposure to specific combinations of MAR antibodies are associated with alterations in species-typical social development.

Development of a Fluorescent Nuclear Marker for Quantification of Live Tilapia Cells Over Time

Tracy Le
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

We use a tilapia cell line (OmB) for mechanistic studies of environmental stress effects on proliferation. Automated cell counting over time can be performed using a Leica Dmi8 fluorescence microscope and NucBlue stain despite overlapping cell boundaries, but NucBlue is cytotoxic. Enhanced green fluorescent protein (EGFP) isn't cytotoxic but it's normally localized throughout the cell, rendering cell counts unreliable. This project aimed to concentrate EGFP in the nucleus. A new fusion protein (EGFP-NLS) generated by adding a SV40 nuclear localization signal (NLS) to the EGFP showed some nuclear EGFP enrichment but still significant cytoplasmic EGFP. We hypothesized adding Cyclin B1 destruction box (CB1DB) limits cytoplasmic accumulation of EGFP increasing nuclear definition. An amino acid sequence alignment between human CB1DB with tilapia Cyclin B1 located CB1DB to exon 2 in the tilapia gene. A new transgene (CDB-EGFP-NLS) was then constructed by fusing the tilapia cyclin B1 exon 2 and EGFP-NLS sequences in an expression vector. Expressing the corresponding CDB-EGFP-NLS fusion protein increased nuclear relative to cytoplasmic localization compared to EGFP-NLS fusion protein, improving automated nuclei recognition. New CDB-EGFP-NLS cell lines can be used for proliferation assays to image the same live cells over time. Funded by NSF-IOS 1656371 and BARD IS-5358-21.

Óscar Romero: Un Caso Práctico en la Capacidad Humana Para Esperanza y Acción Política

Adriana Leal
Sponsor: Robert Irwin, Ph.D.
Spanish & Portuguese

En la academia occidental, la relación entre la religión y acción política suele ser poco estudiado. El movimiento escolar de cambiar la estudia de política a una de "ciencia" ha resultado en que muchos estudios no consideran el papel de la religión en acción político secular. Este estudio intenta contribuir a un entendimiento sobre cómo la religión puede afectar y promover movimientos progresivos en países afectados por violencia e inestabilidad política. Basado en análisis textual de documentos primarios de Santo Óscar Romero, y de materiales secundarios relacionados con su vida y obra, esta investigación revela que la enseñanza de Óscar Romero ayudó a inspirar acción política en El Salvador. Su lealtad al Vaticano y tradiciones católicos, unido con su dedicación al pueblo salvadoreño resultó en dar no nada más un método de sobrevivencia, sino esperanza para el pueblo salvadoreño, lo cual inspiró a campesinos a resistir la opresión del gobierno. Aunque este estudio nada más se enfoque en Óscar Romero como un caso práctico, este análisis se puede aplicar a otras figuras religiosas en momentos de inestabilidad político.

Language as a Determinant of Risk for Coccidioidomycosis Among Race and Ethnicity: A Geospatial Analysis

Yanele Ledesma
Sponsor: Ariana Valle, Ph.D.
Sociology

My project will consist of geospatial analysis, correlating Valley Fever (coccidioidomycosis) incidence rates across California counties with prevention language used across California newspapers in those same counties. Incidence rates were mapped using yearly California Department of Public Health data to code for Valley Fever Incidence by California county and ethnicity. My qualitative code will come from a database that includes newspaper articles, legal cases, and OSHA reports—all reporting outbreaks and prevention. This non-academic source of information on occupational Valley fever exposure proportionally reflects community concern. This geospatial analysis correlates coccidioidomycosis incidence rates with prevention language in newspapers across California. This analysis will inform mechanisms of racial and ethnic health disparities. The epidemiological approach to understanding the mechanisms for infection and understanding the causality of health communications affect the understanding of prevention and therefore infection. Specifically, there will be an exploration of theory and frameworks outlining being Hispanic as a protective factor where other environmental factors lack protection for protection.

Assessing the Genetic Variation of Lahontan Cutthroat Trout in the Walker River Tributaries

paul lee
Sponsor: Andrea Schreier, Ph.D.
Animal Science

The Lahontan Cutthroat Trout (LCT; *Oncorhynchus clarkii henshawi*) has been extirpated from 99% of the historic Walker Basin watershed. The Walker River fluvial LCT populations face many challenges such as the construction of dams, genetic drift, and desiccation. In the 1990s, the Walker basin stream populations were refounded with LCT from By-Day Creek, a tributary of the East Walker River, but potential bottleneck effect and genetic drift remain an ongoing concern. To assess population health, samples were taken in 2020 from 6 different tributaries of Walker River (Slinkard, Wolf, Mill, By-Day, Silver, and Murphy Creeks) and sequenced using restriction-site-associated DNA sequencing (RADseq). The resulting Single Nucleotide Polymorphism (SNP) data will be used to assess genetic diversity, which is correlated to the fitness and adaptability of LCT. In order to gauge the genetic diversity within each creek, heterozygosity will be determined and genetic differentiation, quantified as FST, will be used to assess the relatedness of the populations between each creek within Walker Basin. The information gathered from this study will provide insight into whether these populations can be used for future translocations or genetic rescue endeavors.

Characterization of Novel Genes Associated with the Regulation of NAD+ Metabolism in the Model System *Saccharomyces cerevisiae*

Annika Lee
Sponsor: Su-ju Lin, Ph.D.
Microbiology & Molec Genetics

Nicotinamide adenine dinucleotide (NAD^+) is an essential metabolic cofactor involved in redox reactions, cellular signaling, and regulation. Abnormal levels of NAD^+ and its precursors have been shown to play a role in several age-related human disorders, therefore, these metabolites are an emerging therapeutic target to mitigate cellular damage. However, due to the complexity of its metabolic pathways, NAD^+ synthesis and regulation are not well understood. Our preliminary NAD^+ precursor-specific genetic screen using *Saccharomyces cerevisiae* as a model organism highlighted multiple genes that impact NAD^+ intermediate homeostasis. A secondary screening to validate the resultant phenotypes is ongoing. As an example, the overexpression of *BNA1*, a dioxygenase that functions in the *de novo* biosynthesis pathway of the precursor quinolinic acid (QA), showed an unexpected notable release of nicotinic acid/nicotinamide (NA/NAM) intermediates, though only increased levels of QA were expected. As increased levels of NA/NAM release have been correlated with mitochondrial dysfunction and increased autophagy in some of our yeast mutants, our studies can help understand the mechanisms of the regulation of NAD^+ metabolism and aid in the development of therapeutic strategies for metabolic disorders related to abnormalities in NAD^+ metabolism.

Cat Caretakers' Attitudes Towards Use of Veterinary Video Telemedicine

Sooyoung Lee
Sponsor: Carly Moody, D.V.M.,Ph.D.
Animal Science

Companion cats face difficulties in accessing veterinary care, with 40% of cat caretakers reporting that they did not seek veterinary care each year, compared to 15% for dog caretakers. This research aimed to study companion cat caretakers' perceptions of veterinary video telemedicine, to potentially improve accessibility to care and cat welfare. Fifty-four IRB-approved quantitative survey questions were published through Qualtrics. Participants were recruited through snowball sampling, required to reside in the United States, be the primary caregiver of at least one cat, and be 18 years or older. Majority (97%) of individuals who took the survey had never experienced a video telemedicine appointment with their cat(s), however, most (85.7%) showed interest in utilizing video conferencing platforms for their felines. Additionally, 73% of participants expressed that taking their cat to the clinic is stressful, and over half believed that it would not be stressful for their cats to have a video telemedicine appointment with the veterinarian. Cat caretakers preferred a video telemedicine appointment over a clinic appointment for behavioral concerns such as destructive behaviors (69%), fears/phobias (71%), and aggression (62%.) Ultimately, video telemedicine is a great option for reducing stress related to clinic visits, specifically for behavioral appointments.

Investigation of Deficit Irrigation Treatments on Olive Oil Quality

Elissa Lee
Sponsor: Selina Wang, Ph.D.
Anr Food Science & Technology

In California, climate change and groundwater management policies have evolved within the last two decades as the state faces increasing weather extremes in addition to hotter and drier seasons. Growers have begun to change when and how much irrigation water is applied through deficit irrigation. We investigated the effect of deficit irrigation treatment on olive oil quality after fall harvest by taking measurements of moisture content, fat content, total phenol content (TPC), ultraviolet absorption, induction time, and ratios of 1,2 to 1,3 diacylglycerols (DAGs). Four irrigation treatments used were 1) A: control group with 100% of water application throughout the season; 2) B: 80% of water application throughout the season; 3) C: 25% of water application during pit hardening; and 4) D: 25% of water application during pit hardening and 125% water application the rest of the season. We found significant differences between the four irrigation methods in fat content, TPC, DAGs, and primary oxidation but not in moisture content and secondary oxidation.

The Relationship Between Maladaptive Social Skills, Depressive Symptoms, and Physical Symptoms Among Late Adolescents

Elizabeth Lee
Sponsor: Adrienne Nishina, Ph.D.
Human Ecology

Adolescence is a time of social change as students tend to focus more on peers. Past research has shown that inadequate social skills have been associated with several negative outcomes, such as worsened mental health and academic performance, as well as increased aggression and social-emotional difficulties. However, little is known about how adolescents' post-high school social skills relate to physical symptoms. In the current study, we investigated the association between maladaptive social skills (i.e., jealousy, overconfidence, and impulsivity), depressive symptoms (as a prior correlate of inadequate social skills), and physical symptoms. We hypothesized that higher levels of maladaptive social skills would be associated with depressive symptoms and poorer physical health. We drew data from a longitudinal study of 233 late adolescents (26% Asian American, 23% White, 23% Latinx, 18% Multiethnic, 5% Pacific Islander, 4% African American). Preliminary results show that maladaptive social skills are positively associated with depressive symptoms *($r = .39$, $p < .001$)* and poorer physical symptoms *($r = .40$, $p < .001$).* Future analyses will examine ethnic differences in the association between maladaptive social skills, depressive symptoms, and physical symptoms, as prior research has shown discrepancies in physical health amongst different ethnic groups.

Pejus and Pessimum Zones of an *Oreochromis mossambicus* Cell Line Exposed to Hyperosmolality

Anna Lee
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Mozambique tilapia, *Oreochromis mossambicus*, brain (OmB) cells can tolerate acute hyperosmotic stress up to 700 mOsm/kg. Therefore, OmB cells represent excellent models for studying cellular mechanisms of tolerance towards hyperosmotic stress. In this study we tested the hypothesis that hyperosmotic stress tolerance of OmB cells can be described by the pejus-pessimum model. The boundary between these zones represents the critical threshold where, if cells do not return to pejus levels, cell death is inevitable. The identification of this boundary allows for the establishment of a cellular salinity tolerance range that incorporates both stress severity and time of exposure and is more objective than arbitrarily performing tolerance tests at a specific stress severity for only a single time of exposure. We exposed OmB cells to hyperosmolality ranging from 300 (isosmotic) to 800 mOsm/kg (hyperosmotic) for 1, 2, 4, 8 and 16 days. Cell proliferation, survival, and mortality were determined with nuclear fluorescent dye. From these data we determined that the boundary zone between pejus and pessimum ranges in OmB cells correlates with the maximum observed deviation in plasma osmolality in salinity-stressed intact tilapia. Funded by NSF MCB-2127516, BARD IS-4800-15, AES CA-D-ASC-7690-H, CA-D-ASC-7624-RR.

Sustainable Antimicrobial Coatings on Hydrophobic Food-Contact Surfaces for Reduction of Foodborne Bacterial Contaminations

Daphne Lee
Sponsor: Gang Sun, Ph.D.
Biological & Ag Engineering

Reducing bacterial contamination on food-contacting surfaces is critical in preventing foodborne illness. Biofilm formation on surfaces of produce processing machines and containers, especially on plastic materials, is a common issue contributing to bacterial transmissions in fresh produce. One of the solutions is to develop antimicrobial and antifouling coatings on food-contacting surfaces, though many studies reported the limitation of the coatings in stability and durability. Polyethylene (PE), a common material widely used in food-producing industries, has high hydrophobicity, representing the most challenging situation in the application of antimicrobial-coatings. To address such issues, this research explores a sustainable, biodegradable, and rechargeable antimicrobial food ingredient-based coating with protein-based N-halamine structures for hydrophobic surfaces. The coating systems made with gelatin (Gel), soy protein hydrolysate (SPH), and tannic acid (TA) were deposited as homogenous layers to low-density polyethylene (LDPE) films, which were previously plasma treated to increase interactions with the coating materials. The coated materials (Gel/SPH/TA@PE) were later charged with diluted chlorination solution to convert amino and certain peptide bonds in proteins to biocidal N-halamines to achieve the antimicrobial function. The Gel/SPH/TA coatings demonstrated good stability in low-temperature hydro-rich environments on PE, providing efficient active chlorine to defeat potential microbial contaminations.

Telehealth for Discharge Outcomes in Children (TeleDOC): A Feasibility Study

Julia Lee
Sponsor: Michelle Hamline, M.D.,Ph.D.
MED: Pediatrics

Barriers to accessing healthcare providers and difficulties navigating the healthcare system lead to parental concerns and unanswered questions. This may contribute to hospital readmission and eventually pose negative health outcomes for pediatric patients. Telehealth offers a potential solution to this issue by providing a means of communication between a child's hospital-based physician and caregiver to ease the hospital-to-home transition by directly addressing caregiver concerns and child health complications. This study aims to determine the feasibility of telehealth visits for pediatric patients after hospital discharge. Current study procedures include survey development for both caregivers and providers before and after telehealth was offered. These will be distributed to 100 caregivers and 15 pediatric hospital medicine attendings from which a smaller sample of participants will be selected for interview. Demographics, hospitalization characteristics, health outcomes, and feasibility of telehealth use will be collected via REDCap. Results from the study will help determine caregiver and provider willingness and competency to provide telehealth, potential benefits of telehealth follow-up visits, and workflow challenges. Further improvements to telehealth based on this study can be implemented to ensure that medical services are accessible to provide the best possible care to all patients.

Transformative Climate Change Education for Graduate Students: Developing a Theory of Change-Based Program to Increase Equity in Climate Change Science

Elaina Legg
Sponsor: Sarah Mccullough, Ph.D.
OR: Feminist Research Institute

Climate inequities stem from a lack of equity-focused research informing practices to respond to climate change problems. One way to increase equity in climate change research is through education, specifically targeted at emergent scholars such as graduate students. We developed a transformative climate change program that is adapted from the Asking Different Questions graduate program, titled Asking Different Questions in Climate Change Science (ADQCS). This program will be informed by a theory of change based on the literature on equity-focused graduate education programs and a qualitative analysis of interviews with twenty UC Davis faculty and students. We found that both individual and contextual characteristics impacted a student's experience doing equity-focused research and practices. Individual characteristics include individual motivations, lived experiences, and academic background. Contextual characteristics include an individual's social, cultural, and institutional environments of support. A climate change educational program should integrate these factors in order to be successful, and this will be the aim of ADQCS. ADQCS will give graduate students the skills, knowledge, and resources to understand and respond to climate change problems more effectively.

The Role of the Endoplasmic Reticulum-Bound Kinesin-1 in Meiotic Spindle Asymmetry

Aastha Lele
Sponsor: Francis Mcnally, Ph.D.
Molecular & Cellular Bio

In *Caenorhabditis elegans*, kinesin-1 (a plus-end-directed microtubule motor protein) is required for the oocyte meiotic spindle to be asymmetrically positioned. Asymmetric spindle position facilitates extrusion of half the chromosomes into a polar body. However, the cargo that kinesin-1 binds to for moving the spindle is unknown. We hypothesize that the cargo that kinesin-1 binds to is the endoplasmic reticulum (ER), and that the process of kinesin-1 carrying ER along the microtubule pushes the spindle away from the oocyte center. To test this hypothesis, we replaced the cargo-binding domain of kinesin-1 with iLID, a protein that will bind SSPB only when illuminated with 488 nm light. In addition, we fused SSPB to TMCO-1, a transmembrane Ca^{2+} ion channel residing in the ER. If the ER is the cargo of kinesin-1 that is responsible for spindle positioning, we predict that this optogenetic pair will restore asymmetric spindle position in a kinesin-1 null background. Preliminary results indicate that this optogenetic pair indeed restores spindle asymmetry. We are working on increasing sample size and testing other organelles with a similar optogenetic approach.

A Systematic Content Review and Meta Analysis of the Sami and Russia from 2010-2015

Katharina Lenz
Sponsor: Christyann Darwent, Ph.D.
Anthropology

Russia has a complex history with the Sami in its western Arctic regions, one that has continued for more than 300 years. However, recently Russia's heightened interest in Arctic resources and open-water shipping through newly ice-free waters, fueled by climate change, has shifted their relationship with the Sami. To understand the focal interests of Sami researchers before Russia began forging a new path to economic recovery via the Arctic, a systematic literature content review and meta-analysis was undertaken. Using Google Scholar to funnel articles from 2010-2015 with the key terms Russia* AND Sami*, there were 384 search results, of which 18% were relevant to the relationship between indigenous Sami and Russia. The primary areas of research were health (n=22), culture (n=18), climate change (n=18), politics (n=11), language (n=9), mental health (7), and reindeer husbandry (n=4). Health was the focus of interest in 2011 (60%), 2013 (50%), and 2015 (35%), with culture and climate change being the second most frequent topics discussed (27% over five years). Although facing health and economic struggles hastened by climate change, traditional language decline, and discrimination, this analysis reveals strong Sami resilience in the face of continued Russian colonialism.

Investigating Pronghorn Paleoecology and Ancient Cooperative Hunting in the Western Great Basin Using Stable Isotopes

Andrea Levinson
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Hunting trap complexes offer a rare opportunity to study human cooperation in the past. Most studies of these structures focus on their age, projectile points, trap construction, and ethnography, rather than the behavior of the animals they targeted, which would have fundamentally influenced communal hunting strategies. Ethnography suggests that these traps targeted pronghorn (Antilocapra americana), and some scholars suggest that Indigenous peoples constructed traps in known migration corridors between winter and summer ranges. Preliminary studies of radio collar data indicate that the Bodie Hills pronghorn herd uses migration pathways that intersect with known trap sites, suggesting that they may have been designed to seasonally intercept migrations. This study aims to evaluate this model using Stable Isotope data (C, N, O, S) from faunal remains from a hearth feature associated with a trap complex and comparing the values to an isoscape derived from local plant and water samples. In addition to advancing research on antelope paleoecology and Indigenous communal hunting strategies, this study has implications for modern pronghorn herd management on the CA/NV border.

Validation of an Open-Source Prosthetic Hand for Use in Research

Aidan Lewis
Sponsor: Jonathon Schofield, Ph.D.
Mechanical & Aerospace Engr

Currently available adult prosthetic hands are highly dexterous and able to accurately translate input signals into different grasps, but they are not ideal for use in research because they typically do not provide open access to their control algorithms and raw sensor data. The HANDi Hand was developed by the BLINC Lab at the University of Alberta as an open-source prosthetic hand designed for machine learning and sensory feedback research. However, the HANDi Hand has yet to be benchmarked using standardized object grasping protocols. My project bridges this gap by validating different grasp patterns using the HANDi Hand's sensors and quantifying its grasping ability using the Anthropomorphic Hand Assessment Protocol (AHAP). Preliminary results show that the potentiometers embedded in the hand can accurately measure the position of each finger. This allows us to verify that the fingers are in the correct position or move them to that position when a grasp pattern is performed by the person using the prosthetic.

The Causal Effects of DeFi (Decentralized Finance) on Alleviating Poverty and Promoting Economic Growth in the Developing World

Andy Li
Sponsor: J Taylor, Ph.D.
Ag & Resource Economics

The purpose of my research project is to determine the causal effects of DeFi (decentralized finance) blockchain technology on the eradication of poverty in developing countries and promoting long-term economic growth. This project will analyze real-life examples of various DeFi projects currently being implemented in Latin America, Africa, the Middle East, and South Asia, with a strong focus on countries with a GDP per capita of less than $5000, which fits the UN's definition of a low income or lower-middle income country. In many of these countries, a significant chunk of the local population lack access to traditional financial institutions such as banks or credit unions, and are thus unable to obtain basic lending services that are crucial to underwriting risk and generating economic growth. We will compare these countries' respective economic conditions (GDP, unemployment rate, educational attainment, foreign direct investment, and number of entrepreneurial ventures) before and after the implementation of local and regional DeFi projects to determine if DeFi is an effective and efficient alternative strategy to help impoverished communities access economic opportunity in a globalized world.

Brain region-specific regulation of Cdc42 by the guanine nucleotide exchange factor Ephexin5

William Li
Sponsor: Karen Zito, Ph.D.
Neuro Physio & Behavior

Learning is associated with changes in dendritic spines, the sites of excitatory connections in the brain. Tight regulation of spine growth and elimination are crucial for proper learning and brain function. One protein family implicated in excitatory synapse formation are the Rho GTPases, which are positively regulated by guanine nucleotide exchange factors (GEFs). Ephexin5 (E5) is a GEF that has been shown to interact with both RhoA and Cdc42 GTPases in cell culture. One major unanswered question is which Rho GTPases Ephexin5 regulates in the brain. We hypothesized that Ephexin5 positively regulates Cdc42 in the brain, and that the E5 substrate may be influenced by age and brain region. To test our hypothesis, we immunoprecipitated active Cdc42 from lysate, followed by immunoblotting with α-Cdc42 to characterize differential Cdc42 activation between wild-type and Ephexin5 knockout mice. We previously found that activated Cdc42 levels were significantly lower in E5KO than WT adult whole brain. Intriguingly, our preliminary results in both neonatal and adult hippocampus show no difference in Cdc42 activation levels. Future work will continue analyzing the role of age and brain region in determining differences in Rho GTPase activation.

Synthesis of Copper Oxide and Zinc Oxide Thin Films for Photovoltaics

Jiajun Li
Sponsor: Frank Osterloh, Ph.D.
Chemistry

Here we investigate electrodeposition as a pathway to the synthesis of heterostructured Cu_2O/ZnO thin films for photovoltaic applications. ZnO is an n-type semiconductor with high electron mobility. Cu_2O is a p-type semiconductor with high absorption coefficient and a direct band gap of around 2.1 eV. Cu_2O/ZnO thin films are attractive materials for photovoltaic devices due to their suitable band edge alignments for electron-hole pair separations. The films were studied using UV/vis spectrophotometry and surface photovoltage (SPV), x-ray diffraction (XRD), energy dispersive X-ray spectroscopy (EDX), and scanning electrode microscopy (SEM). XRD confirms the crystalline structure of the films. SEM images illustrate the presence of nanorods and nanopillar morphologies with hexagonal shapes for ZnO. The EDX data proves that a heterostructure of Cu_2O/ZnO was obtained. Band gaps of p-Cu_2O and n-ZnO were measured as 1.9 eV and 3.30 eV respectively. This study demonstrates that electrodeposition is a promising technique to fabricate Cu2O/ZnO thin films.

Light-Enhancement in Catalytic Activities of PLP-Dependent Enzymes

Haocheng Li
Sponsor: Michael Toney, Ph.D.
Chemistry

Pyridoxal 5'-phosphate (PLP)-dependent enzymes represent about 4% of all known enzyme activities. PLP-dependent aspartate aminotransferase (AAT) was previously found to exhibit enhanced catalytic activity with L-Asp upon exposure to blue light. The light enhancement is attributed to the photoinduced deprotonation of Cα-H on the external aldimine intermediate to form the quinonoid intermediate, a partially rate-limiting step in the enzymatic catalysis. This project attempts to understand how general this phenomenon of light-enhanced catalysis is with other PLP-dependent enzymes and their reactions, since they share the similar chemistry. The five enzymatic reactions being explored include AAT with cysteine sulfinate, dialkylglycine decarboxylase (DGD) with aminoisobutyric acid (AIB), DGD with L-Ala, wild-type alanine racemase (AR) with D-Ala, and R219E AR with D-Ala. Steady-state kinetics and stopped-flow kinetics are used to observe catalytic activity increases after exposure to blue light. With the generalization of this light-enhanced kinetics, the conclusion may impact enzyme kinetics in plant biochemistry, animal biochemistry, human medicine, pharmacology, and many related applied fields due to the abundance of PLP-dependent enzymes in nature.

Evaluation of Diverse Compounds for their Potential to Reduce Enteric Methane Using In-Vitro Rumen Fermentation

Zihan Li
Sponsor: Matthias Hess, Ph.D.
Animal Science

Methane is a potent greenhouse gas (GHG) that contributes directly to global warming. Efforts to reduce methane emissions from enteric fermentation of domestic ruminants can be achieved by methane-reducing feed additives. However, many of these feed additives are not sustainable, and there is a renewed effort to identify novel compounds that can be used to achieve the goal of reducing GHG from agriculture. In this respect, in-vitro rumen systems are widely utilized to evaluate the efficacy of potential candidates for their effect on mitigating methane emissions in advance of conducting animal testing. Using a batch-style gas monitoring system, we evaluated the effects of seaweed (*Asparagopsis taxiformis*) on the production of enteric methane, carbon dioxide, and total gas production. At an inclusion rate of 2% dry matter (DM), *A. taxiformis* reduced methane production by up to 93% ($p < 0.0001$) during *in vitro* fermentation. No effect on total carbon dioxide production and total gas production was observed for seaweed. The measured decrease in methane production corresponds to what was measured *in vivo* suggesting that our batch-style gas monitoring system is a viable *in vitro* system that can be used to predict the potential of novel compounds to reduce enteric methane production.

Using Machine Learning to Bring Physical Dynamics Awareness to a Vehicle Cruise Control System

Brian Li
Sponsor: Shima Nazari, Ph.D.
Mechanical & Aerospace Engr

The self-adaptive vehicle cruise control system is a well-known tool used for autopiloting vehicles. It allows vehicles to output and adjust their own acceleration and braking, ensuring the passengers stay safe. With the move toward autonomous road vehicles and the increase in nuance on city streets, the demand for safer, smarter autonomous cruise control systems increases. Our goal is to build a self-adaptive vehicle cruise control system which scans, interprets, and forecasts the ahead objects in its environment. To these ends, we develop an algorithm that constantly measures the speed and position of ahead objects in the environment and outputs a command to control the vehicle speed so as to minimize chances of collision, yet maximize rate. We test our system in simulation, and ensure it meets our needs by simulating different situations with different kinds of vehicles ahead braking with different deceleration rates. We also set a maximum deceleration rate for our control vehicle, and test that our control system can properly identify this shortcoming and appropriately learn to adjust its speed.

Investigation of Two Conventional DO Cell Models

Iris Liang
Sponsor: Mark Goldman, Ph.D.
MED: Eye Center

While color perception is considered crucial for humans and most primates, one class of color-coding cells in the visual cortex – the Double Opponent (DO) cells—is essential for colored edge detection. These cells have also been implicated in color constancy, a phenomenon in which a colored surface appears similar perceptually under distinct lighting conditions. Two divergent models of DO cells, supported by rigorous studies, have been proposed, although there is no consensus as to which model dominates. Our goal in this study is to develop a computational framework to test the predictions made by each model and to investigate why these well-supported models appear disparate. Using the original data from one of these studies that supported one of the models, we have created simulations of the experiment used in this study. Expanding the computational simulations can further explain the seemingly conflicting results observed across different experimental paradigms. Finally, we present results from these simulations that should provide some unification regarding the functional modeling of DO cells in color vision.

Septins and Nuclear Vacuolar Junctions Regulate the Accumulation of Alpha-Synuclein Inclusions via Autophagy

Trina Lim
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

A hallmark of neurodegenerative disease (ND) are deposits of toxic protein aggregates, e.g., alpha synuclein forms inclusions in Parkinson's patients brain samples. Autophagy, the process that targets damaged organelles and protein aggregates for degradation in the vacuole or lysosome, has been proposed to be protective for ND progression. However autophagy's exact role in neurodegenerative disease prevention is unclear. We hypothesize that proteotoxic stress caused by alpha-synuclein expression occurs by damaging membrane organelles that are protected by autophagy and that this response is limited for disease progression. To test this hypothesis, we expressed human alpha-synuclein in budding yeast with mutations either promoting or inhibiting autophagy pathways. Specifically, we examined a septin mutant that the Kaplan lab has shown to allow autophagy to persist and mutants that block autophagy of the ER and nER. We observed that persistent autophagy reduces the levels of a-synuclein, but may "exhaust" autophagy, leading to more inclusions after longer induction. In contrast, loss of ER-phagy results in the dramatic accumulation of aberrant organelle structures. We suggest that there is a balance to the autophagy response to ND driven organelle stress. Next, I aim to identify how autophagy is activated to target toxic structures at the nER.

Pitting foe against foe - Engineering Cyborg Bacteria as antimicrobials

Pin-Ru Lin
Sponsor: Cheemeng Tan, Ph.D.
Biomedical Engineering

Antibiotic resistance of superbugs is a silent pandemic that is worsening and impacting the human population worldwide. But the pipeline of new antibiotics is dwindling, resulting in a shortage of new medicine that can counter antibiotic-resistant superbugs. Here we create Cyborg Bacteria, an engineered non-proliferative bacterium that retains the metabolic activity of a living cell, as antimicrobials against superbugs. We designed the assay based on the inhibition characteristic of *Pseudomonas Aeruginosa*, a pathogenic strain that is antibiotics-resistant and able to survive under various conditions.Cyborg *P. Aeruginosa* 14 and ENVKY2 were applied against *Escherichia coli* DH5a and another antibiotic-resistant pathogen, *Staphylococcus Aureus* MN8. The inhibition zone plate assay indicated that the wildtype *P. Aeruginosa* has an outstanding ability to inhibit the growth of surrounding bacteria. Further liquid competition assay showed that *P.Aeruginosa* inhibited the growth of *E. Coli* DH5a. Based on the promising results, we created Cyborg *P. Aeruginosa* and characterized them through flow cytometry. Our work will open doors to a new class of Cyborg cell therapeutics against drug-resistant microbes.

Low-Cost Microfluidic Device for Single-cell Isolation and Cloning

Derek Lin
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

The Microfluidics Research Team in the BioInnovation Group is developing a low-cost microfluidic chip, known as a single-cell capture (SCC) device, to study heterogeneous cellular populations. We expect this device and methodology to enable the capture, cloning, and analysis of singular cells from heterogeneous populations (cell cultures or tissues) without the use of cell surface markers. The monoclonal cells cultured on chip can then be extracted and studied or used in applications like tissue regeneration. We based our initial device design on examples from literature that used photolithography to create masks for PDMS casting. However, the cost of photolithography limits access to these tools. We propose that common and affordable 3D printing technologies can be used as an alternative to photolithography to create SCC devices that will perform nearly as well as those built using photolithography. Our current device—created with 3D-printed molds—achieves a SCC rate of 35%, comparable to devices created using photolithography (60% capture rate) but at 1/100th the upfront cost. We are currently testing cell culturing, cloning, viability, and function on-device by measuring cell survival and proliferation of various mammalian cell types. We are also working on techniques to optimize and control the growth environment on chip.

Numerical Simulation of Particle Tracks in Detectors

King Lin
Sponsor: Martin Fraas, Ph.D.
Mathematics

In Quantum Mechanics, a direct measurement on a particle's position will inherently collapse its wavefunction and other subsequent measurement on the particle will become uncertain. One way to avoid such uncertainties is to make indirect measurements. In this project, we consider a model of a quantum particle propagating in a cloud chamber in which the ionization of cloud chamber particles will result in an approximate indirect measurement of the position of the particle. In particular, for every interval of time t during the free evolution of the particle as described by the Schrodinger Equation and represented by the unitary operator $exp(-it(P^2+V(x)))$, we will be measuring the particle's position which is represented by the jump operator $V_\xi=(1/(\sigma^2 2\pi))^{1/4})exp(-(X-\xi)^2/(4\sigma^2))$. Specifically in this project, we will be producing a visual representation of the position of the particle to simulate the particle's track. To better understand the particle's track, we first consider the case where the particle is not bound by any potential ($V(x) = 0$), and later the case where the particle is bound by some potential ($V(x) \neq 0$).

Taper Status and Taper Rapidity of Patients Prescribed Long-Term Opiate Therapy with Baseline Alcohol Abuse or Substance Abuse Codes

Cameron Lin
Sponsor: Joshua Fenton, M.D.
MED: Family & Community Med

Chronic pain and long-term opioid prescription abuse are extremely prevalent in the United States. In 2020 alone, more than 16,000 individuals died from overdose due to prescription opioids (WONDER). Since research has shown that rapid discontinuation of opioids is associated with higher risk of suicide and death (Olivia, Hallvik), to help alleviate the burden of the opioid epidemic, it will be especially necessary for physicians to have clearer guidelines on opioid tapering. In this retrospective cohort study, we investigated the insurance claims of a diverse population of deidentified Medicare and Medicare Advantage patients to examine whether alcohol abuse codes or substance abuse codes are correlated with opioid tapers and opioid taper rapidity. We found that for tapers defined as both small and large dose reductions, prior alcohol abuse codes and substance abuse codes were weakly associated with the initiation of a taper. However, when the maximum velocity of these dose reductions was examined, only those with prior alcohol abuse codes were found to have significantly faster tapers and thus may be at higher risk for adverse risks associated with tapering. These findings suggest that patient history may influence prescribers' decisions to initiate tapers and the speed of tapers.

Racial and Ethnic Differences in Infant Diet Quality Predicts Differences in Later Diet Quality

Sarina Lin
Sponsor: Lauren Brinkmeyer, Ph.D.
Nutrition

This study investigated racial/ethnic differences in infant diet quality, later diet quality, and weight status at 2-5 years, and if differences at 2-5 years were explained through infant diet quality among Women, Infants, and Children Program (WIC) participants. Using the WIC Infant and Toddler Feeding Practices Study-2 (n=2,936), the relationship between the Infant Dietary Quality Index (IDQI) and Healthy Eating Index-2015 (HEI-2015) and body mass index z-score (BMIz) at 2-5 years was examined by race/ethnicity. Statistical interaction and mediation analyses between IDQI and each groups were estimated. Racial/ethnic differences in IDQI were observed. Differences were seen in HEI-2015 at 2-5 years with Hispanic-Spanish having higher HEI-2015 scores. Differences in BMIz were observed at 5 years, with Hispanic-Spanish having higher scores. Interaction between race/ethnicity and IDQI was observed for all outcomes except for BMIz at 3 years. For mediation, IDQI explained 22% and 16% of the difference in HEI-2015 scores at 2 and 4 years, respectively, between Hispanic-Spanish and White participants. IDQI explained 26% of the difference in HEI-2015 scores at 5 years between Hispanic-Spanish and Black participants. Racial/ethnic differences in infant diet quality partially explains racial/ethnic differences observed in later diet quality.

A Comparison of Male and Female Childhood Diet at a Middle Period Site in San Jose, CA

Sophia Lindemuth
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

Paleodiet reconstruction gives insight into the social structure of ancient societies, with differences in male and female diets speaking to cultural values and life histories. Thámien Rúmmeytak, CA-SCL-128, is an ancestral Muwekma Ohlone site dating to the Middle Period (ca. 2150-950 cal BP) and Middle to Late Transition Period (950-680 cal BP). In partnership with the Muwekma Ohlone Tribe of the San Francisco Bay Area, this study tests the hypothesis that boys (3-9 years) were training to become effective hunters from an early age, and therefore, had greater access to meat resources than girls at the same age. Because teeth grow in layers and record dietary signatures, analyzing sections of tooth collagen from root to crown provides information about an individual's dietary life history. Carbon and nitrogen isotopes provide information about trophic level, vegetation type (C3 vs. C4 foods), and whether food was sourced from terrestrial or marine environments. Using data from permanent first molars, we will reconstruct sex-specific ancient diets of ancestral Muwekma Ohlone people in order to understand the patterns of diet in early in life.

Change in Depression Symptom Severity From High School to College in Individuals With and Without an ADHD Diagnosis

Kate Linenbach
Sponsor: Shelley Blozis Villarreal, Ph.D.
Psychology

According to researchers, attention deficit/hyperactivity disorder (ADHD) has the potential to negatively affect individuals throughout their lifetimes, particularly during life transitions. However, prior research has been inconclusive as to whether or not ADHD impacts one's ability to transition f3rom high school to college. To contribute to the topic, we chose the National Longitudinal Study of Adolescent to Adult Health (Add Health), which periodically collected data from a representative sample of thousands of adolescents between 1994 and 2018. We selected data from Wave 2, when individuals were in high school, and Wave 3, after they had completed high school. Then, we analyzed the change in Center for Epidemiologic Studies Depression (CES-D) scores of students with and without ADHD from Wave 2 to Wave 3. Using a linear regression model, we compared these data to the CES-D difference scores of students who did not attend college after completing high school. Statistical analysis showed that attending college was significantly linked to decreased severity of depression symptoms, whether or not one was diagnosed with ADHD. More research is necessary to clarify what exactly about college improves the wellbeing of people with and without ADHD.

Dynamic localization of the GTPase RABA1e during cytokinesis in Arabidopsis

Yuchen Liu
Sponsor: Bo Liu, Ph.D.
Ag Plant Biology

RABA1e is one of 57 RAB family GTPase proteins that function as molecular switches to regulate membrane fusion events in Arabidopsis thaliana. During plant cytokinesis, robust vesicle fusion gives rise to the newly formed cell plate. I hypothesized that RABA1e served as a marker of and played a critical role in vesicle fusion during cell plate formation. My first experiment was to isolate homozygous raba1e mutant plants and transform a plasmid which has the expression of a GFP (green fluorescent protein)-RABA1e protein under its native promoter into the raba1e mutant. The GFP-RABA1e was detected in the phragmoplast by a transient assay in a heterologous system prior to being transformed into the raba1e mutant. I have also made expression vectors of the DN (Dominant-Negative) and CA (Constitutively Active) mutant forms of RABA1e by overlapping PCR that will be transformed into the mutant. The resulting transgenic plants will be used for observing the dynamic localization of the three forms of RABA1e in living cells by confocal microscopy. The outcomes will inform me of the dynamics of RABA1e in the phragmoplast and how the GTP-bound (CA) and GDP-bound (DN) forms of the GTPase may be functionally linked to cytokinesis.

Establishment of Mouse Sustentacular Cell Culture

Jiaying Liu
Sponsor: Qizhi Gong, Ph.D.
MED: Cell Biology & Human Anat

Sustentacular (Sus) cells, the cell type spanning the surface of the olfactory epithelium (OE), are known to provide structural support to the olfactory sensory neurons (OSNs). During SARS-CoV-2 infection, Sus cells are the only cell type infected in the OE, not OSNs. While many patients experience olfactory loss, the specific mechanisms by which Sus cell infection results in olfactory neuron dysfunction remain unknown. We hypothesize that as the first responders upon infection, Sus cells communicate with OSNs to induce host shutoff. To identify signals produced by Sus cells upon viral infection, it is necessary to establish an *in vitro* model. The low number of Sus cells in the OE has become a limiting factor. To facilitate the *in vitro* investigation of sustentacular cell signaling, we successfully developed a purification and expansion method. We obtained and dissociated OE from Cyp2g1-rtTA; tetO-GFP transgenic mice after doxycycline induction. GFP-positive sustentacular cells were isolated by fluorescent-activated cell sorting. Collected primary culture was expanded and re-differentiated, and sustentacular cell markers were subsequently validated. Besides its great potential in covid studies, the obtained culture can be a very useful tool to study sustentacular cell properties in general.

Deciphering of Novel Oncogenic Protein Complexes in Lung Cancer Progression

Sebastian Liu
Sponsor: Ching-hsien Chen, Ph.D.
MED: Int Med Nephrology (sac)

Lung cancer is a leading cause of death worldwide, causing over 120,000 deaths every year. Several therapeutic strategies for lung cancer show promising results, but effective treatments remain limited. We identified a therapeutic target, MARCKS (myristoylated alanine-rich c-kinase substrate), which plays an important role in lung cancer progression where phosphorylated MARCKS promotes proliferation, invasion, and tumorigenesis of cancer cells. To further understand the MARCKS regulatory network, we investigated the MARCKS interactome and found several MARCKS-interacting proteins that we identified by using immunoprecipitation and mass spectrometry analysis. Utilizing RNAseq data of Lung Adenocarcinoma patients from TCGA (The Cancer Genome Atlas Program), enabled us to isolate five MARCKS-interacting proteins that showed synergistic effects between MARCKS and patient survival rates. Of the five genes, DDX3X, HNRNPA2B1, and RPL38 function in regulating transcription and translation, while the other two, ALDOA and ERH, are enzymes that play a role within metabolism. Mutations or misregulation of these genes/proteins often results in increased proliferation and tumorigenesis. These results highlight that MARCKS may be a hub of protein regulatory networks in the proliferation and invasion of lung cancer cells, which further supports the concept of MARCKS as a therapeutic target for lung cancer.

Preliminary findings on the housing conditions of backyard ducks

Ryan Lo
Sponsor: Maja Makagon-Stuart, Ph.D.
Animal Science

Many people own backyard ducks, yet little is known about how these birds are housed. We evaluated the living conditions of ducks from photos and videos posted over a 12 month period to four publicly accessible backyard poultry enthusiast subgroups within the social media platform Reddit. We reviewed a total of 697 posts from 265 distinct users. The majority (66.71%) of posts showed ducks in outdoor spaces, and another 10.76% showed ducks as having indoor and outdoor access. Most ducks were housed socially. Ducks were seen with at least one other duck in 56.53% of the posts. When with other animals (15.49% posts), the ducks were typically with chickens, dogs, geese, or cats. Seagulls appeared in 2 posts, and a goat, horse, turkey, and white ibis appeared in 1 post. Ducks had access to swimming water, mainly swimming pools, in 39.17% of the posts, and to coops of various designs in 18.8% of the posts. These results provide initial insight into the types of resources provided to ducks by backyard duck owners. This data will guide future research questions about the housing and welfare of ducks in backyard settings.

Quantifying the Influence of Depth Information and Task on Boundary Transformations in Memory

Trisha Lodha
Sponsor: Joy Geng, Ph.D.
Psychology

Two types of boundary transformation, contraction and extension, are equally likely to occur in memory. In extension, viewers will extrapolate information beyond the edges of the image, whereas in contraction, viewers will forget information near the edges. Recent work suggests that the direction of transformation is dependent on image composition. We also recently found that behavioral tasks like target can significantly influence the type of boundary transformation in memory. Here, participants (N=45) searched for target objects in a rapid serial visual presentation task with 20 distinct scenes taken from 50 distances. A separate group (N=45) were asked just to memorize the images. After viewing the image for only one second, participants were asked to judge whether a viewpoint of the same image was closer or farther in memory. We calculate the distribution of boundary scores by depth, and compare how the task shifts the distributions of memory responses.

Generating an MeCP2-RAG2KO Mouse Model for Rett Syndrome

Alyse Lodigiani
Sponsor: Joseph Anderson, Ph.D.
MED: Int Med Infectious Dis

Rett Syndrome is a rare, X-linked dominant neurological disorder that broadly impacts gross motor movement patterns such as speech, intentional hand use, and coordination. Mutations in the MeCP2 gene, which is responsible for DNA binding, chromatin structure, and transcriptional regulation, causes Rett Syndrome. Because the primary genetic cause has been identified, gene therapy treatments targeting MeCP2 may be developed to treat or cure Rett Syndrome. A normally functioning copy of the MeCP2 gene may be administered to a patient using hematopoietic stem and progenitor cells (HSPC) to recover functional MeCP2 proteins. To evaluate these therapeutic approaches, in vivo models are required to study this potential treatment prior to human clinical trials. To successfully inject and engraft human HSPC into mice, the mouse immune system must be knocked down to prevent the rejection of the new cells. Therefore, in this study, we aimed to generate an immunodeficient mouse model of Rett Syndrome by crossing the disease-specific model with another containing a homozygous knockout of the recombination-activating gene 2 (RAG2) gene.

The Effect of Trauma and Court Participation on Adult Legal Attitudes: A Longitudinal Study

Kara Long
Sponsor: Gail Goodman, Ph.D.
Psychology

Legal attitudes dictate how one engages with the law. Legal attitudes (one's beliefs about the legitimacy and trustworthiness of the law and legal actors) form through the process of legal socialization, as one's life experiences shape one's perspectives and beliefs. Childhood trauma and contact with the U.S. court system are believed to be powerful factors of socialization, yet few studies have addressed their influence on the development of legal attitudes. In this study, I analyzed data from a longitudinal study (N = 100) of suspected child maltreatment victims. Participants had been admitted to a forensic unit for childhood maltreatment investigations and recontacted 20 years later. I examined how ethnicity, childhood maltreatment, trauma-related psychopathology, and court participation relate to positive or negative legal attitudes. A one-way ANOVA, with ethnicity (Black, White, Hispanic/Latinx, and other) as a between-subject factor, revealed no significant differences in legal attitudes. A multiple linear regression examined whether childhood maltreatment, trauma-related psychopathology, and court participation predicted legal attitudes after controlling for Time 1 age, gender, and number of post-forensic unit traumatic experiences. A higher number of post-forensic unit traumatic experiences and more court involvement predicted more negative legal attitudes. Implications for psychology and law are discussed.

Does H2B Mono-ubiquitination Play A Role In Displacement Loop Processing During Homologous Recombination DNA Repair?

Preston Longley
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

DNA wraps around histone proteins to form nucleosomes. It is debated whether nucleosomes act as a barrier to DNA repair proteins during homologous recombination (HR) and/or whether they stabilize certain recombination intermediates, but it is clear that their dynamics are key to successful repair of DNA double strand breaks (DSBs). Post-translational modifications (PTMs) on histone proteins regulate nucleosome dynamics. One such PTM, H2B mono-ubiquitination (H2Bub), has been shown to play a role in the repair of DSBs; however, the underlying mechanism is not yet fully understood. Srs2 helicase and the Sgs1-Top3-Rmi1 helicase topoisomerase complex are also involved in HR repair during disruption of the displacement loop (D-loop). To explore a potential role of H2Bub in D-loop processing during HR, I aim to study the genetic interaction of H2Bub with *SGS1* and *SRS2* in response to DSBs through measuring cell viability after inducing a single DSB. This study will be useful for filling in the knowledge gaps that exist about our cells most vital DNA repair pathway by studying the mechanisms of nucleosome dynamics in D-loop processing during HR repair.

Comparison of Low-Temperature Plasticity Approximations for Subducting Plates

Sophia Loo
Sponsor: Magali Billen, Ph.D.
Earth And Planetary Sciences

Subduction is the geological process by which tectonic plates (slabs) sink beneath an overriding plate and into the mantle driving plate motion and mantle convection. As slabs subduct, they undergo visco-elastic-plastic (VEP) deformation. Lab experiments show that in the cold interior of slabs, deformation is governed by low-temperature plasticity (LTP). Previous studies have approximated LTP with a single yield stress or power-law variation because the LTP flow is difficult to implement directly in numerical codes. Recent attention to LTP in the numerical modeling and rock mechanics communities has led to two new approaches for implementing LTP in subduction models. We use 2D models of a VEP bending beam to systematically test the effects of different LTP implementations using the software ASPECT. In these models, the deformation of the beam is driven by its weight and gravity. We then turn off gravity to model elastic deformation in the beam. By analyzing the deflection and extension of the beam, the stresses and viscosities within the beam, and the rate of deformation, we can compare how different approximations of LTP would affect subduction models. These simple models are key to building the intuition needed to interpret slab deformation in complex subduction models.

Decoding of Letter Representations from Neural Signals

Sebastian Lopez
Sponsor: Steven Luck, Ph.D.
Psychology

Electroencephalogram (EEG) recordings provide neuroscience with essential information about perceptual and cognitive processes. Previous studies explored decoding of neural activity during the delay periods of working memory tasks, using the pattern of EEG voltage on the scalp to "decode" which teardrop orientations measured in degrees are actively held in working memory. The present study uses a similar decoding approach to assess how attention influences the information about simple letters when the visual system is overloaded by fast rates of presentation. We hypothesize that the brain will extract more information from attended sensory inputs than unattended sensory inputs. If that statement is correct, then it is possible to decode which letter the participant is perceiving more accurately when the letter is attended to rather than ignored. Subjects were asked to pay attention to letters drawn in a target color and to press a button when the current target letter had the same shape as the previous target letter. Results show that the average decoding accuracy of the letter identity was greater when the letter was drawn in the attended color than the unattended color, consistent with our hypothesis. These results indicate that attention strengthened the representation of shape information.

Media Framing Immigration Policy From 2016-2021: the Narrative From Mexico to the US and its Interaction With Policy in the US

Jocelyn Lopez
Sponsor: Monica Torreiro-Casal, Ph.D.
Chicano Studies

The well-being of families are negatively impacted by the negative media framing. That is why I want to do research on the media's impact on immigration. The purpose of my research is to identify the media rhetoric that is facilitating or obstructing immigration policy. My study will focus on specific media framing of three immigration policies: Build a Wall, Remain in Mexico and Title 42. The method of analysis that I will be using is discourse analysis to identify the framing of the policies and policy-media interaction outlet. This method will help in seeing how the framing of these policies in the media interacts with the policy put out by the US government. By identifying the themes the media is focusing on, I can uncover the direction policy may be leaning towards. Also dissecting whether the media coverage is trying to be objective, sympathetic or negative towards a certain policy will indicate how the media is constructing the narrative on immigration policy. My research aims to help organizations to take on a positive narrative to help push for better immigration policy that will help immigrants.

The Role of Demographic Variables on Parent-Infant Behaviors During Naturalistic Puzzle Play

Fatima Lopez
Sponsor: Lisa Oakes, M.D.,Ph.D.
Psychology

Over the first year of life, infants come to know an incredible amount about the world around them, and much of this is gained through their daily interactions with their caregivers. Previous work has shown that play provides a deictic context for parents to scaffold the development of infants' sustained, joint attention and language skills. Importantly, these interactions are also influenced by other characteristics of the dyad, such as exposure to multiple languages in the home. In this project, we will analyze a dataset examining parent-infant naturalistic play. Both parents and infants wore head-mounted eye trackers to document the eye-gaze of 53 9-month-old infants (17 females, 36 males) and their parents during a 3-minute puzzle-play task. Infants and their parents were presented with an age-appropriate puzzle. They were instructed to play as they would at home. We coded both parents' and infants' looks to their partner's face, partner's hand, and the puzzle and parents' speech was transcribed. We also collected demographic information, such as the languages spoken in the home, parental education, and infant sex. Our analysis will focus on the impact of these demographics on parental input and visual attention during puzzle play.

Using Yeast, *Kluyveromyces lactis,* to Express Casein Protein for Real Vegan Cheese Production

Emily Lowe
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

We aspire to reduce the environmental impacts of traditional cheese making by exploring cow-free methods to produce milk caseins. These proteins help give cheeses produced from milk distinctive tastes and textures that non-dairy cheese alternatives have yet to replicate. Our research explores the challenge of using the yeast organism *Kluyveromyces lactis* as a more environmentally responsible and economically viable production host for the synthesis of bovine casein proteins in cheese production. We have designed and are building genetic constructs to express the four main subtypes of casein proteins (αs1-casein, αs2-casein, β-casein, and κ-casein) each with and without the presence of alpha mating factor in *K. lactis.* Recent developments include confirming genetic constructs encoding αs1-casein and αs2-casein with Sanger sequencing. Therefore, we are planning our next experiments to test the expression of these genes in *K. lactis* and to evaluate what yield and purity can be achieved in a simple laboratory scale study.

What Microbes are Found in Watermelon Flowers and Seeds?

Kacie Lui
Sponsor: Johan Leveau, Ph.D.
Plant Pathology

Seeds are a vehicle for new plant generations, and they also house unique microenvironments in which microorganisms reside. These seed-associated microbes (e.g.fungi and bacteria) have many impacts on their hosts such as affecting germination, protecting against pathogens and bringing in nutrients from the environment. To learn more about these microbial communities, we studied the flower and seed microbes of commercial watermelon (*Citrullus lanatus*), a popular fruit crop grown near Davis. We sampled anthers, stigmas and seeds from watermelon plants in two commercial fields and isolated microbes from them in culture. Through Sanger sequencing, we are identifying the microbes to discover about their community composition and potential functions. There were more bacteria than fungi on flowers, but fungal diversity was higher. Reisolation frequencies from seeds were very low, suggesting a bottleneck in seed microbial community formation. Based on our sequencing results, we can use these data for future experiments revolving around plant health and microbe-microbe interactions.

Can Infants Learn Dual Language With Overlapping Syllables?

Yushu Luo
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Infants have the ability to learn language through statistical learning mechanisms. Previous research has shown that 16-month-old bilingual infants can use syllable probability patterns to segment individual words from two languages that have overlapping syllables even though the statistical cues underlying the languages conflict. Yet monolingual infants of the same age cannot. Considering that most infants progressively lose the ability to distinguish unfamiliar phoneme contrasts by 12 months of age, it is unknown whether infants' ability to segment two languages with conflicting statistical cues is also related to age. The current study aims to explore whether 9-month-old monolingual and bilingual infants both demonstrate this ability. We will use two artificial languages that include some syllables occurring in both languages. Specifically, ending syllables in one artificial language are beginning syllables in another (L1: "timay"; L2: "mayta"). We will measure infants' listening time to words from a language versus syllable sequences that break the rules of a language. We predict that both 9-month-old monolingual and bilingual infants will be able to segment two languages with overlapping syllables.

Evaluating the role of seizure activity in blood-brain barrier dysfunction caused by acute organophosphate intoxication

Audrey Luo
Sponsor: Pamela Lein, Ph.D.
VM: Molecular Bio Sciences

Acute intoxication with cholinesterase-inhibiting organophosphorus (OP) pesticides can trigger life-threatening seizures associated with chronic neurological complications. Compromised blood-brain barrier (BBB) integrity has been proposed as a pathogenic mechanism linking the acute toxicity of OPs to chronic adverse neurological outcomes. We have shown that acute OP intoxication causes BBB impairment in a rat model; however, whether BBB breakdown is the result of the seizure activity or toxic effects of OPs not related to seizures is unknown. To evaluate the seizure-dependency of BBB impairment post-OP intoxication, we pharmacologically inhibited seizures triggered by acute intoxication with the OP, diisopropylfluorophosphate (DFP). Adult male Sprague-Dawley rats (n=24) were surgically implanted with electroencephalography (EEG) telemetry devices to monitor seizure activity. Animals were administered either vehicle or the anti-seizure compound midazolam (MDZ, 3 mg/kg, s.c.) 30 min prior to DFP exposure (3.75 mg/kg). Brain tissues were collected 1 day post-exposure. EEG analysis confirmed that midazolam pretreatment suppressed DFP-induced seizure activity. Our next steps will be to compare the extent of BBB leakage post-DFP intoxication using serum albumin immunolabeling in animals with and without MDZ pretreatment. This work supported by the UC Davis CounterACT program (U54 NS127758).

Identification of a Threshold Toe Arm Index to Predict Wound Healing in Patients Undergoing Vascular Intervention

Brian Luong
Sponsor: Mimmie Kwong, M.D.
MED: Surgery

The Society for Vascular Surgery (SVS) guidelines recommend use of non-invasive vascular lab evaluation after revascularization for chronic limb threatening ischemia (CLTI). However, the value of toe arm index (TAI) as an indicator of wound healing in patients with CLTI has not been established. A retrospective review was performed of vascular patients with lower extremity wounds that underwent peripheral vascular intervention. Data regarding patient demographics, comorbidities, TAI, and SVS WIfI score were collected. A total of 173 patients (67.7 ± 10.9 years; 71.1% male) were identified with lower extremity wounds. Mean preoperative TAI was 0.21 ± 0.16 and mean SVS WIfI score was 3.02 ± 1.08. The mean postoperative TAI was 0.36 ± 0.20. Sixty-six percent of patients (97) healed within 1 year of revascularization. Patients that healed within 1 year without major amputation had a higher postoperative TAI (0.38 versus 0.30, p=.03). This was similar in the subset of patients with diabetes (0.37 in healed versus 0.28 in non-healed, p=.01). A Youden index identified a TAI value of 0.30 that optimized sensitivity and specificity for wound healing. The TAI value of 0.30 may be a clinically important threshold to identify wound healing potential in patients with CLTI.

Peer Support and Stress in School-Aged Children: Associations With Hair Cortisol

Camille Lussier
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

As they age, children increasingly use peers as sources of social support. Previous studies on the ability of peers to buffer stress levels in children and adolescents have yielded mixed results. Some show that close friendships moderate stress levels, while others found no association. Using data collected from a study conducted in the Greater Sacramento region, we examined the associations between hair cortisol levels and child-reported friendship quality in 148 participants (55.4% girls, M = 9.88 years, SD = 0.55). We hypothesize that positive peer relationships will be associated with lower cortisol levels. To test this hypothesis we will be using linear regressions, controlling for age and sex. Preliminary correlations show a positive yet non-significant correlation between overall friendship quality (r = .16, p = .051) and hair cortisol. A subscale of overall friendship quality, intimate disclosure, did show a significant association (r = .20, p = .015), which remained significant after controlling for age and sex. The positive correlation between intimate disclosure and hair cortisol contradicts our hypothesis of a stress-buffering effect of friendship. We plan to follow up our preliminary analyses by comparing parent and child reports of friendship quality, which will further illuminate potential psychosocial mechanisms at work.

Analyzing the impact of instructional video style on student curiosity and confusion

Alexander Luu
Sponsor: Marina Crowder, Ph.D.
Molecular & Cellular Bio

Students have developed a growing reliance on online educational resources as supplemental material to promote understanding in STEM classes. With many diverse options for delivering content in video form, more needs to be understood about which video styles, structures, lengths, and tones are more effective at engaging students while generating the least amount of confusion. This study aims to identify the impact of different instructional video styles on student engagement and content clarity. Students in a high-enrollment, upper-division genetics course were randomized into groups and surveyed after watching one of three video types on the same scientific content. Responses were collected to two open-ended questions on points of confusion with respect to the videos' presentation, comprehensibility of content, and overall quality. Thematic coding was utilized with a grounded coding theory process to analyze responses that resulted in emergent themes derived from the data. Responses to two questions, with a total of 604 responses, were coded into 22 categories across four emergent themes. The representation of emergent themes across the video styles will help identify video styles that are most effective at generating curiosity and understanding.

Hair We Are! Does the Melanocortin 1 Receptor Play a Role in Coat Color Variations of Salt Marsh Harvest Mice (*Reithrodontomys raviventris*)?

Alexandra Lyon
Sponsor: James Statham, Ph.D.
Veterinary Genetics Lab

The salt marshes of the Greater San Francisco Bay have been steadily fragmented by roadways and urbanization which puts an endemic herbivore, the salt marsh harvest mouse (SMHM, *Reithrodontomys raviventris*), at high risk of extinction. It has been observed that coat color varies across the range of SMHM, and the genetic mechanisms behind this observation have yet to be understood. Our objectives were to identify potential genetic associations with coat color morphology in SMHM. We took specimens, genetically confirmed as SMHM, from three bays in the Greater San Francisco Bay and sequenced the melanocortin 1 receptor (MC1R) gene. The MC1R gene influences coat color in many mammalian species which is why it was chosen for this study. Several association studies were conducted to determine whether polymorphisms in this candidate gene were responsible for coat color while accounting for similarities due to geography. Several polymorphic nucleotide sites were found, including four encoding for amino acid changes, however, geography was a better predictor of the genetic variation than the MC1R gene. More research is needed to determine possible factors outside of this candidate gene that affect coat color, such as the Agouti pigmentation gene or specific environmental conditions.

Nav1.6 is Required in Sensory Neurons for Normal Sensory-motor Circuit Formation in the Spinal Cord

Yanki Ma
Sponsor: Theanne Griffith, Ph.D.
MED: Physiology & Membrane Biol

Proprioceptors are a subpopulation of peripheral sensory neurons that encode muscle movement and force and are essential for coordinated motor behaviors. The mechanosensitive Piezo2 channel is responsible for turning muscle movement into an electrical signal. Following Piezo2 channel opening in proprioceptors, voltage-gated sodium channels (Na_Vs) become active and lead to action potential firing. Therefore, without these channels, action potentials will not generate or propagate. Recently, our lab has discovered that in mice, the $Na_V1.6$ isoform is required in proprioceptors for normal motor behavior. Mice lacking $Na_V1.6$ have severe motor coordination deficits due to loss of action potential firing in proprioceptors. Proprioceptors send axons to the spinal cord where they make synaptic connections with motor neurons. In preliminary experiments, we found that mice lacking $Na_V1.6$ in sensory neurons, including proprioceptors, had reduced clustering of postsynaptic proteins, suggesting that spinal cord circuits in these mice are impaired. My research expands upon these initial findings to determine the extent to which loss $Na_V1.6$ in proprioceptors changes synaptic connectivity between presynaptic proprioceptors and motor neurons in the spinal cord.

Using Yeast, *Kluyveromyces lactis,* to Express Casein Protein for Real Vegan Cheese Production

Kimmie Ma
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

We aspire to reduce the environmental impacts of traditional cheese making by exploring cow-free methods to produce milk caseins. These proteins help give cheeses produced from milk distinctive tastes and textures that non-dairy cheese alternatives have yet to replicate. Our research explores the challenge of using the yeast organism *Kluyveromyces lactis* as a more environmentally responsible and economically viable production host for the synthesis of bovine casein proteins in cheese production. We have designed and are building genetic constructs to express the four main subtypes of casein proteins (αs1-casein, αs2-casein, β-casein, and κ-casein) each with and without the presence of alpha mating factor in *K. lactis*. Recent developments include confirming genetic constructs encoding αs1-casein and αs2-casein with Sanger sequencing. Therefore, we are planning our next experiments to test the expression of these genes in *K. lactis* and to evaluate what yield and purity can be achieved in a simple laboratory scale study.

Effects of Reward and Punishment on Learning Analyzed by Neural Data Informed State-Space Model

Yuting Ma
Sponsor: Shizhe Chen, Ph.D.
Statistics

How the brain learns to make decisions is a longstanding problem in computational neuroscience. New in vivo neural-activity-recording technology such as Neuropixels probes provide opportunities for indispensable insights into this problem. Despite observing big data in neural activities, it is impossible to reveal how the brain actually develops, adjusts, and abandons decision-making strategies during task-specific learning. These strategies are usually characterized as states in hidden Markov models that fit on behavior and stimulus data only. We extend the classic state-space model to include the pre-stimulus neural activities which come in the form of multivariate point processes. We examine the performances of hidden Markov models that utilize discrete and continuous states and expand the inputs by incorporating informative summaries of neural spike trains. Using an Expectation–Maximization algorithm, we fit the proposed model on simulated data. Our methods are further validated through real data analysis from an interleaved perceptual decision-making experiment conducted on mice.

Genetic Association Analysis of Equine Neuroaxonal Dystrophy

Lyra Ma
Sponsor: Carrie Finno, D.V.M.,Ph.D.
VM: Population Hlth & Reprod

Equine neuroaxonal dystrophy (eNAD) is an inherited neurodegeneration disease in horses, associated with a vitamin E deficiency early in life and commonly occurs without access to green pasture. Our lab is investigating genetic components responsible for developing eNAD. Altogether 103 Quarter Horses were studied by genome-wide association studies (GWAS), including 39 eNAD-affected and 64 controls. Data analysis was performed using PLINK 1.9, a whole genome analysis command line program. A total of 30 variants were found in 28 vitamin E candidate genes associated with eNAD as well as involved in vitamin E absorption, transport, and metabolism. Among them, two single nucleotide polymorphisms (SNPs) in chromosome 4; chr4_731082 and chr4_726485, which reside within the gene *CD36*, are the strongest candidate genetic variants. The protein encoded by *CD36* is one of the glycoproteins and serves as a membrane receptor in various cell lines related to the transfer and metabolism of Vitamin E. Vitamin E also affects and regulates the expression of *CD36*. In the future, reverse-transcriptase quantitative polymerase chain reaction (RT-qPCR) will be performed to justify the specific regulatory functions of these two SNPs on eNAD, which could lead to the develop a genetic test for the disease.

The Effects of Temperature on Delta Smelt Embryo Development

Cecilia Ma Li
Sponsor: Bruce Hammock, Ph.D.
VM: Anat Physio & Cell Biology

Climate change and human activities have altered the life stages of Delta Smelt. Delta Smelt (*Hypomesus transpacificus*) is an endangered indicator species endemic to the San Francisco Estuary. An indicator species is a sensitive organism that reflects changes in their environment. Delta Smelt feeds on zooplankton and provides food for many vertebrates. We can help restore Delta Smelt population through understanding extinction factors. Delta Smelt has specific habitat requirements including temperature, pH level, and salinity. Larval recruitment is crucial for population health. To hatch the eggs and keep the larvae healthy, we need to determine the optimal hatching environment. We will investigate the physiological tolerance of Delta Smelt to different temperatures by holding embryos at four temperatures (10°C, 14°C, 18°C, and 20°C) and analyzing the hatching process. We hypothesize that embryos treated at higher temperatures will have smaller hatching size compared to embryos treated at lower temperatures. Higher temperature embryos need more energy, thus reducing growth and larval survival. We will also examine the embryo survival rate, the lengths of hatched larvae, the yolk sac size of hatched embryos, and the weights of embryos. Findings can improve Delta smelt conservation and broaden understanding of estuary impacts from anthropomorphic activity.

Early Home Literacy Practices and Expressive Vocabulary on English Reading Skills in Elementary Years: A Longitudinal Study on Mexican-American and Chinese-American Dual Language Learners

Katrina Mabalot
Sponsor: Yuuko Tonkovich, Ph.D.
Education

Research shows that positive home literacy environments in early childhood can predict reading skills in later years for monolingual children. However, few studies have examined the longitudinal relations between early language and home environments and later reading skills among dual language learners (DLLs). Considering the importance of reading in academic success, more studies should explore the roles of early language and home environments. This study investigates the relationships between 42 DLLs' (30 Chinese-American, 12 Mexican-American) home literacy practices and vocabulary skills in preschool and their later reading skills in the early elementary years. Home literacy practices were collected from a parent-reported questionnaire about the frequency of storytelling, reading, and help with learning in both English and heritage language (HL). DLLs' vocabulary skills were measured using the Picture Vocabulary subtest of the Woodcock-Johnson IV. DLLs' reading skills were assessed using the Gray Oral Reading Tests. Preliminary results suggest that preschool English expressive vocabulary and HL exposure support later English reading skills. Home literacy practices in both English and HL are positively associated with later English reading proficiency. This study supports the use of both English and HL at home, leaving further implications for parents and teachers of DLLs.

The Influence of Parent Pitch on Infant Vocabulary Size

Sabrina Macias
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Adults use a specific speaking style when speaking with infants. Infant-directed speech (IDS) often has a high pitch and a broader pitch range than speech directed to adults (e.g., Fernald et al., 1989).Parents might tend to place an emphasis on raising their pitch to support the children's processing of new words (e.g., Ma et al., 2011). This change in pitch may promote speech processing for word learning and support vocabulary development (Kalashnikova, 2018). This investigates the role of pitch in language acquisition. Is parent pitch in infant directed speech related to infants' vocabulary size? By testing 8- to 10- and 18- to 20-month-old English learners and their parents, we measure how parents talk to their infants versus other adults. We examine the characteristics of IDS while parents introduce a set of words during play-based interactions and compare these characteristics to the same words produced in adult-directed speech collected while parents interacted with an experimenter. Because pitch may affect infant attention and learning, we predict that parents who have a higher pitch in IDS may have infants with larger vocabularies than parents with lower pitch in IDS.

The Relationship Between Callose and Cellulose Synthase During Cytokinesis

Hoang Tuan Mai
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

During cytokinesis in plants, the cell plate forms dividing the parent cell into two identical cells, facilitating plant development. In this process, the cell plate forms, expands, and matures through a combination of vesicle delivery, fusion and membrane transformation stages. Two polysaccharides, callose and cellulose, are considered to play important roles during the maturation of the cell plate membrane. The synthesis of callose during cytokinesis is proposed to be mediated by GSL8, one of the twelve members of glucan synthase-like proteins in Arabidopsis. The homozygous *gsl8* mutant plants show abnormal growth phenotypes including dwarfism, irregularly formed cotyledons, and seedling lethality. In this study, the Ypet - GSL8 fusion is used to complement the *gsl8* mutant in an effort to restore the function of the mutant gene to that of the wild-type, while additionally exploring the relationship between callose and cellulose synthase at the cell plate. Characterization of the transgenic line will be presented along with the callose and cellulose localization patterns.

Investigating the Potential of the Complex Coacervation Spray Drying Process (CoCo Process) to Control the Release of Mosquito Repellants into the Atmosphere

Emily Makeev
Sponsor: Tina Jeoh, Ph.D.
Biological & Ag Engineering

The Complex Coacervation (CoCo) spray drying process is a cost-effective, scalable, and biodegradable microencapsulation method. The CoCo process achieves *in situ* complex coacervation between alginate and gelatin and forming dry, insoluble matrix capsules in a single step. Studying the release of volatile compounds from CoCo microcapsules can determine the potential of the CoCo process to facilitate controlled delivery of mosquito repellants into the atmosphere. Limonene is used as a model volatile compound and its release into the air from different formulations of CoCo is studied, building off previous research which has studied CoCo release into aqueous environments and sought to maximize retention of volatile compounds. It is hypothesized that incorporating ethylcellulose latex into the formulation will drive more limonene to the surface of the microcapsules, thus accelerating its release. This is studied by imaging CoCo by scanning electron microscopy, and by gas chromatographic analysis of limonene content of CoCo over time to track its release. By studying the release of limonene from different formulations of CoCo and their respective morphologies, the potential to engineer CoCo to control release rates of mosquito repellants into the atmosphere is investigated.

Low-Cost Microfluidic Device for Single-Cell Isolation and Cloning

Meera Mallya
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

The Microfluidics Research Team in the BioInnovation Group is developing a low-cost microfluidic chip, known as a single-cell capture (SCC) device, to study heterogeneous cellular populations. We expect this device and methodology to enable the capture, cloning, and analysis of singular cells from heterogeneous populations (cell cultures or tissues) without the use of cell surface markers. The monoclonal cells cultured on chip can then be extracted and studied or used in applications like tissue regeneration. We based our initial device design on examples from literature that used photolithography to create masks for PDMS casting. However, the cost of photolithography limits access to these tools. We propose that common and affordable 3D printing technologies can be used as an alternative to photolithography to create SCC devices that will perform nearly as well as those built using photolithography. Our current device–created with 3D-printed molds–achieves a SCC rate of 35%, comparable to devices created using photolithography (60% capture rate) but at 1/100th the upfront cost. We are currently testing cell culturing, cloning, viability, and function on-device by measuring cell survival and proliferation of various mammalian cell types. We are also working on techniques to optimize and control the growth environment on chip.

How Sample Characteristics in Scientific Paper Titles Influence Readers' Judgments

Mavleen Mann
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Current publication practices within psychology are biased to favor dominant over marginalized samples in the publication process. For example, studies coming from White and western countries are more likely to be published in high-ranking journals compared to those from the rest of the world. The field's tendency to prioritize research conducted with dominant group samples can have detrimental effects, such as neglecting meaningful research and driving the assumption that the psychological experience of a very narrow set of people generalizes to all humans. In response to this problem, some psychology journals are beginning to require authors to specify sample characteristics in their titles. However, in the absence of empirical evidence on how this information affects readers, it is difficult to design effective policies. Our study aims to assess how people from various backgrounds might react to literature titles that include different types of sample characteristics. Participants will see three study titles: (1) a control title with no sample characteristics, (2) a dominant sample title (e.g., "among White participants"), and (3) a marginalized sample title (e.g., "among participants of color"). For each title, they will assess how interesting, important, and applicable they find each study.

Identification of Novel Inversions in Teosinte Subspecies

Sowmya Mambakkam
Sponsor: Jeffrey Ross Ibarra, Ph.D.
Evolution & Ecology

When broken chromosomes are repaired, pieces are occasionally inserted in reversed orientation. These "backwards" segments are known as inversions, and suppress normal recombination. This lack of recombination can create "supergenes", or sets of linked alleles inherited together during meiosis. Inversion supergenes have been identified as playing an important role in adaptation in a diversity of organisms. A number of large inversions have been identified in maize and its wild relative teosinte, but the broader methods used to identify these do not always pick up on smaller inversions. This project utilizes genome-wide genotype data to map diversity across each megabase of the genome. Inversions appear on principal component graphs as a distinctive pattern of three clusters, consisting of individuals homozygous for the inversion, individuals heterozygous for the inversion, and homozygotes without any copy of the inversion. Initial PCA graphs reveal at least 50 inversions that were not part of the large, well-known ones previously identified on chromosomes 1, 4, and 9. Though most of these appear to segregate broadly in teosinte, we also identify several that differ in frequency between subspecies of teosinte, suggesting that these inversions have a role to play in adaptive divergence between subspecies.

The Link Between Women's Agricultural Empowerment and Political Inclusion in Latin America

Jennifer Manseau
Sponsor: Mccage Griffiths, Ph.D.
Political Science

Women make up the majority of agricultural workers worldwide but are often the least empowered individuals in their community. As a result, their political involvement suffers. This has ramifications on women's lives and the manner in which policy is conducted. As such, it is crucial to study linkages between women's empowerment, agriculture, and politics. This research will focus primarily on Latin America as a case study for effective factors of female empowerment. Found and explored connections can then be used as evidence regarding the importance of women's involvement in agriculture and politics. Conducted in a comparative manner, this research will lay emphasis on analysis of proposed and applied policy pertaining to female empowerment, illustrate the roles assigned to women in politics and in agriculture, and focus on involvement or lack thereof in the preexisting contexts. Viewed through a feminist perspective, this work will operate through the confines of behaviouralism, radical choice theory, and institutionalism which will clearly illustrate the issue and connect the research being conducted to relevant prior research. The ultimate goal, to fill in gaps pertaining to the ties between Latin American women's agricultural and political empowerment which will help provide proposed solutions to the issue at hand.

Wearable, Gaze-Directed Beamforming to Improve Speech Comprehension

Aman Manvattira Ganapathy
Sponsor: Lee Miller, Ph.D.
MED: Otolaryngology

Conventional hearing aids treat loss of hearing sensitivity; however, they also amplify all sources of sound in the environment, including noise, thus failing to address the fundamental issue. Solving this problem would ameliorate a continual, daily challenge faced by millions of Americans and would represent a profound technological advance in the field. By measuring the eye gaze of the wearer and using it as an indicator of what source of sound to amplify, we generate a facsimile of the human capability for selective amplification. This amplification can be handled through "beamforming", that is, organizing the sound into beams and then enhancing or reducing the individual components based on whether they are aligned with the eye gaze. While beamforming to enhance sound has been explored before, the scope has often been limited either by the number of microphones or by the context in which it has been used. Our development of these processes is inspired by the existing literature but will utilize more sophisticated tools and finely tuned constraints to build a system that is suitable for everyday use by individuals with hearing loss.

Bird Banding Project: Bird Band Inventory Management and Reporting Trends

April Ann Angela Maravilla
Sponsor: Kyra Mills, M.A.
VM: Wildlife Health Center

Bird banding is a technique of collecting data on individual birds. Information received by band reporting is useful in scientific research, management, and conservation projects. Federally marked bands are placed on the legs of birds by permit holders and provide a means of individualized identification. If anyone encounters a bird with a band, they can report the location, time, and any notes of the encounter and the bander will be notified. While there is scientific literature that uses banding data, there is no literature showing band reporting trends and a lack of literature illustrating the process of banding and band organization. This project aims to reveal bird band reporting trends as well as provide insight on bird band inventory management and upkeep. In addition to highlighting the importance and uses of bird banding data, I intend on creating an adaptable and transportable inventory management system for federal bird bands as well as conduct data analysis of bird band reporting trends using the North American Bird Banding Program Dataset. Results from the analysis may provide insight on where reporting can be improved and/or where reporting has been most successful.

Study Abroad gap, do Students From Different Ethnicities Have the Same Motivations to Study Abroad? A Case Study Method: Semester at Sea Fall 2022

Celia Mares de Juan
Sponsor: Jacob Hibel, Ph.D.
Sociology

Participation of students of color in study abroad has not increased as much as the participation of white students over the past years (Salisburry, 2011). Previous research suggests that money is not the only factor that affects students of color not studying abroad. Social capital and networks play a big role in the decision of studying abroad. Most research done related to minorities going abroad asks the question why minority students do not go abroad (Perkins 2020). This research will use an anti-deficit orientation asking why students decide to study abroad and Yosso's community cultural wealth model as a guiding framework to analyze the fifteen different qualitative interviews conducted to a diverse group of students that participated in the Fall 2022 Semester at Sea study abroad program. By identifying different motivations associated with students' ethnic and racial backgrounds, findings from this study can help inform and diversify study abroad programs like Semester at Sea as they develop more inclusive recruitment and curriculum practices.

53BP1 Regulation by ATM in the *C. elegans* Germline

Ayton Marzal
Sponsor: Joanne Engebrecht, Ph.D.
Molecular & Cellular Bio

53BP1 is a tumor suppressor involved in cell cycle checkpoints and DNA repair pathways. Thus, mutation of 53BP1 promotes cancer. However, how 53BP1 is regulated and why mutation of 53BP1 leads to cancer is not completely understood. To address these questions, we are analyzing the *C. elegans* 53BP1 ortholog, HSR-9. *hsr-9* mutants display defects in processing of recombination intermediates in the germ line, suggesting that HSR-9 functions in DNA repair pathways. The HSR-9 protein has a similar domain structure and is extensively phosphorylated like human 53BP1. We are examining HSR-9 localization using a GFP::HSR-9 fusion. Preliminary data suggest that HSR-9 is associated with chromatin. We are currently performing nuclear spreads to examine localization using high-resolution microscopy. To determine the role of HSR-9 phosphorylation, we are examining GFP::HSR-9 in *atm-1* mutants. ATM-1 is a serine/threonine kinase and an ortholog of human ATM that phosphorylates 53BP1. When ATM is mutated, gastrointestinal cancer and lung carcinoma can emerge. Phosphorylation of HSR-9 by ATM-1 could potentially change its localization. Thus, we are tracking localization of HSR-9 visually and quantitatively through GFP fluorescence and western blots in the presence and absence of ATM-1. Consequently, we hope to reveal whether ATM regulates HSR-9 localization and function.

Characterization of Novel Genes Associated with the Regulation of NAD+ Metabolism in the Model System *Saccharomyces cerevisiae*

Matilda Mcdaniel
Sponsor: Su-ju Lin, Ph.D.
Microbiology & Molec Genetics

Nicotinamide adenine dinucleotide (NAD^+) is an essential metabolic cofactor involved in redox reactions, cellular signaling, and regulation. Abnormal levels of NAD^+ and its precursors have been shown to play a role in several age-related human disorders, therefore, these metabolites are an emerging therapeutic target to mitigate cellular damage. However, due to the complexity of its metabolic pathways, NAD^+ synthesis and regulation are not well understood. Our preliminary NAD^+ precursor-specific genetic screen using *Saccharomyces cerevisiae* as a model organism highlighted multiple genes that impact NAD^+ intermediate homeostasis. A secondary screening to validate the resultant phenotypes is ongoing. As an example, the overexpression of *BNA1*, a dioxygenase that functions in the *de novo* biosynthesis pathway of the precursor quinolinic acid (QA), showed an unexpected notable release of nicotinic acid/nicotinamide (NA/NAM) intermediates, though only increased levels of QA were expected. As increased levels of NA/NAM release have been correlated with mitochondrial dysfunction and increased autophagy in some of our yeast mutants, our studies can help understand the mechanisms of the regulation of NAD^+ metabolism and aid in the development of therapeutic strategies for metabolic disorders related to abnormalities in NAD^+ metabolism.

EEG Investigation to Evaluate Multi-level Processing of Language in Ecologically Relevant Conditions

Jillian McKie
Sponsor: Lee Miller, Ph.D.
MED: Otolaryngology

The neural mechanisms responsible for listening to language in a noisy environment are poorly understood. Our current EEG findings are from a larger three-part study to better quantify listening ability. Participants listen to a story with chirp speech ("Cheech"). This allows us to examine neural activity at multiple time scales. Participants report "color" words in the target story. The two condition types are a "single speaker" playing a target story and a "dual speaker" playing a target and distractor story concurrently. We observed significant EEG component differences at peak amplitudes after chirp onset of "color" words for the single talker compared to the dual talker conditions. In auditory brainstem responses (ABR), reflecting the early encoding of sound, we observed more negative peaks before and after Wave V. The Middle Latency Responses (MLR), which corresponds with the transmission of speech information from lower to higher levels of processing, exhibited a more negative Na component. The Late Latency Responses (LLR), historically associated with higher cognitive processes, showed a more positive Pb component peak amplitude. These multilevel component amplitude differences could be indicative of additional cognitive demand of listening to speech with noise, when compared to listening with no distractions.

Using Ecological Monitoring to Assess Restoration Goals at the UC Davis Putah Creek Riparian Reserve

Christa Mclellan
Sponsor: Valerie Eviner, Ph.D.
Plant Sciences

A major challenge in restoration is managing for multiple goals. Monitoring plays a critical role in determining the feasibility of meeting these goals. There is particular interest in assessing whether ecological goals can be provided by small strips of wildland between agricultural patches. We determined the ecological services and challenges provided by a plot of land owned by the Putah Creek Riparian Reserve, which has the long-term goals of increasing biodiversity and ecosystem functionality. We focused on three aspects of the habitat: the vegetation composition, soil and water quality, and wildlife presence. We found the site had minimal vegetative structural diversity, and was dominated by non-native flora, indicating a loss in potential biodiversity. Our water testing revealed coliform contamination, which potentially runs off into Putah Creek. We recommend increasing the presence of riparian and wetland herbaceous species that will improve biodiversity and provide the ecosystem service of water filtration. There were frequent sightings of large mammals, suggesting that small strips of natural lands in an agricultural landscape can be critical for wildlife. Further restoration of plant structural diversity could encourage wildlife use. By utilizing our monitoring results, the Reserve can make informed decisions for the restoration of this site.

Clinical Presentation Influences Examiner Confidence in Autism Spectrum Disorder Diagnoses

Emma McNeilly
Sponsor: Meghan Miller, Ph.D.
MED: Psychiatry & Behav Sci

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that begins to show symptoms such as communication and social interaction difficulties and repetitive behaviors within the first few years of life. ASD diagnoses rely on the clinical judgment and confidence of the examiner, which may be heavily influenced by the clinical presentation of the child. Confident, accurate, and early diagnoses are critical because early behavioral interventions have been associated with long-term improvement of ASD symptoms. The purpose of this study is to determine how the characteristics and clinical presentation of 50 children with ASD, each evaluated at 6 or 9, 12, 18, 24, and 36 months of age, affected the examiner's level of confidence in their diagnosis. Examiners were more confident about diagnoses in younger children, those with lower developmental scores, those with higher levels of autism symptoms as measured by the Autism Diagnostic Observation Schedule, and those with higher scores on the "Withdrawn" subscale on the Child Behavior Checklist. Examiners' confidence ratings did not, however, differ based on race, ethnicity, gender, and socioeconomic status. These findings will help to improve the diagnostic pathways for early detection of ASD by better understanding the clinical characteristics of children that influence examiner confidence ratings.

The Influence of Family Environment and Parent Emotionality on Infant Emotional Regulation

Melany Medina
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Research suggests that parental emotionality and family environment play an important role in infants' emotional development. However, the combined effect of family environment and parental emotionality on infants' emotion regulation remains understudied. The current study aims to address this gap by investigating how these two factors influence infants' emotion regulation. 56 3- to 5-month-old infants and their mothers participated in a dyadic interaction task assessing mothers' natural emotionality. Mothers also filled out questionnaires that assessed family environment via Confusion and Hubbub and Order Scale and the Experiences in Close Relationships Revised Scale, parental emotionality using Difficulties in Emotion Regulation Scale and the Emotion Reactivity Scale, and infant emotional regulation via the Infant Behavioral Questionnaire. Data analyses are underway. We hypothesize that family environment is positively associated with parental emotionality which in turn influences infants' emotional regulation. The results of the study will elucidate the relation between family environment and parental emotionality and their influence on infant emotion regulation which brings a more nuanced and holistic view into understanding infant emotional development.

The Impact of a Cultural Burn on the Species Composition of a California Grassland

Isabel Mendoza
Sponsor: Valerie Eviner, Ph.D.
Plant Sciences

Historically, Indigenous groups of California were stewards of the land. Grasslands in particular were integral to the prosperity of Central Valley tribes. Traditional ecological knowledge emphasized the importance of a fire regime to maintain the land. Fire suppression in the last century has allowed for the prosperity of non-native species. I assessed the impact of no management, cultural burning, grazing in a California oak savanna and grassland located in Woodland, California at the Cache Creek Conservancy. The primary purpose of the cultural burn was to clear out non-native vetch from the land and clear out thatch buildup. I assessed 12 pairs of plots total, with each treatment having 8 plots total, 6 experimental plots and 2 control plots. Half of the plots were seeded with a mix of species post-burn to compare the species composition between seeded and non-seeded plots. Data is still being collected, but I hypothesize that cultural burns result in a higher diversity of plants and a lower abundance of non-native species, especially in seeded plots, compared to plots with no management. Grazing would likely enhance species diversity, but may not alter the prevalence of non-native species.

Using Ecological Monitoring to Assess Restoration Goals at the UC Davis Putah Creek Riparian Reserve

Allison Menelli
Sponsor: Valerie Eviner, Ph.D.
Plant Sciences

A major challenge in restoration is managing for multiple goals. Monitoring plays a critical role in determining the feasibility of meeting these goals. There is particular interest in assessing whether ecological goals can be provided by small strips of wildland between agricultural patches. We determined the ecological services and challenges provided by a plot of land owned by the Putah Creek Riparian Reserve, which has the long-term goals of increasing biodiversity and ecosystem functionality. We focused on three aspects of the habitat: the vegetation composition, soil and water quality, and wildlife presence. We found the site had minimal vegetative structural diversity, and was dominated by non-native flora, indicating a loss in potential biodiversity. Our water testing revealed coliform contamination, which potentially runs off into Putah Creek. We recommend increasing the presence of riparian and wetland herbaceous species that will improve biodiversity and provide the ecosystem service of water filtration. There were frequent sightings of large mammals, suggesting that small strips of natural lands in an agricultural landscape can be critical for wildlife. Further restoration of plant structural diversity could encourage wildlife use. By utilizing our monitoring results, the Reserve can make informed decisions for the restoration of this site.

Regulation of daily activity rhythm, sleep, and immune response by S-palmitoylation.

Yu-Ping Meng
Sponsor: Joanna Chiu, Ph.D.
Entomology/Nematology

Overconsumption of saturated fatty acid increases the risk of diseases including metabolic disorders and cancer, but the molecular mechanisms underlying the role of lipids in disease pathogenesis are still under investigation. S-palmitoylation is a post-translational modification whereby palmitic acid, a 16-carbon saturated fatty acid, is attached to substrate proteins. S-palmitoylation increases protein hydrophobicity and alters protein subcellular localization, activity and/or interaction with other molecules. I hypothesize that altering the cellular status of S-palmitoylation and disruption of biological processes that are regulated by S-palmitoylation can affect human healthspan. Using *Drosophila* as an animal model, this project aims to investigate the role of palmitoylation in daily activity and sleep behaviors as well as immunity, biological processes that are critical to animal healthspan. I will generate transgenic fly lines with altered expression level of enzymes that modulate S-palmitoylation levels. I will then subject these flies to behavioral assays to measure activity rhythm and sleep-wake cycles as well as bacterial challenge to evaluate the efficacy of their immune responses. My results will improve our understanding of palmitoylation as a potential mechanism by which saturated lipids contribute to metabolic diseases and shed light on the deleterious effect of the common high-fat diet in modern society.

Thermal Characterization and Modeling of a CubeSat in Low Earth Orbit

Angel Meza Terriquez
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

The Space and Satellite Systems (SSS) club's REALOP mission is to create a 2U CubeSat which is designed to deploy out of the ISS. As a sub-department of SSS, Structures Thermal Analysis' (STA) goal is to simulate the thermal environment of a transient orbit around the Earth to verify CubeSat nominal temperatures. To create the simulations, STA utilizes Thermal Desktop to build a thermal model of the CubeSat. These simulations will help determine which components aboard the CubeSat need to be adjusted or reinforced thermally. The software CES Edupack is used to gather optical and thermophysical properties required to fully detail the CubeSat model. STA is in the process of modeling the entire structure with internal components to understand the temperature changes the CubeSat will undergo as it is exposed to the extreme space environment. This will showcase the effects of radiation on the external faces of the structural frame, as well as internal heat transfer between the inner components/faces of the frame. The overall goal of the STA team is to ensure the CubeSat stays thermally safe throughout its operational lifespan.

Contributions of Spontaneous and Explicit Mental-State Reasoning to Theory of Mind in Middle-Childhood

Hannah Min
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Decades of research have studied advances in children's social understanding from age 3- to 5-years-old, when children undergo rapid developments in their understanding that our own and others' minds guide behavior in the social world – commonly referred to as "theory of mind". Specifically, children transition from thinking others share the same knowledge, thoughts, and desires (i.e., "mental states") as themselves, to understanding that each person has their own unique mind. However, there remain questions about 1) What social skills in toddlerhood support social developments later in childhood, and 2) How to characterize the trajectory of mental state understanding across childhood? For example, there is some evidence that social understanding may not develop linearly across childhood, and there are open questions about how and whether early social understanding (e.g., sharing visual perspectives) relates to later social understanding (e.g., emotion understanding). The present study addresses these questions using a longitudinal design in which children's social understanding were assessed when children were 2-years-old (N = 214), 3-years-old (N = 159), and 6-years-old (N = 96). The present study focuses on how both eye-gaze and verbal measures of social competency at 2- and 3-years-old relate to social understanding as children at 6-years-old.

The Portrayal of Arabs in the New York Times during the 1940s

Ali Misleh
Sponsor: Suad Joseph, M.D.,Ph.D.
Anthropology

I researched and analyzed the use of the term "Arab" in the New York Times on ProQuest from 1940-1949 by filtering for articles, editorials, and front-page articles. After screening 60 articles, of which 7 were relevant, I found patterns of Arabs being stereotyped, overgeneralized, and misrepresented as uncivilized, irrational, and violent. Little distinction was made among different types of Arab groups, cultures, and identities. Additionally, Arabs were rarely consulted in the articles for their own opinions or identities. A close look into how Arab people were represented during this period is crucial because many Arab countries won independence. Therefore, this representation may have influenced how the rest of the world views newly formed independent nations in the Middle East. The study of the usage of the term "Arab" in the media is vital in understanding how Arabs were represented during this period in the context of western interest in World War II. This is part of a long-term analysis from 1850 to the present of the NYT from the Suad Joseph Lab. The project analyzes the representation of Islam and Muslims in over a 150-year period.

Differentially Private Provable Repair of Deep Neural Networks

Jacqueline Mitchell
Sponsor: Aditya Thakur, Ph.D.
Engr Computer Science

Deep Neural Networks (DNNs) are increasingly important pieces of software, having become ubiquitous in various sensitive, safety critical applications. Just like any other pieces of software, DNNs are susceptible to bugs, motivating the provable repair problem of DNNs. However, the data used in provable repair may be highly sensitive, such as in loan approval systems or recidivism prediction. To enforce the privacy of such data during repair, we propose the differentially private provable repair (DP-PR) problem. The DP-PR problem requires the satisfaction of the following two desiderata: (1) the repair is correct w.r.t. to the original repair specification (2) the repair process satisfies a notion of differential privacy. In this work, we (i) formalize the provable repair problem, (ii) provide (and motivate) two locally-differentially private mechanisms for DP-PR, (iii) provide an empirical evaluation of our method. The goal of our work is to establish a proof of concept that provable repair satisfying a notion of differential privacy is possible.

A Biochemical Analysis of MAP1B

Barbara Mitchell
Sponsor: Kassandra Ori-Mckenney, Ph.D.
Molecular & Cellular Bio

The microtubule-associated protein (MAP), MAP1B, is generally linked with development of the nervous system, and microtubule polymerization. Furthermore, MAP1B interactions are associated with neurodegenerative disorders such as Parkinson's, Alzheimer's, and giant axonal neuropathy. However, much of the functions of MAP1B on a molecular level are still unknown. MAP1B is translated as a single polypeptide chain, then proteolytically cleaved into a heavy chain (HC) and a light chain (LC). In this study, we cloned multiple truncation constructs via Gibson Assembly to analyze the behaviors of the different chains. These constructs were then expressed using either bacterial or insect cell expression systems using BL21 or SF9 cells, respectively, and purified with ion exchange chromatography. In order to analyze how these respective chains interact with the microtubule lattice, in vitro methods such as total internal reflection fluorescence microscopy (TIRF) were used to visualize these interactions. In summary, we offer a biochemical investigation of the MAP1B gene in order to elucidate its function in the nervous system.

Egypt's Representation in the *New York Times* During the 1960s

Aaminah Mohammad
Sponsor: Suad Joseph, Ph.D.
Anthropology

This paper analyzes the representation of Egypt and Egyptians in articles published in the *New York Times* between 1960-1969. As the leading newspaper in the United States, and perhaps the world, the NYT plays a key role in influencing the perceptions of the general public. Following the aftermath of Egypt's war with Israel in 1948 and the overthrow of King Farouk 1952, this period in Egyptian history under the leadership of President Nasser is marked by the nationalization of the Suez Canal, the 1967 Arab-Israeli War, and the annexation of Gaza by Egypt and the Republic of Syria. In the context of this global atmosphere, the NYT had a pattern of portraying Egyptians as the aggressors during the 1967 war. At times they are described as backwards and barbaric. By the time of the presentation, I will have screened 300 articles of which one-third is estimated to contain relevancy to representation based on the data of previous interns. This paper is part of a long term analysis from 1850 to the present of the NYT from the Suad Joseph lab. The project analyzes the representation of Islam and Muslims over a 150-year period.

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Social Networks can Help Developing Countries Improve Their Health Information by Using Evidence From the BAANG Platform in Pakistan

Mohammed Mohammed
Sponsor: Arman Rezaee, Ph.D.
Economics

Governments and NGOs are increasingly leveraging social media to share important health information. Sharing public health information on social media is particularly valuable in developing countries with poor quality of health information systems, such as Pakistan. The BAANG social network allows users in rural Pakistan a potential medium for sharing health information by allowing users to call in, record audio posts, and listen to posts. Preliminary analysis of the BAANG data suggests that usage patterns vary remarkably across users - some call in once while others post frequently. This study will determine if users decide to stay on BAANG due to increased engagement: 1) quality engagement based on post quality, and 2) random engagement based on the time users post. By analyzing post quality ratings and the time of each post, we will determine whether quality engagement or random engagement directly correlates with user post activity. This hypothesis will be tested using data from 6000 users on the platform during the period of early COVID-19 information dissemination. We hypothesize users frequently use BAANG because of the increased engagement they receive from other users and health officials.

Simulating Intracranial Atherosclerotic Disease from Magnetic Resonance Imaging using Computational Fluid Dynamics

Alique Momjian
Sponsor: Audrey Fan, Ph.D.
MED: Neurology

Intracranial Atherosclerotic Disease (ICAD) is characterized by the buildup of plaque in major arteries of the brain. Computational fluid dynamic (CFD) simulations can be used to characterize hemodynamic parameters to grade stenosis severity. My study involved creating a detailed pipeline to build vascular models, assign boundary conditions, and interpret results based on patient-specific MRI scans. I weighed different methods of modeling cerebral vasculature from Time of Flight MRA images (Voxel Size: .53x .53x .53mm3, Flip Angle: 20°, repetition time: 22ms, echo time: 3.99 ms) to span the entire Circle of Willis for 5 ICAD patients and 5 healthy controls. My simulations also incorporated patient-specific boundary conditions, such as separately measured phase-contrast MRI scans to derive pulsatile inlet flow in major inflowing arteries. Finally, I was able to optimize my outlet boundary conditions through extensive literature review. My research will conclude with simulation results for all 10 of my subjects, in which I validate my boundary conditions by comparing outlet flow rates to cerebral blood flow values determined using Arterial Spin Labeling MRI as a reference standard. I will then compare physiologically relevant parameters in grading ICAD such as fractional pressure ratio and wall shear stress in major cerebral arteries.

Exploring the Interplay between Language and Attention in Early Childhood Development

Thida Mommaitri
Sponsor: Lisa Oakes, Ph.D.
Psychology

The visual world is complex, and deciding what to pay attention to is crucial as it would be overwhelming to attend to everything. It's important to attend to meaningful regions of the environment, especially in early life when visual information is abundant. Studies show that young children's looking behavior becomes more systematic, consistent, and similar to that of adults when viewing natural scenes (e.g., photos of kitchens and nature). Yet, these changes are not fully explained by developing attention to physical features like brightness (Pomaranski et al., 2021). As infants get older, they focus more on parts of scenes that adults consider more meaningful than less meaningful parts (Oakes et al., 2023). However, the relationship between language development and attentional development in toddlers and preschoolers is not well understood. This study aims to fill that gap by exploring how language acquisition and attention are related. Using data from parents on their children's vocabulary, we will analyze how language development affects looking behavior while viewing natural scenes. Our prediction is that as language skills improve, attention will become more focused on meaningful regions of the scenes. These findings will contribute to our understanding of attentional development in toddlers and preschoolers.

Examining Savings and Temporal Stability of Explicit and Implicit Adaptations Using Visual Feedback Perturbations

Emma Monsen
Sponsor: Wilsaan Joiner, Ph.D.
MED: Neurology

Visuomotor perturbations induce motor learning, and faster relearning to compensate for the previously experienced perturbation indicates savings. Both explicit (EX) and implicit (IM) learning mechanisms contribute to changes in motor output. We hypothesized there is a relationship between the temporal stability of motor learning and the savings when a perturbation is reintroduced. We utilized a visuomotor adaptation paradigm that induces motor learning in response to a rotation of visual feedback. During all trials subjects indicated their planned reaching direction, and then made their reaching movement. Two aspects of learning were assessed: savings and decay. Both experiments consisted of a baseline and training period. Savings included a washout followed by a re-exposure period allowing measurement of savings. Decay included waiting periods and subsequent probe trials to quantify temporal stability. In probe trials subjects received no visual feedback. Results showed greater adaptation to perturbation during re-exposure than training, indicating savings. Washout induced a greater degree and faster rate of decay than a waiting period. EX decayed at a faster rate than IM during the washout and waiting period. Greater savings was associated with less temporal decay. Next steps are to compare these findings to those from older healthy controls and Alzheimer's patients.

Effects of Epilepsy Surgery on Nondominant Brain Hemisphere Functions

Ebelin Montoya Martinez
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MED: Neurological Surgery

Epilepsy is a disorder of abnormal electrical activity, or seizures, that affects the brain. Underrecognized symptoms of epilepsy include impacts on social interactions, decision-making capacity, or mood. Epilepsy surgical treatment planning includes identifying where seizures start relative to where neurological functions are located. Current clinical methods evaluate dominant-hemisphere functions, such as language, memory, or sensorimotor function. There are not quantitative tests for nondominant hemisphere neuropsychological outcomes that significantly impact quality of life (QOL), such as decision-making or emotional tone perception. This research assesses how well, if at all, nondominant-hemisphere functions are considered in pre-surgical planning to determine what percentage of patients who undergo surgery for epilepsy were counseled about functional losses other than language, sensorimotor symptoms, or memory. This research will reveal whether nondominant-hemisphere surgical costs were adequately predicted during treatment planning by assessing pre and postoperative QOL, emotional awareness, and decision-making. Completion of this research contributes to the goal of comprehensively identifying likely functional losses from epilepsy surgery, including those that are not well-assessed by current methods, to help counsel patients about risks and benefits of surgical treatment for epilepsy. The next step of this research is developing quantitative algorithms to gauge nondominant hemisphere costs of epilepsy surgery.

Female Weightlifter's Presentation of Gender on Instagram

Mikayli Moore
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Sociology

A growing literature uses Goffman's dramaturgical analysis to examine the role of social media in upholding beauty norms for women, but these studies do not examine the unique position of women posting weightlifting content, who appear to be aware of gender norms, but post in defiance of them. This study utilizes ten semi-structured interviews with women who post weightlifting content on Instagram to learn the motivations and consequences of performing femininity in a masculine gym space, and stigma management techniques to negotiate engaging in gender non-conforming behavior online. Abductive coding of transcript data revealed the subjects use stigma management techniques common of deviant subcultures such as normalizing, upstaging, and engaging in boundary work. The female participants demonstrated the salience of gender in both the physical and online gym spaces, but relayed the unexpected feeling that they acted as representatives of all women in those spaces, and therefore continued to engage in deviant behavior at the risk of failed gender assessments to be a role model for other women. These results therefore contribute to the understanding of social media's ability to support performance teams among women who perform femininity in a normatively masculine environment.

Stable Isotope Analysis of Deer Remains From Alameda County

Brooke Morey
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

In partnership with the Him'Ren Ohlone Tribe (Most Likely Descendant), this project examines mule deer (Odocoileus hemionus) remains collected from archaeological site CA-ALA-554, an ancestral Ohlone site in modern-day Pleasanton, California. Accelerator mass spectrometry radiocarbon dates indicate that the ancestral Ohlone lived here and deposited the deer bones between four hundred and two thousand years before present. Our research goal is to document shifts in deer ecology, especially concerning diet sources and migratory behaviors, across this swath of time by producing an isotopic biography of each individual deer. Analysis of nitrogen, sulfur, and carbon stable isotopes in bone collagen performed at the Stable Isotope Facility at University of California, Davis help reconstruct the diet sources and movement patterns of each individual deer. This data speaks to larger population trends, which allows us to reconstruct the environmental landscape used by mule deer from four hundred to two thousand years before present.

Collecting Lead Isotopic Data in Yellowstone Sanidine Using Mass Spectrometry to Build an Understanding of Magma Storage

Kyle Mui
Sponsor: Kari Cooper, Ph.D.
Ctr Plasma Mass Spectrometry

Viscous silicic magma systems vary in the types of eruptions and hazards they create, from ones that can form sunken calderas to effusive lava flows. Unfortunately, not much is known about the connection between magma storage and the type of eruption produced. This project is designed to amend this gap in scientific knowledge by focusing on the newly dated Central Plateau Members in Yellowstone and determining whether there are systematic patterns in the compositions of erupted material that reflect the location and timing of eruptions. My contribution is via conducting Pb analysis in sanidine crystals using the mass spectrometry lab at the Earth and Physical Sciences building. Preliminary results reveal that sanidine lead isotopic compositions of eruptions from a specific age group are unrelated to previously studied eruptions in Yellowstone, but have closely related chemistry with eruptions from the same location and time. Younger eruptions from different regions possess higher lead isotope ratios, which could be due to magma body evolution, compositionally distinct but separate magma bodies, or compositional gradients within a single magma body. The compositional data will reveal how eruptions are related to one another spatially and temporally, giving insight into future eruption types and storage conditions.

Natural Language Processing of Textual and Biomedical Data to Delineate, Quantify and Rank Protein Biomarker Candidates in Cardiovascular Disease Using Phrase-Mining CaseOLAP Algorithm

Chitra Mukherjee
Sponsor: David Liem, M.D.,Ph.D.
MED: Int Med Cardiology (davis)

In a sea of over 33 million manuscripts on Pubmed, a research hub for biomedical journals where new findings are accumulating daily, there has been an unmatched opportunity to apply computational Text Mining and Natural Language Processing techniques to these publications to draw insights from them regarding cardiovascular diseases(CVDs) and their associations with different proteins. Using the cloud based computing algorithm CaseOLAP, we quantified, ranked and delineated 8,325 cardiovascular categorized proteins where 3,174 proteins were found to have a significant correlation to 6 CVDs. Through extracting baseline files from the National Library of Medicine (NLM) where each is tagged with a unique PMID identifier, each file is parsed into a dictionary data structure which allows us to assign each protein a score between zero and one depending on its integrity, popularity and distinctiveness. Those with a score greater than 0.15 were defined as being largely correlated to one CVD, aiding us in statistical analysis to draw connections between proteins and CVDs. These phrase-mining applications achieve exponentiated efficiency and accuracy and have widespread applications that can allow us to develop new drugs targeting the specific CVD and help identify relationships between proteins, diseases and therapies.

Chitosan Hydrogels Containing MK2 Inhibitor Peptide Loaded Nanoparticles to Facilitate Percutaneous Absorption and Dampen Local Inflammation for Atopic Dermatitis Treatment

Sanjana Muniraj
Sponsor: Alyssa Panitch, Ph.D.
Biomedical Engineering

Atopic Dermatitis (AD) is a chronic inflammatory skin disorder with millions of cases annually in the US. The standard treatment to control AD is the topical application of corticosteroids, which may result in dermal atrophy. In this study, a cell penetrating MK2-inhibitor peptide YARA (YARAAARQARAKALNRQGLVAA) was encapsulated into thermo-responsive pNIPAM nanoparticles (NP), which were incorporated into chitosan hydrogels to promote local drug delivery, improve moisture and anti-inflammatory activity, while reducing adverse effects. The NPs showed a mean diameter of 361.5 ± 4.6nm, negative ζ potential (-28.3mV), high encapsulation efficiency (>50%) and did not show cytotoxic effects in human fibroblasts and keratinocytes, suggesting its safety for topical applications. Both nanoparticles and hydrogels were able to improve the release kinetics of YARA up to 120h and deliver 2 and 4-fold more YARA into viable skin layers of porcine skin *in vitro* at 12h post-application than the nonencapsulated compound in intact and impaired barrier conditions. Furthermore, the NPs treatment decreased the levels of IL-1β, TNF-α, INF-α and IL-10 cytokines up to 9-fold compared with the non-treated group of human keratinocytes under inflammatory conditions. These results suggest that YARA loaded nanoparticles incorporated into chitosan hydrogel is a promising treatment for AD.

The Influence of Parent Pitch on Infant Vocabulary Size

Jasmine Munoz
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Adults use a specific speaking style when speaking with infants. Infant-directed speech (IDS) often has a high pitch and a broader pitch range than speech directed to adults (e.g., Fernald et al., 1989).Parents might tend to place an emphasis on raising their pitch to support the children's processing of new words (e.g., Ma et al., 2011). This change in pitch may promote speech processing for word learning and support vocabulary development (Kalashnikova, 2018). This investigates the role of pitch in language acquisition. Is parent pitch in infant directed speech related to infants' vocabulary size? By testing 8- to 10- and 18- to 20-month-old English learners and their parents, we measure how parents talk to their infants versus other adults. We examine the characteristics of IDS while parents introduce a set of words during play-based interactions and compare these characteristics to the same words produced in adult-directed speech collected while parents interacted with an experimenter. Because pitch may affect infant attention and learning, we predict that parents who have a higher pitch in IDS may have infants with larger vocabularies than parents with lower pitch in IDS.

Assessing the Effects of Permafrost Thaw on the Uptake of Mercury in Aquatic Food Webs of the Arctic

Jeff Murray
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Environmental Toxicology

Mercury (Hg) is a global contaminant transported through the atmosphere to some of the most pristine environments including the Arctic. As climate change continues, the Arctic is being impacted at a faster rate than lower latitudes; one of the major impacts is the thawing of permafrost. The thawing of permafrost releases dissolved organic matter (DOM) and inorganic Hg to neighboring aquatic ecosystems, influencing the bioavailability of Hg within aquatic food webs. I hypothesize that the thawing of permafrost increases Hg uptake in Arctic food-webs. To test this hypothesis, I analyzed muscle tissue of three fish species (n=402), Slimy Sculpin (*Cottus cognatus)*, Arctic Grayling (*Thymallus arcticus)*, and Dolly Varden (*Salvelinus malma*) collected across 4 different rivers in Arctic Alaska for total mercury concentration and bulk stable isotope composition (C, N, S). I will present a preliminary evaluation of differences in Hg accumulation in fish across regions of Arctic Alaska subject to differing extents of permafrost thaw. I also will discuss how future research could leverage compound specific isotopic analyses of amino acids to better understand the impact of fish trophic position and spatial distributions on the total Hg burden of these fish.

Role of CHD4 in Mice Spermatogonial Stem Cells

Shanmathi Murugesan
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Microbiology & Molec Genetics

Chromodomain helicase DNA-binding protein 4 (CHD4) is a nucleosome remodeling protein. Though CHD4 is known to be a gene regulator, its function remains unknown in spermatogenesis. To investigate the function of CHD4 in male germ cells, we examined how a lack of CHD4 affects germ cells. Breeding Chd4-floxed mice with the Ddx4-Cre mouse line, in which Cre is specifically expressed in germ cells from E15.5, produced Chd4-conditional knockout (cKO) mice. We examined the testes of cKO (lacking CHD4) mice and their littermate controls (expressing CHD4). In order to make comparisons between the two genotypes, we carried out the immunostaining procedure on postnatal day 5 and day 3 mice testes of both phenotypes. We observed that germ cell loss takes place in P5 Chd4 cKO mice. In order to determine the cause of germ cell loss, we stained the testes with apoptosis markers, which revealed an increase in apoptotic cells in P3 Chd4 cKO. However, the differentiation ratio is approximately the same between the mutants and controls, indicating that the differentiation process (from prospermatogonia to undifferentiated spermatogonia) remains unaffected. From this experiment, we determined that CHD4 plays an important role in suppressing apoptosis of spermatogonia, but it does not affect differentiation.

Improving Surveillance for Patients with Abdominal Aortic Aneurysms

Aida Mushell
Sponsor: Misty Humphries, M.D.
MED: Surgery

More than 200,000 abdominal aortic aneurysms (AAA) are diagnosed each year in the US, a condition that becomes life-threatening if not identified and treated appropriately. Currently, the majority of primary healthcare providers adhere to the US Preventive Services Task Force (USPSTF) screening guidelines when evaluating patients for AAA, though up to 40% of patients miss these recommended screenings. We sought to use Natural Language Processing (NLP), a form of machine learning, to review patient imaging to improve identification of AAA. Across a large tertiary care system, 3859 patients with aneurysms (aortic dilation >3 cm) and ectasia (dilation between 2.5-3 cm) were identified by NLP. After exclusions, we evaluated demographic data for 1924 (55%) of these patients. Minorities represented 38% of aneurysms among patients under 65 years. Additionally, the average age at diagnosis in Hispanic patients was 50 compared to 59 in non-Hispanic patients. White and black patients were more likely to be captured by screening guidelines than Asian and Other patient groups, and Asian patients were significantly more likely to be diagnosed after 75. Incorporating NLP enhances screening practices and successful detection of aneurysms especially within minority populations more likely to be excluded by USPSTF screening guidelines.

What Do We Remember From Narratives and Why Do We Remember It? A Signal Detection Study

Stefanie Mutialu
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Communication

Strategic messages are often developed to inform the public about important individual- and society-level health information. Narratives are commonly used to achieve this ambition. Narratives are presumed to be effective due their relative ease of processing and promotion of states which induce focused attention on story content. Surprisingly, however, few studies have systematically investigated what public health information people remember from a narrative, or why they remember it. Using signal detection measures, we discovered that people had better sensitivity (A') for health information in narratives that required less cognitive load to process. In our study, this meant that participants had better recognition memory for health messages that used simpler language rather than more complex language. Interestingly, language difficulty did not influence participant response bias (B"). One important goal of narrative health messages is to increase health knowledge, particularly in contexts where diseases are new, rare, or affect a certain group. Many of these efforts have relied on heuristics for what makes a "good" narrative where "good" is defined in terms of engagement or entertainment. Our study helps align the ambitions of narrative health messages (audience knowledge increase) with practical tips for accomplishing this ambition (use simpler language).

A Study of Shock Layers in Viscous Flows

Carlos Anthony Natividad
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Mechanical & Aerospace Engr

For inviscid flows, shocks are treated as discontinuities. In viscous flows, a shock is a layer where the thickness of this layer depends on the flow parameters. The flow in the viscous shock layer is governed by conservation laws of mass, momentum, and energy including viscous dissipation and heat conduction effects. There are three parameters in this problem: Reynolds number, Mach number, and Prandtl number. Assuming perfect gas law and constant specific heat, there are analytical solutions only for special cases. In general, numerical solutions are essential to study this problem. Three approaches will be considered for steady flows. The first approach is based on a nonlinear two point boundary value problem using fixed point iteration. The second approach is to find the steady state solution of the time-dependent partial differential equations. The third approach depends on matched asymptotic analysis. The results of these three approaches will be documented in a final report.

Low-Cost Microfluidic Device for Single-Cell Isolation and Cloning

Veda Nayak
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

The Microfluidics Research Team in the BioInnovation Group is developing a low-cost microfluidic chip, known as a single-cell capture (SCC) device, to study heterogeneous cellular populations. We expect this device and methodology to enable the capture, cloning, and analysis of singular cells from heterogeneous populations (cell cultures or tissues) without the use of cell surface markers. The monoclonal cells cultured on chip can then be extracted and studied or used in applications like tissue regeneration. We based our initial device design on examples from literature that used photolithography to create masks for PDMS casting. However, the cost of photolithography limits access to these tools. We propose that common and affordable 3D printing technologies can be used as an alternative to photolithography to create SCC devices that will perform nearly as well as those built using photolithography. Our current device–created with 3D-printed molds–achieves a SCC rate of 35%, comparable to devices created using photolithography (60% capture rate) but at 1/100th the upfront cost. We are currently testing cell culturing, cloning, viability, and function on-device by measuring cell survival and proliferation of various mammalian cell types. We are also working on techniques to optimize and control the growth environment on chip.

The Willow Clinic Behavioral Health Team: A Model for Reducing Mental Health Care Accessibility Barriers

Sanjana Neeli
Sponsor: Kate Richards, M.D.
MED: Family & Community Med

This innovative quality improvement study uses depression screening to evaluate the Behavioral Health Team (BHT), offered in Sacramento through two student-run clinics, as a model for addressing health disparities and reducing obstacles to mental health care for people experiencing homelessness and people who inject drugs. Unhoused People are disproportionately affected by trauma and depression yet face unjust barriers to mental health treatment. At two of the UC Davis Health student-run clinics serving diverse populations, every person is offered a Patient Health Questionnaire-9 (PHQ-9), a standardized depression screening. A medical provider reviews all questionnaires for crisis intervention, and people at risk for moderate or severe depression are connected, if interested, to BHT, which offers direct psychiatric services and supportive resources. This study evaluates BHT as a model for decreasing obstacles to mental health care for people experiencing homelessness through evidence-based, person-centered care integrated within two student-run clinics by measuring depression screening rates and using outcome data and reiterative changes to address health disparities and promote equitable practices. Through depression screening at student-run clinics, the Behavioral Health Team provides accessible, evidence-based care and highlights the importance of understanding disparities in behavioral health resources.

Chromosome Axis and Cohesin Proteins may Facilitate Homologous Pairing in Zebrafish Meiosis

Alex Neupauer
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Molecular & Cellular Bio

Proper formation of gametes requires that homologous chromosomes pair in meiosis. Meiotic chromosomes consist of a proteinaceous filament called the chromosome axis, to which DNA loops are attached via cohesins. During synapsis, homologs physically join by attachment of their axes. However, we do not understand the role axis and cohesin proteins play in allowing homologs to find each other, if any. We hypothesized that homologous chromosomes share similar distributions of cohesin and chromosome axis proteins. To test this, we measured fluorescence intensities of axis protein Sycp3 and cohesin subunit Rad21l1 along chromosomes. In each pair, we correlated the distributions of Sycp3 from one homolog to the other and repeated for Rad21l1. We wanted to rule out the possibility of synapsis generating these correlations by repeating our methods in Sycp1 mutant nuclei, which are defective in synapsis. In Sycp1 mutant nuclei, we analyzed distributions of Sycp3. We found that distributions of Sycp3 exhibit significant correlations from one homolog to the other, in wild-type nuclei and those defective in synapsis. Rad21l1 also exhibits significant correlations in WT nuclei. Our results demonstrate that homologs share similar distributions of Rad21l1 and Sycp3, and that similarities of Sycp3 distributions emerge prior to synapsis.

Growth of two *Bifidobacterium* Strains as Co-cultures in Media Containing 2'-Fucosyllactose and 3'-Sialyllactose

Samantha Ng
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Food Science & Technology

The composition of the gut microbiome is influenced by the diet and the interactions between gut associated bacteria. Therefore, understanding the symbiotic relationships between bacterial strains are important. *Bifidobacterium* species in the infant gut can metabolize human milk oligosaccharides and provide beneficial effects for the host. In this project, we studied the co-existence ability of *Bifidobacterium* strains in media containing two carbon sources. *Bifidobacterium longum* SC596 that can grow well in 2'-Fucosyllactose (2'-FL) and the *Bifidobacterium breve* strains, SC573 and SW1107E, that can grow well in 3'-Sialyllactose (3'-SL) were grown in a culture medium containing 2'-FL and 3'-SL. DNA was extracted after 48 hours of growth, and the genome copy numbers of each strain were quantified using real time PCR. *B. longum* SC596 and *B. breve* SW1107E demonstrated an ability to stably coexist, with each strain comprising equal genome copy numbers in the co-culture. However, in the *B. longum* SC596 and *B. breve* SC573 co-culture, the *longum* strain exhibited dominance representing more than 80% of genome copies. Our research indicates bifidobacteria that consume different oligosaccharides can be simultaneously enriched *in vitro*. This suggests how different bifidobacterial populations in the gut might differentially consume separate milk oligosaccharide resources thus allowing co-colonization.

Cardiac Stress-induced Arrythmias via Genetically Phosphodeleted Sites in Connexin-43 Channels

Thao Nguyen
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MED: Physiology & Membrane Biol

Connexin 43 (Cx43) gap junction remodeling is observed in cardiac pathologies and is linked to arrhythmogenesis and sudden death. Cx43 post-translational modifications, such as phosphorylation and S-nitrosylation, are thought to play a role in cardiac remodeling and arrhythmogenesis. Here, we used two genetically phospho-deleted Cx43 knock-in mouse lines with serine residues replaced by alanine in the corresponding sites for phosphorylation via mitogen-activated protein kinase (MAPK) (S255/262/279/282A; $Cx43^{MK4}$) and casein kinase 1α (CK1) (S325A/S328A/S330A; Cx43S3A), to assess cardiac electrical signals and arrhythmias in normal and stressed hearts. Upon basal condition or isoproterenol stimulation, wild-type animals did not display arrhythmogenic behaviors. However, $Cx43^{S3A}$ mice showed increased QTc and deadly arrhythmias compared to wild-type animals after isoproterenol treatment. While $Cx43^{MK4}$ mice displayed increased single PVCs compared to wild-type mice, no significant differences were observed for severe arrhythmias. Immunofluorescence analysis showed that cardiac Cx43 co-localized with N-cadherin at the intercalated disks in wild-type animals but is also found remodeled in $Cx43^{S3A}$ and $Cx43^{MK4}$ mice. In addition, super-resolution analysis showed increased volume of Cx43 spots in isolated $Cx43^{S3A}$ cardiomyocytes compared to $Cx43^{MK4}$ and wild-type mice. These results suggest that the absence of Cx43 phosphorylation by CK1 or MAPK differentially promotes Cx43 remodeling and cardiac dysfunction.

Geographic Variation in Vocal Behavior of the Western Tanager (*Piranga ludoviciana*)

Valerie Nguyen
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Ag Neurobiology, Phys & Behav

Birds are among the few animal species that evolved complex vocal patterns to communicate with each other. Over time, many songbird species exhibited song dialects, which are geographic variants of note type and note syntax specific to a population. Researchers often use this variation as evidence that aspects of vocalizations may be learned through vocal copying. Only a handful of songbirds have had vocal development studied carefully, and many groups have not been analyzed for the presence of geographic variation in song that would be consistent with vocal learning. In this study, we examined individual and geographic variation in songs of a previously unstudied songbird species, the western tanager (*Piranga ludoviciana*). We characterized note repertoires and syntax from multiple individuals recorded during the breeding season at several widely spaced geographic locations around the western United States. Preliminary findings indicate substantially more note-sharing between individuals within locations than among distant locations. Further analyses will seek to determine the nature of this geographic variation in note composition, occurrence, and syntax of songs. This study will contribute to a wider understanding of how extensive vocal learning through copying is among songbirds previously simply assumed to learn.

Repair of Oxidative DNA Damage in Human Cells Relies on all Three NEIL Enzymes Revealed Through a GFP-based Plasmid Reporter Assay

Kimberly Nguyen
Sponsor: Sheila David, Ph.D.
Chemistry

Oxidative DNA base modifications can be caused by radiation, inflammation, or reactive oxygen and nitrogen species. Base damages such as 5-hydroxyuracil (5-OHU), guanidinohydantoin (Gh), and thymine glycol (Tg) are insidious due to their ability to cause mutagenesis and block DNA replication. A DNA glycosylase that participates in base excision repair (BER) pathway to remove aberrant bases is the endonuclease VIII-like (NEIL) family of repair enzymes that cleaves the N-glycosidic bond between the base and sugar when abnormal bases are detected. NEIL1, NEIL2, and NEIL3, different isoforms of NEIL, can remove a variety of base modifications from different DNA structural contexts, which has been extensively characterized *in vitro,* but has not been investigated in the cellular context. We have designed a GFP-based plasmid reporter assay that reports on the ability of the NEIL enzymes to repair 5-OHU, Gh, or Tg via flow cytometry in human cells. Using *NEIL1, NEIL2,* and *NEIL3* knockout HEK293FT cell lines, we performed a comparative repair analysis of the various DNA base modifications by NEIL. We demonstrate that even in the absence of one NEIL enzyme, all three lesions still exhibit robust repair, suggesting that all three NEIL enzymes coordinate in the repair of oxidative DNA damage.

Calmodulin Dependent Protein Kinase II Regulation by Methylation

Brian Nguyen
Sponsor: Julie Bossuyt, Ph.D.
MED: Pharmacology

Calcium Calmodulin-dependent Kinase II (CaMKII) is a major regulator of ion channels, calcium handling proteins, mitochondria and gene transcription in the heart. Dysregulation of CaMKII has been linked to heart failure and arrhythmias, making CaMKII a true therapeutic target. Binding of Ca^{2+}/CaM induces a transient kinase activation and permits post-translational modifications (PTMs) within a flexible hinge region resulting in autonomous kinase activity. To date phosphorylation at T287, oxidation at MM281/282, O-GlcNacylation at S280, and S-nitrosylation at C290 have been identified as activating PTMs, and S-nitrosylation at C273S as inhibitory. Recently, CaMKII methylation has been proposed as another inhibitory PTM so here we examine the regulatory role of the arginine residue 275 in mediating regulation of CaMKII by methylation. We use a novel FRET sensor of CaMKII activation, Camui, to monitor changes in conformation and activation of cardiac CaMKII activity in response to interventions targeting protein arginine methyltransferases (PRMTs). In addition to pharmacological interventions Camui mutants, specifically those mimicking and resistant to methylation, will be compared using fluorescence-lifetime imaging microscopy (FLIM) to detect FRET. Results from these studies contribute to a better understanding of the CaMKII regulation molecular mechanism and could lead to novel therapeutic strategies targeting CaMKII in heart disease.

Optimize and Interpret a Machine Learning Automated Pipeline - *Model Selection and Analysis Pipeline (MSAP)*

Keer Ni
Sponsor: Ilias Tagkopoulos, Ph.D.
Engr Computer Science

This research project is derived from a Depression Project (DEP) in Doctor Ilias Tagkopoulos' Lab. The goal of the DEP is to predict childhood depression using the Avon Longitudinal Study of Parents and Children (ALSPAC) data. To achieve this goal, we have implemented an exhaustive Model Selection and Analysis Pipeline (MSAP) which performs preprocessing, prediction, hyperparameter tuning, and data analysis. One of the main challenges is the expensive computation required by the pipeline. Specifically, the ALSPAC dataset contains 886 features and between 3,334 to 7,363 samples depending on predicting depression status at which age and the current implementation of MSAP take more than 3 days with 24 CPU cores for predicting depression at a given age. The main computational bottlenecks include hyperparameter tuning and feature selection, where both tasks require repeatedly fitting a candidate classifier with cross-validation. Depending on classifiers, a GPU can achieve around 20 to 100 speedup compared to a single CPU core. Enabling the existing MSAP to utilize multiple GPUs can drastically reduce the runtime of the pipeline. This project will provide auxiliary support for the DEP project, while the pipeline itself is data-independent. This means that any project involving model selection can utilize this pipeline.

Covid-19, Biotech Firm Creation, and Impact Valuation

Minsheng Nie
Sponsor: Giovanni Peri, Ph.D.
Economics

In new panel data on monthly number of firm creations spanning 47 sectors, the author tries to implement several regression analyses to identify if there existed a recent increase in the biotechnology sector's firm creations as opposed to other sectors, and if so whether a relationship exists between the increase and the Covid-19 Pandemic. In addition, an impact valuation model for assessing values of businesses is being developed that will be used to see if this pandemic has caused a change in the net value of related industries such as biotechnology. This valuation model includes a range of indicators such as profit, economic and social impact, job creation, amount of innovation, etc. This simple valuation system inspired by ESG, however, is a fundamentally different attempt. Overall, this research solves a small piece of the puzzle that might help policymakers to anticipate the development and changes in the economic market, financial market, macro-level group behavior, and net social impact in the event of similar large-scale public crises in the future.

The Relationship Between Tunisian Men and New York Times Media Coverage in the 1940s

Aryan Nooshi
Sponsor: Suad Joseph, Ph.D.
Anthropology

My research analyzes the representation of Tunisian men in the 1940s in the New York Times. The New York Times is the leading liberal newspaper in the United States and perhaps the world, making it a vital tool in disseminating information on key issues impacting the world. For my research I screened 324 articles written between August of 1941 and May of 1943, of which 20 were relevant to the representation of Tunisian men. They indicated a pattern of disregard toward the presence and autonomy of Tunisian men. Many articles only discussed Tunisia as a strategic arena for World War II in the North African campaigns conducted by the US and Germany. When Tunisian men were mentioned, coverage insinuated elements of barbarism and backwardness, and mention of political discontent was met with prejudiced criticism posing them as hyper-emotional. My research allows us to trace the representation of Tunisian men in tandem with media coverage that centers itself around US interests in World War II to understand the relationship between communities in the greater Middle East and media coverage. This paper is a part of a long-term analysis from 1850 to the present of the NYT from the Suad Joseph Lab.

Changes in Floral Microbial Community Abundance Over Time in Artificial Nectar Solution

Helen Noroian
Sponsor: Rachel Vannette, Ph.D.
Entomology/Nematology

Flowers are host to microbial communities including yeasts and bacteria, which can be picked up by bees while foraging. Although we know floral microbes can impact bee foraging, little is known about interactions between floral microbes in flowers and how their communities change in composition and abundance over time. To examine community composition, two known floral bacteria, *Acinetobacter pollinis* and *Lactobacillus kunkeei,* and yeast *Metschnikowia reukaufii* will be simultaneously grown in artificial nectar solution. To examine how the abundance of each changes over time, the nectar will be plated on three types of growth media (TSA, YM, and MRS) on Day 1 and Day 3 of the experiment. Three days after plating, the number of each microbe will be counted, which will be used to measure the relative abundances of each species as well as any significant increase or decrease in individual species abundance. As a comparison, each microbe will also be plated individually to evaluate growth without competition. By discovering how these microbes interact within an artificial nectar solution, we will uncover how floral microbial communities change over time. Ultimately, this will help us understand the microbial communities bees encounter while foraging, which may impact their health and behavior.

Assessing Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi)* Hybridization Status Within the Willow-Whitehorse Basin in Southeast Oregon

Daniel Novoa
Sponsor: Andrea Schreier, Ph.D.
Animal Science

Lahontan Cutthroat Trout (LCT; *Oncorhynchus clarkii henshawi)* evolved isolated in ancient Lake Lahontan over two million years ago. LCT has been listed as a federally threatened species since 1975 due to the threats of hybridization and habitat fragmentation. Disconnection caused by habitat fragmentation can lead to sub-populations going extinct. Due to its close phylogenetic relationship to rainbow trout (RBT; *Oncorhynchus mykiss*), LCT are susceptible to hybridization with rainbow trout introduced into their habitat. High levels of introgression caused by hybridization can lead to genetic swamping and outbreeding depression, limiting the potential for genetic rescue. Because the Willow-Whitehorse basin is the last remaining LCT population found in Oregon, it is important to understand the hybridization status within the basin. In this study we are using single-digest restriction site-associated DNA sequencing (RADseq) data to assess hybridization status of rainbow trout and LCT within the Willow-Whitehorse Basin. To do this we are using principal component analysis (PCA) and admixture analysis to identify LCT x RBT hybrids and estimate individual admixture proportions. Historically conservation efforts have been to segregate hybrids found. Assessing hybridization status will allow us to better inform conservation management on best practices to aid LCT conservation.

Greek Life Trained to Save Lives: Narcan Training for Safety Officers

Richard Occhino
Sponsor: Charlotte Siggins, M.S.
Sociology

Opioid and opiate related overdoses have been steadily on the rise since 2010. Recent data suggest that over 110,000 people died in a single 12-month period from 2021-2022 in the United States. This is an alarming trend that does not seem to be reversing anytime soon. Although young adults aged 18 to 25 do not make up a large portion of these overdoses, the data suggest that non-medical use of prescription drugs has increased exponentially over the last decade for this population. Furthermore, research shows that students who are in sororities and fraternities are more apt to smoke cannabis and tobacco, drink alcohol, binge drink, and consume other types of drugs. Research also shows that college students who routinely use substances are more likely to dropout when compared to students who do not use substances. This project was inspired by the author's own struggles with substances and the loss of two brothers to drug-induced suicides. The project specifically includes Narcan trainings for sororities/fraternity Safety Officers on the University of California, Davis campus during the project period as well as a strategy to institute similar trainings on an annual basis after the project is completed to ensure a longer-term impact.

ReSINing to Stress: Defining the Limits of DNA Replication Stress Induced Nucleophagy (ReSIN)

Tiffany Oentoro
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

Autophagy is a membrane trafficking pathway that targets damaged organelles for degradation in the lysosome or vacuole in order to maintain cellular homeostasis and to protect cells from disease progression. Increasing evidence indicates that a specific form of autophagy, known as nucleophagy, plays a protective role in maintaining both nuclear function and genome stability during stress (e.g., replication stress). It is increasingly clear that many diseases exhibit defects in cell stress pathways such as autophagy, leading to the idea that this pathway can become limiting and thus compromise cellular functions. For example, the presence of multiple stressors may prevent cells from efficiently using nucleophagy to preserve nuclear function and genome integrity. We therefore hypothesize that accumulated cell stress will reduce nucleophagy under replication stress conditions and will compromise nuclear function and genome integrity. To test this, we will quantify the targeting of nucleolar proteins (e.g. Fob1-GFP) to the vacuole after replication stress in the presence or absence of nutritional stress induced by the drug rapamycin. We will monitor nuclear organization by imaging the nucleolus (e.g. Nop1-GFP) and we will monitor genome stability by quantifying the formation of DNA repair factories (e.g., Rad52-GFP, Rfa1-mCh).

Virtual Reality Attention Management for Children With ADHD

Jordan Ogbu Felix
Sponsor: Julie Schweitzer, Ph.D.
MED: Psychiatry & Behav Sci

Distractibility in daily life is now considered a major public health concern. Currently, there are no known interventions specifically developed to reduce distractions from interfering with attention. Our project is testing a treatment that combines virtual reality (VR) technology and eye tracking with habituation learning and exposure therapy to reduce the ability of distractors to interfere with learning and attention in children with ADHD. This is a double-blind, randomized control trial of 60 children, comparing the active training condition with exposure to classroom distractors versus a control condition with no distractors during performance on academic and attention tasks. We are assessing children's distractibility via eye-gaze metrics and performance measures (e.g., accuracy and response time) in VR and collect rating scale data from home and school. Previous results on distractibility within our laboratory suggest that children with attention deficits may have a hard time returning to tasks once those tasks are interrupted, even if the distractor itself does not hold their attention. We predict that children in the active training condition will return their focus on the classroom whiteboard faster after exposure to the distractors and that their performance will be less disrupted compared to children in the control condition.

Brassicaceae's Nutritious Rebellion: The Identification of Toxin-Producing GSL-OH Genes Within a Glucosinolate Pathway

Odinaka Okegbe
Sponsor: Daniel Kliebenstein, Ph.D.
Plant Sciences

Specialized metabolites are compounds that aid a plant's survival. Glucosinolates are an example primarily found within the Brassicaceae family. The hydrolysis of the 2-hydroxy-but-3-enyl (progoitrin) glucosinolate by the myrosinase enzyme forms goitrin, which is toxic to animals when ingested in large amounts. This prevents the utilization of many Brassicaceae species as feedstock. GSL-OH has been identified as the enzyme responsible for synthesizing progoitrin in the model species *Arabidopsis thaliana,* yet has not been identified across other plants within the family. Utilizing this target enzyme, we are attempting to functionally validate homologous genes along a phylogenetic tree. We tested these candidate genes by cloning them into an expression vector, which we used to transform *A. thaliana* that are natural knockouts for GSL-OH. Using an HPLC we assessed the progeny for progoitrin presence and determined whether the candidate genes are functional. We have identified GSL-OH like enzymes in the species *Meniocus linifolius*. This system has allowed the identification and functional validation of a previously unknown gene in a non-model species. This will serve as a way to test candidate genes across other sectors, which will help find GSL-OH genes from species with feedstock potential to remove it and increase their market.

Effect of Different Sources of Follicle-Stimulating Hormone (FSH) on Equine Cumulus Cell Expansion and Gene Expression Patterns; an in vitro study

Jazmin Orozco
Sponsor: Stuart Meyers, D.V.M.,Ph.D.
VM: Anat Physio & Cell Biology

Cumulus cells surround the oocyte and support its maturation. Once exposed to follicle-stimulating hormone (FSH), cumulus cells undergo expansion. Despite the utilization of FSH in equine *in vitro* oocyte maturation media, there is little information about its effect on cumulus expansion rate and gene expression. This study aims to examine the effect of different sources of FSH on equine cumulus cells when cultured in an *in vitro* environment. Cumulus cells will be harvested from equine oocytes after 0 hrs. and 24 hrs. of maturation. They will be cultured at 37°C under 5% CO2 within oocyte maturation medium. The maturation medium will be supplemented with different sources of FSH at a single concentration along with a control that lacks FSH. The expression of FSH receptors will be evaluated using a polymerase chain reaction (PCR). In addition to this, cumulus expansion will be measured after the cultures. The results of this experiment will assist in improving the overall success rate of *in vitro* equine embryo production by identifying the optimal source of FSH. Further study could benefit human *in vitro* fertilization treatments by providing a better understanding of oocyte maturation and development.

Molecular Basis of Mutation Bias in Arabidopsis Thaliana

Lissandro Ortega
Sponsor: John Monroe, Ph.D.
Plant Sciences

Previous studies in the plants such as Arabidopsis thaliana, rice, and walnut tissue cultures have observed lower mutation rates within the gene bodies relative to upstream and downstream intergenic regions. Regions of low mutation rates tend to be marked by the histone modification H3K4me1, suggesting its role in these trends. Additional work suggests this pattern of bias is directly related to the MSH6 gene, a DNA repair protein which contains a Tudor domain that can specifically bind H3K4me1. Thus, in conjunction with the MSH6 gene, the epigenomic mark H3K4me1, provides a potential mechanism by which gene bodies and biologically essential genes signal for DNA repair via the Tudor domain, ultimately resulting in the lower mutation rates that have been observed. To test this hypothesis, an experiment was conducted. MSH6 knockout lines were grown, followed by DNA extractions and PCR to confirm MSH6 deficiency. By deep sequencing of DNA from wildtype plants, which contained the MSH6 gene and the mutant variants which did not contain this MSH6 gene, we identified de novo somatic mutations. We found that when the MSH6 gene is not present, mutation rates are significantly increased in gene bodies and regions marked by H3K4me1.

Activation of a Novel MARCKS/NF-kB Signaling Axis Contributes to Acute Kidney Injury

Lindsay Oshiro
Sponsor: Ching-hsien Chen, Ph.D.
MED: Int Med Nephrology (sac)

Monocytes/macrophages are known to play a critical role in the pathogenesis and progression of acute kidney injury (AKI). Although targeting macrophages has emerged as a promising therapeutic strategy for AKI, the effective treatment is still limited. Analysis of the single-cell RNA sequencing data has identified that the immune microenvironment of injured kidneys is associated with the expansion of monocytes/macrophages. We next show that there's an elevated abundance of phospho-MARCKS in macrophages upon cisplatin treatment and that this increase occurred in parallel with upregulation of inflammatory cytokines and markers of nephrotoxicity in cisplatin-exposed kidneys. Mechanistically, we demonstrate that MARCKS protein directly binds to the nuclear factor-kappa-B-activating protein (NKAP). Following cisplatin-induced phosphorylation at ser159 and ser163, the interaction of MARCKS with NKAP was inhibited, contributing to p65 phosphorylation and NF-κB activation. We find that targeting of MARCKS phosphorylation with the MPS peptide, a novel MARCKS inhibitor, not only downregulated kidney infiltrating macrophages, but also suppressed levels of serum creatinine and blood urea nitrogen in mice exposed to cisplatin. Our results suggest that MARCKS phosphorylation is a novel NF-kB activator in pro-inflammatory macrophages and present a proof of concept for the use of MPS peptide as a renal protection agent for AKI.

Ketogenic Diet's Impact in Desminopathic Rats

Cyril Osifo-Doe
Sponsor: Keith Baar, Ph.D.
MED: Physiology & Membrane Biol

Desminopathy is the most common myofibrillar myopathy, a disease that leads to the formation of abnormal aggregates of protein inside skeletal muscle cells. The desmin protein plays a critical role in maintaining skeletal muscle membrane integrity alongside the dystrophin-associated protein complex. Our lab has shown that a ketogenic diet (KD) improves skeletal muscle function in old animals, in part by improving membrane integrity. The KD works by providing an alternative fuel source (besides glucose and fatty acids) to power mitochondria in muscle. This directs metabolism away from glucose to fatty acids and ketone bodies, mimicking caloric restriction or exercise. I hypothesized that a ketogenic diet should improve muscle function and prevent injury in myofibrillar myopathy. To test this hypothesis, my project determined whether a KD could decrease muscle injury and improve muscle function in our desminopathic rat model (MUT). My preliminary data show that the MUT and wildtype (WT) animals maintain similar body weights on control or KD. MUT animals on a KD tend to improve their run time to exhaustion compared to control diet-fed counterparts. MUT animals on a KD also tend to improve muscle strength, suggesting that a KD may improve muscle function in MUT rats.

The effectiveness of equine therapy for supporting parent-child connections: a pilot study

Jessie Ostrove
Sponsor: Rebecca Calisi, Ph.D.
Neuro Physio & Behavior

Amidst a mental health crisis in a post-pandemic world, the need for mental health resources globally is unprecedentedly scarce. Family dynamics and connectedness between parent and child have been particularly disrupted due to the unique challenges of parenting amidst the COVID-19 pandemic. Equine therapy is the use of horses and donkeys as an integral part of a therapeutic intervention to treat various health conditions, both mental and physical. Studies have reported that equine therapy can reduce symptoms of pain, anxiety, and depression. However, little is known about the potential therapeutic effects of equine therapy on parent-child relationships. I hypothesize that interactions with a mother-son pair of miniature donkeys will have an effect on parent-child connectedness, as measured via the level of synchronization of heart rate and brainwave activity via a portable EEG head device, physical behaviors of eye contact, physical touch, and participant survey responses. Using an alternative treatment to mental health like that of equine therapy may offer more treatment options to families who need support, with the purpose of providing a basis for evidence-based public health interventions.

Varieties of Transitional Justice: An Examination of Civil Society, Regime Change, and Truth Commission Establishment on the Depth of Transitional Justice in Post-Conflict Peru, Argentina, and Guatemala

Mary Anneleise Padilla
Sponsor: Juan Tellez, Ph.D.
Political Science

Scholars of transitional justice have examined the variety of mechanisms and tools available to states to facilitate peace-building and reconciliation processes following an internal conflict. However, while the literature is expanding, the measurement of the effectiveness of these mechanisms as a spectrum and the examination of regional variations in success is undertheorized. This work seeks to extend this research through an evaluation of the regional variation in transitional justice processes in Peru following the Internal Conflict (1980-2000), Argentina following the Dirty War (1974-1983), and Guatemala post-Civil War (1960-1996). I conduct a qualitative comparative analysis using a most-similar case study design and employ the use of an original four-point spectrum to classify "transitional depth" on a spectrum from "shallow" to "deep" with the inclusion of each of my dependent variables equivalent to one point (reparations, prosecutions, institutional reforms, memorialization). I hypothesize that a robust civil society presence, regime change, and truth commission establishment increases the likelihood of a deep transitional justice process. My findings provide support for all three hypotheses. I conclude that while all three variables deepen a given transition, regime change and truth commission establishment are a greater determinant to a deep transitional justice process than civil society strength.

A Road By Any Other Name: Manipulating Speech Sounds in Children's Naturalistic Word Recognition

Kaylahnie Palencia
Sponsor: David Corina, Ph.D.
Linguistics

Children are constantly exposed to audiovisual speech, in that visual cues, (i.e. face, mouthing words), support audio cues during speech recognition. Visual cues are often absent in studies of spoken language. Priming studies are a common method for studying spoken word recognition in children, and can inform how children process rhymes and other speech sound manipulations. We presently test these effects under naturalistic audiovisual speech conditions. To do this, typically-developing children (n=15; ages 8-13) will complete a picture-matching word task, with four different word conditions. These include picture-word pairs of 93 matches ("nose"-NOSE), 31 unrelated ("nose"- BALL), 31 rhymes ("nose"-ROSE), and 31 word-initial cohort ("nose"-NOTE). We predict higher accuracy in match and unrelated conditions than in the rhyme and cohort conditions, given more obvious speech sound differences. With regards to response time, based on previous priming studies, we expect to see slowest responses in the unrelated condition, intermediate responses in the rhymes/cohorts, and fastest responses in the matches. This study will help us understand how audiovisual speech plays a role in word recognition in children, which can help influence speech recognition technology, and provide better resources for hearing impaired individuals.

Lived Experiences of First-Generation Latina Undergraduate Math Students at University of California-Davis

Paola Pantoja Gomez
Sponsor: Michael Singh, Ph.D.
Chicano Studies

Colleges and universities pride themselves on having a diverse student population and an increased number of first-generation students. However, the number of first-generation and minority students in STEM majors is limited. Women of color, specifically first-generation Latinas, continue to be widely underrepresented in STEM majors at universities. Research documents how these students experience racial and gender microaggressions from both themselves and others, causing many to question their sense of belonging to their STEM fields. Further research reveals these students feel under-prepared and under-supported within their STEM majors. Despite these hardships, first-generation Latina students have demonstrated different forms of resiliency and persevered through their STEM majors. This study aims to document the lived experiences of four first-generation undergraduate Latinas majoring in Math at UC Davis. Through semi-structured interviews, a phenomenological and Chicana Feminist qualitative approach, this study will examine how race and gender impacted the experiences of these students as math majors. I aim to not only discover the types of marginalization they encounter, but also how they persevere as math majors and find support to complete their degrees.

Examining Automaticity of Prediction in Auditory Sentences

Jinhee Park
Sponsor: Tamara Swaab, Ph.D.
Psychology

Predictive coding suggests that higher cortical levels make descending predictions on lower sensory representations. However, recent studies indicate that this process of top-down prediction is not necessarily automatic (Brothers et al., 2017; 2019). To address this issue, the present study aims to explore the automaticity of prediction in auditory sentences by manipulating the proportion of sentences with high predictable and low predictable target words. To perform this study, we generated 450 pairs of sentences in which we manipulated two factors: animacy (animate or inanimate) and constraint (high or low predictability with regard to animacy). These standardized sentences will be presented in the auditory modality to 80 participants across two experiments while recording their EEG. In experiment 1, participants will hear 80% high constraint and 20% low constraint sentences. In experiment 2, participants will hear 80% low constraint and 20% high constraint sentences. If the process of prediction is automatic, it should result in a consistently high level of decoding accuracy that is above chance level (50%) in highly predictable sentences regardless of the proportions of sentences manipulated.

Investigating the Roles of SUMOylated Proteins During Yeast Meiosis

Maithili Patel
Sponsor: Neil Hunter, Ph.D.
Microbiology & Molec Genetics

Meiosis is the reductional division that creates haploid gametes. A key mechanism during meiosis is homologous recombination, during which homologous pairs of chromosomes align, cross over, and exchange genetic material. Although homologous recombination is an essential feature of meiosis, it can be error-prone and give rise to non-disjunction events and aneuploid gametes, the leading cause of miscarriage, infertility, and congenital disorders in humans. Using yeast as a model organism, our lab investigates the role of SUMOylation during meiosis. Conjugation of SUMO to a protein can cause stabilization, degradation, or conformational changes. Previous studies in our lab discovered that SUMO is a common post-translational modification present in several key meiotic proteins. A proteomics screen uncovered 2747 SUMO conjugation sites during meiotic prophase I. To test whether these conjugation sites are important for meiosis, I used CRISPR-based genome editing to replace SUMOylated lysines with arginines in the following proteins: DMC1 (strand-exchange protein required for meiotic recombination), CHD1 (chromatin remodeler required for crossover resolution), ZIP2 and ZIP3 (pro-crossover factors which link synapsis to homologous recombination). After generating non-SUMOylatable alleles in haploid strains, I mate them and induce diploids to enter meiosis to assay for spore viability, a readout for functional meiosis.

Inhibition of Soluble Epoxide Hydrolase Is Protective against the Multi-omic Effects of a High Glycemic Diet on Brain Microvascular Inflammation and Cognitive Dysfunction

Dhruti Patel
Sponsor: Amparo Villablanca, M.D.,Ph.D.
MED: Int Med Cardiology (davis)

Soluble epoxide hydrolase (sEH) enzyme converts neuroprotective and vasodilatory epoxy-fatty acids into biologically less-active diols. sEH inhibitors (sEHIs) are promising therapeutic targets for hyperglycemia, diabetes, Alzheimer's disease (AD), and cardiovascular diseases. Our study aimed to determine the multi-omic effects of sEHI on the hippocampal microvessels of high glycemic diet (HGD) fed male mice and cognitive function. Wildtype mice were fed low glycemic diet (LGD) or HGD with/without the sEHI, trans-4-[4-(3-adamantan-1-yl-ureido)-cyclohexyloxy]-benzoic acid (t-AUCB), for 12 weeks. Hippocampal microvascular gene expression was assessed by microarray. Data was analyzed using a multi-omic approach for differentially expressed coding and noncoding genes (DEGs), gene networks, and functional pathways. Global hippocampal microvascular gene expression following HGD was distinctly different and opposite to HGD+sEHI. Interestingly, the inhibitor reversed the gene expression profile of HGD akin to LGD. The inhibitor response on HGD was characterized by 1701 DEGs, mostly downregulated and involved in similar cellular pathways as HGD: cell signaling, neurodegeneration, metabolism, and cell adhesion/inflammation/oxidation. We also demonstrated that DEGs modulated by HGD+sEHI negatively correlated to gene expression profiles from AD patients. To our knowledge, this is the first study to demonstrate that sEH inhibitor reverses the deleterious effects of HGD, correlating with protection against dementia.

Electrical Modulation of ERK Dynamics to Control Cell Behaviors

Preena Patel
Sponsor: Min Zhao, M.D.,Ph.D.
MED: Dermatology

Extracellular signal-Regulated Kinase (ERK) plays a crucial role in cell differentiation, proliferation, and migration. It is well recognized that cells can encode complex information in ERK activations with distinct dynamic patterns to control these cell functions, although the mechanisms aren't crystal clear. Several approaches have been employed to regulate cell behaviors by controlling ERK dynamics, however, sophisticated devices and/or genetic modification are needed in these studies. It is thus still challenging to apply precise inputs to live cells since they are not formatted. We reported here an electrical approach as a promising method to modulate ERK activity in a more practical way. We used a fluorescence labeled translocation reporter (ERKTR) to monitor ERK activities in live cells and found that a short AC stimulation pulse could trigger a switch-like ERK biphasic response with an initial inhibition and later activation. And we were able to perfect our method where AC stimulation was used at different time intervals and strengthens to manipulate ERK dynamics with precisely controlled amplitude, duration, and frequency. Furthermore, we provide evidence showing that these electrically controlled ERK signals could lead to both immediate and long-term cellular responses.

High Prevalence of *Toxoplasma gondii* DNA Found in Feral Cat Feces in Association with Rainy Weather Conditions

Anika Patel
Sponsor: Karen Shapiro, D.V.M.,Ph.D.
VM: Pathology, Micro, & Immun

Southern sea otters are an endangered species in California that is facing morbidity and mortality due to infections caused by the zoonotic parasite *Toxoplasma gondii*. Felids serve as the definitive hosts of *T. gondii* and can shed oocysts, the environmentally resistant stage of *T. gondii*, in their feces. Oocysts can be taken up by marine invertebrates such as bivalves and snails, which are common prey for otters. Precipitation leads to increased surface water runoff that carries the oocysts to the ocean habitat of sea otters. The goal of this study was to investigate the prevalence of *T. gondii* oocyst shedding in feral cats on the California central coast and determine if prevalence is affected by season (rainy vs. dry seasons). We collected feral cat feces from four free-ranging cat colonies on the California central coast to assess the prevalence of *T. gondii* oocyst shedding in feces. Our results suggest a high prevalence of *T. gondii* DNA in feces and highlight the important role that feral cats play in transmitting this parasite to coastal waters.

Evaluation of Plavix Resistance and its Role in Predicting Stent Thrombosis in Transcarotid Artery Revascularization

Anjani Patibandla
Sponsor: Misty Humphries, M.D.
MED: Surgery

Transcarotid Artery Revascularization (TCAR) is a minimally invasive carotid artery procedure involving stent delivery through a neck incision. Plavix is often used as part of dual antiplatelet therapy to prevent stent thrombosis in TCAR. Up to 70% of patients have Plavix resistance in the literature but resistance testing for TCAR is not routinely performed and the extent of resistance in TCAR patients is unknown. We compared the different methods of Plavix resistance testing to determine the prevalence of resistance and the effect on stent outcomes. At our large academic institution, 85 patients underwent TCAR from 2018-2022 and 9 patients (10.6%) developed stent thrombosis during the follow-up period. Plavix resistance testing was performed in 35 (41%) patients, with 25 patients undergoing thromboelastogram (TEG) with platelet mapping, 5 undergoing VerifyNow P2Y12 inhibitor testing, and 5 undergoing testing with both modalities. Among patients with Plavix resistance, 5 (20%) patients had stent thrombosis. Furthermore, we found that VerifyNow more reliably predicted Plavix resistance than TEG (78% accuracy versus 38%, respectively). In conclusion, though some testing modalities are more reliable than others, the rate of Plavix resistance is high in the TCAR patient population, with a higher thrombosis rate in those with Plavix resistance.

Using Structural Biology Strategies to Elucidate the Molecular Perception of Strigolactone, a Critical Plant Growth Hormone

Jacob Pawlak
Sponsor: Nitzan Shabek, Ph.D.
Plant Biology

As climate change intensifies and the human global population continues to grow, significant food security challenges will develop in the coming decades. Understanding the molecular mechanisms driving plant growth will only become more essential as time passes and we search for solutions to global food insecurity. One high-value target for study is the process of shoot formation, which could be manipulated to raise crop yields. Strigolactones are a class of plant hormones that are produced by the roots of plants that signal the inhibition of shoot branching in the axillary buds of the plants. In legumes, RAMOSUS3 (RMS3) is the strigolactone receptor, and studies in peas that are mutated in the rms3 gene have found that inhibition of its function lead to significantly increased shoot branching compared to wild-type. However, the exact mechanism of strigolactone perception by RMS3 has yet to be fully determined, and the irreversible reaction it performs to generate the ligand is undescribed. I will expressed and purified RMS3 and obtained X-ray crystallography data to structurally characterize the protein in the aim to begin to uncover its hormone receptor mechanism. I will additionally complex my purified RMS3 with a strigolactone to analyze the strigolactone hydrolysis mechanism.

Characterization of Novel Genes Associated with the Regulation of NAD+ Metabolism in the Model System *Saccharomyces cerevisiae*

Erin Peixoto
Sponsor: Su-ju Lin, Ph.D.
Microbiology & Molec Genetics

Nicotinamide adenine dinucleotide (NAD+) is an essential metabolic cofactor involved in redox reactions, cellular signaling, and regulation. Abnormal levels of NAD+ and its precursors have been shown to play a role in several age-related human disorders, therefore, these metabolites are an emerging therapeutic target to mitigate cellular damage. However, due to the complexity of its metabolic pathways, NAD+ synthesis and regulation are not well understood. Our preliminary NAD+ precursor-specific genetic screen using *Saccharomyces cerevisiae* as a model organism highlighted multiple genes that impact NAD+ intermediate homeostasis. A secondary screening to validate the resultant phenotypes is ongoing. As an example, the overexpression of *BNA1*, a dioxygenase that functions in the *de novo* biosynthesis pathway of the precursor quinolinic acid (QA), showed an unexpected notable release of nicotinic acid/nicotinamide (NA/NAM) intermediates, though only increased levels of QA were expected. As increased levels of NA/NAM release have been correlated with mitochondrial dysfunction and increased autophagy in some of our yeast mutants, our studies can help understand the mechanisms of the regulation of NAD+ metabolism and aid in the development of therapeutic strategies for metabolic disorders related to abnormalities in NAD+ metabolism.

Cortisol Reactivity and Athletic Participation in Children

Colleen Pendergast
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

Physical activity has been thoroughly researched and shown to not only improve health, but also lower stress levels. Specifically, organized sports team participation has been linked to long term physical activity (Kudlacek M. (2021). This study expands on previous research and analyzes the effects of sport participation on cortisol reactivity in children. We conducted a secondary data analysis using data from the Social Support Study (Parenteau et al., 2020). The study included a subset of 97 children from an urban area, 47 of whom were female (48%) ages 9-11 years old (M = 9.88, SD = 0.59). Participants completed a social stressor and their parents reported up to three organized sports teams their child participated in. Cortisol levels were measured via saliva samples and collected at eight time points throughout the visit. A multiple linear regression analysis was used to analyze the relationship between children's sports participation and cortisol reactivity post-stressor. Results indicated that sports participation was not a significant predictor of cortisol reactivity, while controlling for gender and age, ($F(5,86) = 1.699$, $p = 0.14$, $R2 = 0.03$). Further research is needed to fully explore a possible relationship between organized sport participation and stress reactivity levels.

Life Under the Ice: Antarctic Microbial Mat Morphology and Spatial Ecology

Allison Peng
Sponsor: Dawn Sumner, Ph.D.
Earth And Planetary Sciences

Microbial communities have existed on Earth for the majority of the planet's history, yet we cannot fully explain their formation and ecology. In the perennially-frozen saline lakes of Antarctica's dry valleys, benthic microbial communities are the dominant life forms. These low disturbance environments provide an ideal opportunity to study the connection between life and the physical environment. The communities, mostly cyanobacteria, form "mats" of combined biological material and sediment that build up over time. A key structure present in the mat's topography are pinnacles, which form in part due to cyanobacteria tending to grow towards the direction of light to increase photosynthesis rates. We construct 3D models of microbial mats to statistically analyze the distribution of pinnacles. The distribution reflects patterns associated with community organization and their respective environments. We observe clustered, regularly spaced, and randomly distributed spatial patterning at different sites, suggesting that both competition and mutualism are influential. By investigating modern mat formation and the connection between morphology and environment, we also aim to better understand early life on Earth.

Comparison of Proteases Used in Histone PTM Analysis of Mozambique Tilapia Gills

Kathleen Petcu
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Proteases have practical use in histone post-translational modification (PTM) analysis, particularly using liquid chromatography mass spectrometry methods. It is beneficial to know what protease will be the most effective at revealing the desired histone PTMs in a given study. Four proteases were identified to have promise in revealing unique histone PTMs. We used Trypsin platinum, ProAlanase, Thermolysin, and Pepsin to digest Mozambique tilapia (*Oreochromis mossambicus*) gill tissue samples. The *O. mossambicus* samples were obtained from fish that had experienced two different salinity treatments. One group of fish had experienced freshwater (0 ppt) conditions and the other group had experienced seawater (30 ppt) conditions. All gill samples were aliquoted and processed using each of the four proteases. A second goal of the experiment was to investigate the differences in the global histone PTM landscape between fish inhabiting freshwater versus saltwater conditions. By comparing these proteases' effectiveness in revealing desired histone PTMs we establish which is the most beneficial to use.

Seed Traits and Seed Survival in California Annual Grasslands

Sophie Pettit
Sponsor: Marina Laforgia, Ph.D.
Evolution & Ecology

Seeds are the beginning of the next generation of all plant life, yet little is known about how their traits relate to seed survival. Seed survival is critically important for maintaining seedbanks, pools of viable seed below ground, especially in California grasslands where seedbanks help plants withstand droughts and harsh environments. In this project, we paired a seed burial experiment on 20 annual California grassland species with seed trait measurement to understand how seed traits relate to seedbank persistence and survival. Seeds were buried for one year and are currently being dissected to assess viability. Additionally, we measured a suite of seed traits on these species that we hypothesized could play a role in seed survival including mass, size, shape, and seed coat thickness. We predict that smaller, rounder seeds with thicker seed coats compared to their mass will have higher survival rates, as small round seeds are more easily buried and seeds with thicker coats are more protected from pathogens. This study will clarify which species are likely to form seedbanks by exploring the relationship between seed survival and traits. This information is vital for understanding seedbank persistence and how changing environmental conditions will affect seed survival and biodiversity.

Investigating the Mechanism of P-Rex2 and PTEN Binding Using Chimera Proteins

Chi Phan
Sponsor: Jennifer Cash, Ph.D.
Molecular & Cellular Bio

The mutations of phosphatidylinositol-3,4,5 trisphosphate-dependent Rac exchange factor 2 (P-Rex2) is often associated with diseases like cancer. P-Rex2 is regulated by phosphatase and tensin homologue (PTEN) which is a tumor suppressor that binds and inhibits P-Rex2 through an unclear mechanism. In this study we will determine which P-Rex2 domains are crucial for PTEN to bind to P-Rex2. We hypothesize the pleckstrin homology (PH) domain and the inositol polyphosphate 4-phosphatase-like domain (IP4P subdomain) of P-Rex2 are responsible for facilitating PTEN binding. To determine if these domains are sufficient for PTEN binding, we will generate P-Rex1 chimeras that contain the PH, PDZ2, or IP4P subdomains replaced with P-Rex2 sequence. These constructs will then be expressed in HEK293F cells and characterized for their activity with PTEN. We expect the domains responsible for the P-Rex2 and PTEN binding will inhibit the activity of the P-Rex1 chimera compared to wild-type P-Rex1 which is not inhibited by PTEN. Through this process, we hope to determine sufficiency for PTEN binding to different P-Rex domains. This understanding of the mechanism for PTEN inhibition of P-Rex2 is crucial for possible therapeutic targets for this protein.

Contributions of Spontaneous and Explicit Mental-State Reasoning to Theory of Mind in Middle-Childhood

Tammy Phan
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Decades of research have studied advances in children's social understanding from age 3- to 5-years-old, when children undergo rapid developments in their understanding that our own and others' minds guide behavior in the social world – commonly referred to as "theory of mind". Specifically, children transition from thinking others share the same knowledge, thoughts, and desires (i.e., "mental states") as themselves, to understanding that each person has their own unique mind. However, there remain questions about 1) What social skills in toddlerhood support social developments later in childhood, and 2) How to characterize the trajectory of mental state understanding across childhood? For example, there is some evidence that social understanding may not develop linearly across childhood, and there are open questions about how and whether early social understanding (e.g., sharing visual perspectives) relates to later social understanding (e.g., emotion understanding). The present study addresses these questions using a longitudinal design in which children's social understanding were assessed when children were 2-years-old (N = 214), 3-years-old (N = 159), and 6-years-old (N = 96). The present study focuses on how both eye-gaze and verbal measures of social competency at 2- and 3-years-old relate to social understanding as children at 6-years-old.

Evolution of a Molecular Species Barrier in *Zea mays*

Garnet Phinney
Sponsor: Jeffrey Ross Ibarra, Ph.D.
Evolution & Ecology

In grasses, fertilization is achieved when the male genetic material in the pollen reaches the female genetic material in the pistil. In *Zea mays*, this fertilization is inhibited if the male and female genetic material have incompatible versions of genes referred to as gametophytic factors (GFs). In the case of incompatibility, the pollen tube cannot grow in the correct direction to reach the pistil. It is currently not understood exactly where these factors are in the genome or how they evolved. To better understand this system, we used genome assemblies of 31 different grass genomes, including multiple individuals of *Zea mays* as well as its wild relatives. We used both synteny and homology detection approaches to identify GF loci in each genome. While we find that these loci have been conserved for much longer than previously predicted, we also identify multiple distinct haplotypes across three *Zea mays* subspecies, signaling genetic divergence through various evolutionary events. This project will help us understand the evolution of crossing barriers and speciation in *Zea mays* and other plants and highlight the underlying genomic mechanisms.

Evaluating Sexual Violence Resource Education at University of California, Davis

Jadzia Pho
Sponsor: James Housefield, Ph.D.
Department Of Design

13% of all US graduate and undergraduate students experience sexual violence on college campuses. Given this unfortunate trend, universities have invested heavily in providing resources to educate and aid students. However, resources cannot be utilized if they are not easily accessed. I explore the on-campus and digital resources provided by UC Davis that help students following instances of sexual violence. Research was conducted through qualitative surveys with current UC Davis undergraduate students and interviews with faculty from branches of the UC Davis administration who address sexual violence. Quantitative data was collected through the 2021 UC Davis Harassment & Discrimination Assistance and Prevention Program Annual Report and the 2021 Association of American Universities Campus Climate Survey. I have found that the current resources for students following incidents of sexual violence are inaccessible, especially in times of great stress. The resources, while abundant, are difficult to navigate without previous knowledge about all the different programs and materials. Solutions for improving sexual violence resource aid and education will also be discussed.

Machine Translation for Low-Resource Languages

Jade Phoreman
Sponsor: Raul Aranovich, Ph.D.
Linguistics

Machine translation models generally require a large amount of training data, but thousands of the world's languages are low-resource: they do not currently have a large amount of training data available. This project investigates how to optimally craft a parallel aligned training corpus for a high-resource and low-resource language pair so that the corpus can be as small as possible while maximizing the model's accuracy. The Bible will be our starting point for a parallel corpus due to its availability in thousands of languages and its helpful verse structure for the purposes of alignment. I will be trying to find an optimal and minimal combination of Biblical passages that will maximize coverage of vocabulary and sentence structure for the training data. Additionally, I will experiment with other data augmentation strategies such as part-of-speech (POS) tagging and adding training data from another language related to the low-resource target language. Finding ways to improve machine translation for low-resource languages has the potential to remove language barriers and provide billions of people with greater access to technologies and education.

PCB 11 (3,3′- dichlorobiphenyl) Exposure Alters Epithelial Secretory Cells In the Developing Mouse Lung

Dheya Pillai
Sponsor: Laura Van Winkle, Ph.D.
VM: Anat Physio & Cell Biology

Polychlorinated biphenyls (PCBs) are harmful chemicals which have been a negative impact on the environment and human health, resulting in a partial ban. 3,3'- dichlorobiphenyl (PCB 11) can be formed accidentally during the production pigments and has been found in current industrial products as well as in the air in Chicago primary schools. PCB11 has recently been measured in human blood. The current study tested the hypothesis that developmental PCB 11 exposure alters lung development. Mice were exposed to PCB 11 *in utero* and when nursing via exposed (oral treatment) dams. Lung samples were collected at Postnatal Day (PND) 4, 21, 60. Embedded and sectioned lung tissue was stained using Alcian Blue Periodic Acid-Schiff stain (AB/PAS) to highlight lung mucous. Slides were imaged using brightfield microscopy. Our primary finding was both male and female mice exposed to 1.0 mg/kg PCB 11 at PND 60 had increased AB/PAS-positive cells compared to vehicle-treated controls. Our secondary finding was that PND 4 males had premature intrapulmonary AB/PAS-positive cells in a region that should not have AB/PAS-positive cells at this developmental age. This study suggests PCB 11 exposure causes increased and/or alters secretory cell development in PCB 11 exposed mice.

Investigating the Genetic Mechanism of Rabicano Coat Pattern in Horses

Kathleen Pinder
Sponsor: Rebecca Bellone, Ph.D.
VM: Population Hlth & Reprod

Rabicano is a white spotting pattern in horses characterized by unpigmented hairs interspersed with pigmented hairs in the flank and around the tail. It is thought to be inherited as a dominant trait. A previous study using a whole genome sequencing candidate gene approach identified single nucleotide polymorphisms (SNPs) within a 2 Mb region near *KITLG* that were associated with the rabicano phenotype. Here we aim to refine the associated locus and identify the genetic cause. Investigating short read sequencing data from a rabicano horse identified a 551bp deletion (NC_009171.3:g.14595313_14595864del) downstream of *KITLG* for further interrogation. Genotyping this variant in 97 horses across eight breeds, segregating for rabicano, determined that the deletion was associated with the rabicano phenotype (p=1.2x10-7) but was not as concordant as the SNPs within the initial 2 Mb rabicano associated region (p=6.96x10-9). Genotypes from variants spanning 6.7 Mb, flanking the initial region of association, were used to phase haplotypes in 30 offspring of a rabicano stallion. This approach identified potential recombination events within a 500 kb region which will help guide the selection and evaluation of additional variants to identify the genetic cause of rabicano in horses.

Smells Like...Increased Cancer Risk? Risk Assessment of the Fragrance Ingredient Safrole in Personal Care Products

Lucija Plazibat
Sponsor: M. elizabeth Marder, Ph.D.
Environmental Toxicology

Personal care products sold in California may contain fragrance ingredients that are associated with adverse health effects. One such ingredient is the carcinogen safrole, which has been reported in 205 products in the California Safe Cosmetics Product Database, with concentrations ranging from 0.03-100 ppm. Safrole has also been measured in products on the California market; a recent community-based study found safrole in shampoo, leave-in hair styling, and moisturizer/lotion products at concentrations ranging from 0.3-3275 ppm in analyses of 31 products marketed to Black, Latina, and/or Vietnamese women. This concentration data, along with data about product use, informed estimates of lifetime exposure, which were developed for overall and population-specific users of these products. Previous research has demonstrated evidence of racial/ethnic differences in exposures to such toxic ingredients, with women of color typically being more exposed. These differences in exposure may arise not only from differences in types of products used and frequency of use, but in product composition. Estimates of cancer risk, including aggregate risk, posed by use of safrole as a fragrance ingredient were then calculated based on a cancer potency estimate of 0.22 $(mg/kg\text{-}day)^{-1}$ derived by CalEPA's Office of Environmental Health Hazard Assessment.

Optimization of the Resampling Method in the Weighted Ensemble Simulation Toolkit with Parallelization and Analysis (WESTPA)

Dennis Plotnikov
Sponsor: Surl hee Ahn, Ph.D.
Chemical Engineering

When using molecular dynamics (MD) simulations to study atomic systems, it is difficult to effectively sample rare events since the system tends to stay in the high probability regions of the conformational space. The weighted ensemble method (WE) allows for the sampling of rare events by running many MD trajectories in parallel and has been widely used to study protein folding. WE works by having MD trajectories carry probabilities or "weights" and enforcing equal computational time for high and low probability regions by "resampling," which splits or merges trajectories to maintain a fixed number of trajectories for each region. The Weighted Ensemble Simulation Toolkit with Parallelization and Analysis (WESTPA) software, one of the most popular WE programs, assigns varied weights to trajectories during the resampling process. Since the variance in the trajectories' weights becomes non-zero, the existing resampling method gives statistical errors. Hence, we have optimized resampling by assigning equal weights to trajectories instead, which would minimize statistical errors. We present our implementation and results using our optimized resampling method.

Searching for the *Avr15* Gene in the Lettuce Pathogen *Bremia lactucae*

Gwendolyn Porter
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

Bremia lactucae is a species of oomycete that causes downy mildew disease of lettuce, which severely affects crop production throughout Europe and the United States. Downy Mildew resistance (*Dm*) genes encode receptors in the Nucleotide Binding, Leucine Rich Repeat family. *Dm* genes recognize specific *Bremia* effectors, which triggers the defense pathway, and results in a Hypersensitive Response (HR). A goal of our lab is to identify *Bremia* avirulence effectors that are recognized by *Dm* genes. Previous work in our lab identified two gene candidates for *Avr15* from the *Bremia* isolate C82P24. In this study, I am cloning the gene candidates to be tested for recognition by *Dm15*. The *Avr15* locus is heterozygous in C82P24. This isolate is heterokaryotic and can therefore contain up to four alleles for any gene. I sequenced and phased multiple clones for each gene and have identified five possible alleles per gene. To test for recognition by *Dm15*, I transiently expressed each allele in lettuce lines containing *Dm15* using *Agrobacterium tumefaciens*. In future applications, our research into the interaction between *Avr15* and *Dm15* will be useful for studying the defense pathway in plant-pathogen relationships.

The Role of Demographic Variables on Parent-Infant Behaviors During Naturalistic Puzzle Play

Nikhita Prabhu
Sponsor: Lisa Oakes, M.D.,Ph.D.
Psychology

Over the first year of life, infants come to know an incredible amount about the world around them, and much of this is gained through their daily interactions with their caregivers. Previous work has shown that play provides a deictic context for parents to scaffold the development of infants' sustained, joint attention and language skills. Importantly, these interactions are also influenced by other characteristics of the dyad, such as exposure to multiple languages in the home. In this project, we will analyze a dataset examining parent-infant naturalistic play. Both parents and infants wore head-mounted eye trackers to document the eye-gaze of 53 9-month-old infants (17 females, 36 males) and their parents during a 3-minute puzzle-play task. Infants and their parents were presented with an age-appropriate puzzle. They were instructed to play as they would at home. We coded both parents' and infants' looks to their partner's face, partner's hand, and the puzzle and parents' speech was transcribed. We also collected demographic information, such as the languages spoken in the home, parental education, and infant sex. Our analysis will focus on the impact of these demographics on parental input and visual attention during puzzle play.

Effect of *trans*-Vaccenic acid on Insulin-Mediated Akt Activation in a Mouse Model of Diet-Induced Obesity and Insulin Resistance

Christopher Prajogo
Sponsor: Payam Vahmani, Ph.D.
Animal Science

Recent government bans on industrial trans fatty acids (TFA) in developed countries have left ruminant products (e.g., dairy and beef) as the sole source of TFA in the food supply. In contrast to industrial TFA, previous studies have associated trans-vaccenic acid (TVA), the predominant TFA isomer in ruminant products, with a reduced risk of type 2 diabetes. This study addressed the hypothesis that supplementing a high-fat diet (HFD) with TVA may help to improve glucose homeostasis by activating insulin signaling pathways. Thirty-six male mice were fed either a low-fat diet (LFD), a control HFD (HFD-C), or a HFD enriched with TVA (HFD-TVA) for 19 weeks. Following the dietary intervention, the metabolic phenotype was characterized using glucose tolerance test (GTT) and insulin tolerance test (ITT). Liver, muscle, and adipose tissues were harvested and analyzed for protein kinase B (Akt) phosphorylation level by western blot. HFD-TVA did not improve glucose tolerance or insulin sensitivity compared to HFD-C. When compared with the LFD group, the HFD-TVA group showed greater glucose intolerance, complemented by a lower level of Akt phosphorylation in the muscle and liver. In conclusion, our finding suggests that TVA does not improve glucose homeostasis nor insulin-mediated Akt activation in insulin-sensitive tissues.

Are Undergraduate Research Journals Worth it? An Assessment of Benefits to Students of Participation in Undergraduate Research Journals

Vishwanath Prathikanti
Sponsor: Sean Burgess, Ph.D.
Molecular & Cellular Bio

Most universities support undergraduate research journals (URJs), either a faculty-run journal and/or a student-run journal. Previous studies have focused on the experience of student writers on URJs whose editorial board consisted of faculty, and little is known of the student experience and impact of participation on fully student-run URJs. The purpose of this project is to analyze the goals and skills college students acquire through participating in undergraduate research journals and help flesh out the question of whether or not URJs are useful for students on a broader scale. The study presented is a pilot study on UCD's URJ, the Aggie Transcript (AT). Data was obtained through a 10-minute questionnaire administered to members of the editorial board and graphic design team. The majority of students on the AT stated that they were either overwhelmingly or generally positive regarding their experiences with the AT. This is in contrast to previous studies on student-run journals, where editors generally believed their experiences had little impact on their future careers and lives. For AT members, the mean values for “What skills did your journal provide for your future career” were around 50-60 on a scale of 1-100, indicating the impact may not be dramatic.

The Moderating Effects of Gender on Social Support as a Protective Factor Against Adolescent Suicide

Adam Pratt
Sponsor: Robert Faris, Ph.D.
Sociology

Suicide remains both a leading cause of death among adolescents and a highly gendered issue with men committing suicide at greater rates but women displaying higher rates of suicidal behaviors. Social support has been shown to be an important protective factor, being able to act as a buffer against suicide and suicidal behaviors. This project intends to examine how gender moderates the relationship between social support and suicide among adolescents and seeks to understand how social support’s ability as a protective factor is affected by gender in both its prevalence and effectiveness. Using a longitudinal survey dataset unique relationships between social networks, gender, and suicide can be created and analyzed with a logistic regression model. This analysis will help create a better understanding of how gender impacts the ability of social support to buffer against suicide which can help equip adolescent mental health programs with better knowledge of the important roles social support and gender play in preventing suicide.

Causative Factors of Obesity: Challenging Pre-Health Students to Investigate the Social, Biological, and Genetic Aspects of Obesity

Ofelia Preciado
Sponsor: Brie Tripp, Ph.D.
Neuro Physio & Behavior

Discrimination against obese individuals in the United States is ubiquitous, particularly within the medical field. One way to mitigate implicit bias of future healthcare workers is to introduce undergraduate pre-health students to social determinants of health regarding obesity through Social Justice in Science (SJS) case studies. We developed a case study that had students explore the physiological mechanisms and social factors that contribute to obesity (poverty, redlining, food deserts, and hormonal imbalance. To pilot this case study, we administered a survey to collect the perspectives from 180 pre-health students enrolled in an advanced physiology course at UC Davis in spring 2022. Students read the case study and provided perspectives on (1) the cultural sensitivity and (2) appropriateness of learning social justice issues in a physiology class. We employed content analysis–an evidence-based qualitative method–to create themes that surfaced from each survey question, and then quantified the occurrence of responses that belonged to each theme. Our results indicated that 90.6% of students viewed our case study as culturally sensitive to obese populations and 87% indicated it was appropriate to learn about obesity discrimination in a science course. We intend to pilot this case study in spring 2023 in the same course.

Pubertal Dihydrotesterone (DHT) Effects on Social Stress in California Mice

Zhana Prince
Sponsor: Brian Trainor, Ph.D.
Psychology

Vigilance is a key component of behavioral inhibition, a personality trait that is a risk factor for anxiety disorders. In rodents, this is usually seen as an individual orienting to an unfamiliar individual without approaching. Previous research has shown that compared to males, female California mice had reduced social approach and increased vigilance for a longer period of time after exposure to the stressful social environment. In males, exposure to androgens such as testosterone or DHT during puberty are responsible for the weaker responses to social stress. We hypothesize that the introduction of DHT during adolescence in females will result in behaviors that mimic those of male control mice in the previous studies. Prior to puberty, we inserted a subcutaneous implant, that was either empty or contained DHT. We then observed social approach behaviors both before and after social defeat stress. Before stress mice that were treated with the DHT implants had similar behavior as controls. After stress, DHT treated mice exhibited increased social approach and decreased vigilance compared to controls. These results suggest the presence of DHT during puberty causes the difference in anxiety behaviors between the sexes and that androgens affect the neural circuits involved in anxiety.

Macrophages in Olfactory Epithelium Upon Pathogen Exposure

Emma Proctor
Sponsor: Qizhi Gong, Ph.D.
MED: Cell Biology & Human Anat

The body is always under attack from microbes and pathogens in the outside world, which the nasal cavity is constantly exposed to. However, the innate immune capacity of the olfactory epithelium has not been well studied. The olfactory epithelium harbors resident macrophages which phagocytize invading pathogens as well as cell debris from continuous neurogenesis. When there is viral pathogen exposure, there is a dramatic infiltration of activated macrophages. However, the origin of these macrophages remains unclear. The macrophages may be from the resident population already in the tissue, or differentiated from circulating monocytes. By invoking an immune response from the olfactory epithelium with poly IC, a viral mimic, we were able to observe macrophage distribution through the use of immunocytochemistry. We also examined the olfactory epithelium after SARS-CoV-2 infection and analyzed the prevalent distribution of macrophage activation. Further, by utilizing a double transgenic mouse model (Ccr2[RFP]Cx3cr1[GFP]) we tracked the population of infiltrating monocytes versus resident macrophages. We are currently analyzing the proportion of activated macrophages which are differentiated from infiltrating monocytes.

Synchronization of Digital Fireflies

Liana Pruyn Goldstein
Sponsor: Daisuke Sato, Ph.D.
MED: Pharmacology

Synchronization is a universal phenomenon in natural, physical, and mechanical systems. For example, cardiac pacemaker cells are not the same at the cellular level. But when they are coupled, they generate synchronized signals in the heart. Synchronization of fireflies is another example of this, in nature. These systems are not controlled by a command cell or command firefly, but rather synchronization occurs due to entrainment of nonlinear oscillators. In this presentation, we will demonstrate synchronization of mechanical fireflies, through a physical circuit model. The fireflies are built using Arduino, LEDs, and light sensors. The body of the firefly is designed and built using 3D CAD software and the stereolithography 3D printer. We use a mathematical model of the nonlinear oscillator, which is simulated in Arduino using Pulse Width Modulation. Each firefly emits light from LEDs based on its own oscillation, and then receives light from the other fireflies. The signal from the other fireflies affects the timing of the oscillation, becoming a pulse coupled oscillator. Even when signals from multiple fireflies are initially randomly, as time goes, they synchronize, a phenomenon that will also be shown in our presentation.

Utilizing AI to Detect Wildlife in Trail Camera Images

Brinda Puri
Sponsor: Gary Bucciarelli, Ph.D.
Natural Reserve System

Trail cameras capture images of wildlife by detecting changes in heat or motion. A known issue is that trail cameras generate huge volumes of data and have an abundance of noise or irrelevant data. This causes researchers to use a vast amount of time and resources to sort through the images manually. We hope to reduce this burden by using images collected from the University of California Natural Reserve System (UCNRS) to create a user-friendly pipeline and identify metrics that could eventually be used to detect wildlife all over California. We plan to use deep convolutional neural network models to first determine if animals appear in an image or not, and then we will research more advanced deep learning strategies to classify animals in the given image. This will have a significant impact on protecting wildlife as it optimizes the work flow of researchers, enabling better detection of animals and better population estimates for endangered and at-risk species. We believe this image analysis pipeline will help create better protection and policy measures for wildlife conservation.

Utilizing AI to Detect Wildlife in Trail Camera Images

Zhantong Qiu
Sponsor: Gary Bucciarelli, Ph.D.
Natural Reserve System

Trail cameras capture images of wildlife by detecting changes in heat or motion. A known issue is that trail cameras generate huge volumes of data and have an abundance of noise or irrelevant data. This causes researchers to use a vast amount of time and resources to sort through the images manually. We hope to reduce this burden by using images collected from the University of California Natural Reserve System (UCNRS) to create a user-friendly pipeline and identify metrics that could eventually be used to detect wildlife all over California. We plan to use deep convolutional neural network models to first determine if animals appear in an image or not, and then we will research more advanced deep learning strategies to classify animals in the given image. This will have a significant impact on protecting wildlife as it optimizes the work flow of researchers, enabling better detection of animals and better population estimates for endangered and at-risk species. We believe this image analysis pipeline will help create better protection and policy measures for wildlife conservation.

UC Davis College Students' Understanding of Positive and Negative Cat Behavior

Yuqi Quan
Sponsor: Carly Moody, Ph.D.
Animal Science

Cats are the most numerous pet in the US. It's important cat owners are able to interpret cat behavior, as behavioral changes are often the first sign of a health concern. However, cat behaviors are often more subtle and difficult to read compared to dogs, and little research has looked at recognition of these behaviors in non-professionals like college students. The purpose of this study is to determine how well UC Davis college students can distinguish between positive and negative behaviors in domestic cats. This will be done through an online survey with several demographic questions and 10 videos of cat-cat interactions. Participants will be asked to rate the interactions from extremely negative to extremely positive, and the results will be compared to cat behavior expert scores. We hypothesize that students will be better at recognizing positive behavior compared to negative behavior, and that students with professional experience with cats would be better at reading cat behavior than students without professional experience with cats. As many college students may own or work with cats now or in the future, the results of this study may be useful in determining whether further education on pet behavior is necessary for students.

Detecting Propaganda on Twitter using Text Classification and User Metadata Analysis

Arnib Quazi
Sponsor: Setareh Rafatirad, Ph.D.
Engr Computer Science

Detecting propaganda, misinformation, and fake news in social media is indispensable in understanding the role they play in polarizing public discourse. However, due to the exponentially increasing rate of data generation on social media, relying on human manual detection is no longer a feasible approach. We need automated mechanisms to help identify propaganda and misinformation. In this work, we propose a framework that leverages the latest in Natural Language Processing (NLP) techniques for identifying propaganda in tweets. Our proposed framework combines the usage of text classifiers on tweet text data and supervised learning algorithms on user metadata such as user location or account age. Using the Russia-Ukraine War as a case study, we are exploring different ways of augmenting existing NLP transformers to recognize patterns in tweets that could either be Russian government propaganda or impartial news reporting on the conflict. We expect that by combining the insights from our augmented NLP transformers with user metadata analysis we can holistically evaluate a tweet with more context than currently existing solutions. Thus, paving the way for more robust content moderation tools that can reduce the harm done to public discourse caused by hostile propaganda campaigns.

Examining Gender Ideologies And Partner Preferences

Guadalupe Quezada
Sponsor: Paul Eastwick, Ph.D.
Psychology

The Ambivalent Sexism Model suggests that there are stereotypes that set up gender based hierarchies amongst men and women. The sub-components of ambivalent sexism generate separate but equally harmful stereotypical gender attributes that contribute to this hierarchy. Hostile sexism creates a negative perception of those who go against the stereotypical or traditional norms that are assigned to each gender. In like manner, benevolent sexism lays out the framework of how each gender should behave and what roles they should adopt. Although benevolent sexism can be seen as a positive form of sexism, it nonetheless promotes inferiority toward women. In similar comparison, religious institutions are shown to parallel the majority of these gender ideologies. Previous research indicates that individuals who value religion tend to value more conservative ideals such as tradition and sticking to the gender status quo, seemingly adhering to ambivalent sexism. This study seeks to analyze these parallels in the context of relationships to further investigate whether partners who report higher levels of ambivalent sexism, also choose partners with traditional mate preferences. In order to research this, we will use the ASI and AMI scale (Glick & Fiske 1996) in order to compare gender differences and sexist attitudes.

Exploring the Development of Spatial Play and the Role of Experience in 24- to 42-Month-Old Children Using a Hape Shape Sorter

Franchesca Quintero
Sponsor: Lisa Oakes, Ph.D.
Psychology

Spatial play is an essential form of play that is associated with the development of cognitive skills, such as mental rotation, spatial awareness, and language (Jirout & Newcombe, 2015, Mo?hring & Frick, 2013; Walle & Campos, 2014). Bambha et al. (2022) found that across the period from 12 to 48 months, children became more accurate at inserting 3D shapes into a shape sorter. The current project seeks to extend the previous study by examining the accuracy of object insertions in a sample of fifty-eight 24- to 42-month-old children. Participants were presented with a shape sorter and six corresponding solid shapes (circle, square, hexagon, triangle, trapezoid, and semicircle). We also asked parents to complete a questionnaire about their children's experience with spatial toys (e.g., puzzles, blocks). We hypothesize that older children and children with more spatial toy experience will show a higher proportion of correct object insertions, specifically for asymmetrical solids. These results will help us gain more insight into how age and spatial toy experience contribute to the development of cognitive abilities such as mental rotation and spatial skills.

Influence of Ketogenic Diet on Lactate Metabolism in Brain

Kelsey Racacho
Sponsor: Jon Ramsey, Ph.D.
VM: Molecular Bio Sciences

A control mouse diet (CD) frequently consists of high carbohydrate, moderate protein, and low fat, and glucose is the main fuel source for the brain. In contrast, a ketogenic diet (KD) consisting of high fat, moderate protein, and low carbohydrates results in the production of ketones that serve as an alternate fuel source for the brain. Lactate is also a known energy source that can be synthesized from glucose and utilized by the brain. Lactate dehydrogenase (LDH) is an enzyme involved in lactate metabolism, converting pyruvate to lactate, and in aged mice, it has been shown to have increased activity. The link between aging and lactate production in the brain of mice is not well established. We hypothesize that mice on KD have decreased lactate abundance and LDH activity in the brain because ketones, serving as a substitute energy source, will decrease the reliance of tissues on glucose. To test this hypothesis, we measured and compared LDH activity and lactate quantities in mouse brain between a CD and KD using colorimetric assays. Lactate quantification will allow us to determine if a KD can alter brain lactate levels as well as determine LDH activity in the pathway of lactate production.

Differences in Rates of Neural Proliferation During Developmental Neurogenesis in *Chd8* Haploinsufficient Mice

Darlene Rahbarian
Sponsor: Cesar patricio Canales Martinez, Ph.D.
MED: Psychiatry & Behav Sci

De novo mutations in the chromatin-remodeling factor CHD8 (Chromodomain-Helicase DNA-binding protein 8) are strongly associated with autism spectrum disorder (ASD). CHD8 is a transcription factor responsible for regulating critical gene expression networks during prenatal growth including neurogenesis, a process where neurons are produced. Mutations in Chd8 ultimately affect cortical development resulting in autism-like phenotypes, one of them being an abnormal overgrowth of the brain, or macrocephaly. However, whether alterations in neuronal proliferation persist across brain development remains unknown. Here, I hypothesized that a time course analysis of cell cycle dynamics during prenatal neurogenesis will reveal alterations to the cell cycle that will persist across the examined developmental window in the Chd8 haploinsufficient mice, resulting in accelerated neuronal proliferation rates throughout embryonic (E) time-points at E11.5, E15.5, and E17.5. To accomplish this, I time-bred the experimental groups of mice, performed EdU pulse-chase procedures, immunohistochemistry (IHC), and quantification to determine cell proliferation rates and cell cycle differences between the analyzed groups. Experiments are currently ongoing and my results, when completed, will be important in establishing correlations with the causal biology behind macrocephaly in CHD8 ASD patients, contributing with insights for future therapeutic strategies for ASD.

The Last of Arabidops(us): Modeling Plant-Fungal Interactions via the Shikimate Pathway

Gurshan Rai
Sponsor: Daniel Kliebenstein, Ph.D.
Plant Sciences

Botrytis cinerea is a generalist fungal pathogen that causes millions of dollars of crop damage every year. Using *Arabidopsis thaliana*, we sought to understand the role of metabolism gene regulation in controlling plant resistance. By modulating the promoter elements of the Shikimate Pathway, we sought to test how regulation of this key primary metabolism pathway influences the production of the specialized defense metabolites; camalexin, lignin, and glucosinolates. We tested eight Arabidopsis Crispr-edited lines with insertions or deletions in the promoter region of enzymes of the Shikimate Pathway with eight strains of Botrytis with either high or low Botrydial, a phytotoxin. Previous work suggested that Botrydial induces the Shikimate Pathway via a collection of MYB transcription factors that bind a specific sequence in the promoters. To test if the promoter mutants disconnect the Shikimate Pathway from the pathogen's Botrydial production, we conducted a detached leaf assay to measure relative leaf and lesion size on the mutants using digital image analysis. Our preliminary findings indicate Botrydial had no effect on pathogenicity. Furthermore, mutations to the MYBelement and evening element promoters affected plant defense and overall development. This work highlights the influence of regulatory elements in plant defense.

Investigating the Role of Pdzrn3 Knockout on Pancreatic Cancer Metastasis

Neha Ramesh
Sponsor: Changil Hwang, D.V.M.,Ph.D.
Microbiology & Molec Genetics

Pancreatic ductal adenocarcinoma (PDA) is the third leading cause of cancer related deaths in the United States, with a 12% survival rate. Although most patients are diagnosed at the metastasis stage, molecular mechanisms of PDAC metastasis are poorly understood. We have previously found that Pdzrn3 is lowly expressed in PDAC metastasis and that low Pdzrn3 expression is a prognostic indicator of poor patient survival. Pdzrn3 is a ubiquitin ligase that regulates the non-canonical Wnt/PCP pathway, which has been implicated in tumor cell migration by facilitating cytoskeletal rearrangements. However, the role of Pdzrn3 in PDAC metastasis is largely unknown. I hypothesize that knockout (KO) of Pdzrn3 promotes metastasis by encouraging filopodia formation. To test this hypothesis, I will be using immunofluorescence staining of F-actin to assess the cell morphology of Pdzrn3 KO tumor cells. I expect that Pdzrn3 KO cells have more and longer filopodia compared to non-targeting control cells.

Repeated Aggressive Territorial Defense in Sexually Naïve California Mice Induces Stress-Like Behaviors

Alison Ramirez
Sponsor: Brian Trainor, Ph.D.
Psychology

Defending a territory often requires the use of aggression to fend off intruders. Typically this behavior is seen in male and not females, but the California mouse (*Peromyscus californicus*) allows us to study this in both sexes as both sexes engage in aggressive territorial defense. While previous studies conducted showed that female California mice engage in this behavior, little is understood about the neural mechanisms involved. Thus, this study aims to examine behavioral and neural changes sexually naïve male and female California mice experience when exposed to different levels of territorial aggression via resident-intruder tests. Contrary to previous studies, in both sexes we observed that repeated territorial intrusions resulted in increased stress-like behaviors over aggressive ones and animals became more hesitant to engage with intruders over time. These results suggest that repeated aggressive territorial defense is stress inducing for our mice. Overall, our research helps provide us with a deeper understanding of how high stress social interactions can impact individual behavior.

Proper Temperature Cycling Promotes Longevity in *Drosophila melanogaster*

Richard Ramolete
Sponsor: Fumika Namekawa, Ph.D.
Neuro Physio & Behavior

Previous scientific research suggests that circadian rhythms are often affected by environmental temperature. As an ectotherm, internal temperature regulation in *Drosophila melanogaster* is dependent on its external environment, allowing us to consider the impact of body temperature. Body temperature rhythm plays an important role in homeostasis in *D. melanogaster*. Would maintenance of a constant temperature or a proper cycle of temperatures support a longer lifespan? Based on our past research on the temperature preference rhythms (TPR) of *D. melanogaster*, we investigated the effect during day (7AM-7PM) and night (7PM-7AM) phases of the proper temperature cycle (TPTC, 21°C:27°C:21°C at 7AM:7PM:7AM), inversed temperature cycle (TITC, 27°C:21°C:27°C at 7AM:7PM:7AM), and constant temperature (TC, 25°C at all times) on the lifespan of *D. melanogaster.* Unexpectedly, *D. melanogaster* incubated at TPTC displayed a longer lifespan than those at TC. Incubation at TITC and TC presented a similar pattern of longevity. The results propose the attribution of the longevity of *D. melanogaster* to a thermally affiliated gene intrinsically linked to its circadian rhythm.

Demystifying the Link Between Restoration Activities and Functional Fish Habitat in Tidal Wetlands

Alejandro Ramos Hurtado
Sponsor: Andrew Rypel, Ph.D.
Wildlife & Fisheries Biology

Large scale restoration is currently underway in the San Francisco Estuary and seeks to increase shallow nursery habitat for several imperiled fish species. These projects cost millions of dollars but highly dynamic tides obscure efforts to measure their intended impact. Thus, despite enormous expense, there is little certainty that restoration will engender desired habitat attributes for the conservation of targeted fishes. I seek to resolve this ambiguity by measuring tidal inundation patterns across space and time. This information, along with fish depth and mobility thresholds, will be used to generate site-specific estimates of habitat availability and accessibility for endangered Chinook salmon smolts. Next, I'll compare these metrics, which integrate habitat conditions across space and time, to static morphometric features currently understood to influence fish nursery function. Doing so will help determine if my novel habitat metrics can corroborate, and possibly extend, existing knowledge regarding how tidal wetland landform influences functional fish habitat.

Targeting EN1-Associated Proteins in Pancreatic Ductal Adenocarcinoma

Shounak Ranabhor
Sponsor: Changil Hwang, D.V.M.,Ph.D.
Microbiology & Molec Genetics

Pancreatic cancer is the third-leading cause of cancer-related deaths in the United States. Pancreatic ductal adenocarcinoma (PDA) is the most common and challenging form of pancreas due to resistance to current chemotherapies. To develop novel therapeutics treating PDA, we previously identified a homeobox transcription factor engrailed-1 (EN1) associated with aggressive PDA phenotypes. Clonogenic assays with PaTu8988s and CFPAC-1 indicated EN1 overexpression promoted cell survival. To elucidate how EN1 governs gene expression, we performed nuclear co-immunoprecipitation followed by mass spectrometry and identified several epigenetic remodelers that interact with EN1, including BRD8, WDR5, and EZH2. Based on this finding, I hypothesize that EN1 recruits the identified proteins to regulate the expression of EN1 target genes, therefore targeting EN1-interacting proteins will attenuate the PDA progression and metastasis. To test this hypothesis, I will target SIRT7, SINHCAF, WDR5, KAT2A, EZH2, and MORF4L2 using small molecule inhibitors and perform clonogenic assays using human and murine PDA cell lines that overexpressed EN1. This study will pave the road toward the development of an effective therapeutic regimen in treating PDA patients and improve patients' survival outcomes.

Compensation Training and Lifestyle Modifications to Promote Healthy Aging in Persons at Risk for Alzheimer's Disease: A Digital Application Supported Intervention

Jagnoor Randhawa
Sponsor: Sarah Tomaszewski Farias, Ph.D.
MED: Neurology

'Brain Boosters' is a novel combined compensatory training and lifestyle modification intervention aimed at Alzheimer's disease (AD) risk reduction. Training in compensation will focus on a calendar and tracking system, organizational strategies, and goal setting, all aimed at supporting independent function. An easy-to-use, interactive application, Electronic Memory and Management Aid (EMMA) will be used to facilitate behavioral change and enhance participant motivation. To capitalize on a critical window of opportunity to intervene, we will target cognitively normal older adults with subjective cognitive concerns (SCC), an established risk for AD and cognitive impairment. The trial will enroll 200 older adults with SCC who will be randomized to our digital application-supported compensation training and lifestyle modification intervention, or to an education-only control group that will not use the EMMA app or be taught how to implement the educational material into their daily lives. Both intervention arms will be delivered in a group setting over 6 months, followed by 12 months of unsupervised follow-up. The project is expected to expand understanding of factors that may impact adherence to and outcomes of a preventative intervention leading to optimization of a scalable intervention to reduce dementia risk applicable to diverse populations.

Comparison of Infrared and Visual Imaging Technology for Guidance, Navigation, and Control of CubeSats

Shuban Ranganath
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

The Cubesat is a cost-effective platform to test and develop flight hardware while encouraging engineering, collaboration, and education. The Human, Robotics, Vehicles Integration and Performance Laboratory (HRVIP) at UC Davis is researching the use of CubeSats for routine spacecraft inspection tasks, thereby eliminating serious hazards for humans by utilizing automation for damage inspection. This research project compares the effectiveness of infrared (IR) and visual imaging technology for navigation and guidance on CubeSats to determine the best option for future inspection space missions. IR images retain shape information while reducing glare, an issue with visual images in orbit. However, IR images do not have the color or texture information that visual images contain. Experiments are conducted using IR and visual imaging technology and the data is analyzed to determine which option yields greater accuracy with object detection. Additionally, the feasibility of using IR images on models trained with visual data is explored. The study also examines each technology's potential benefits and drawbacks, including cost, performance, and reliability. The findings of this study have potential significant implications for the design and implementation of future inspection CubeSat missions, particularly those that involve object detection and tracking.

Utilizing AI to Detect Wildlife in Trail Camera Images

Shuban Ranganath
Sponsor: Gary Bucciarelli, Ph.D.
Natural Reserve System

Trail cameras capture images of wildlife by detecting changes in heat or motion. A known issue is that trail cameras generate huge volumes of data and have an abundance of noise or irrelevant data. This causes researchers to use a vast amount of time and resources to sort through the images manually. We hope to reduce this burden by using images collected from the University of California Natural Reserve System (UCNRS) to create a user-friendly pipeline and identify metrics that could eventually be used to detect wildlife all over California. We plan to use deep convolutional neural network models to first determine if animals appear in an image or not, and then we will research more advanced deep learning strategies to classify animals in the given image. This will have a significant impact on protecting wildlife as it optimizes the work flow of researchers, enabling better detection of animals and better population estimates for endangered and at-risk species. We believe this image analysis pipeline will help create better protection and policy measures for wildlife conservation.

Exploration of Enzyme Heat Capacity Changes Using Molecular Dynamics Simulations

Griffin Rangel
Sponsor: Michael Toney, Ph.D.
Chemistry

Chemical reaction rates, including enzyme catalyzed reactions, increase exponentially with temperature. A plot of ln k vs 1/T gives a straight line for nonenzymatic reactions, but many enzymes show curvature in this plot. We are examining the origin of this curvature, which we believe to be the involvement of enzyme motions in catalytic events. Some have argued that denaturation (enzyme unfolding) is insufficient to account for this curvature. As a result, two primary hypotheses have emerged to explain this phenomenon. The first argues for a large heat capacity difference between the ground state and the transition state. The second argues for the presence of inactive states along the reaction pathway. Molecular dynamics simulations, supported by experimental work, may offer unique insight into the underlying causes of this phenomenon. We are using molecular dynamics simulations to calculate differences in heat capacity between ground and transition state structures and comparing these to experimental values measured in our lab. If agreement is found, then we can interpret the differences in dynamics in terms of how enzyme motions facilitate catalysis.

Increasing Regeneration Efficiency to Enhance the Production of Transgenic Lettuce Plants by Co-transformation with GRF-GIF Fusions

Megan Reeves
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

Agrobacterium mediated transformation is a common method in plant research to edit and regenerate plants. However, regeneration efficiency varies across species and varieties. Growth regulatory factors (GRFs) have a key role in plant development, which is enhanced by GRF-Interacting Factors (GIFs). GRF-GIF fusions have been shown to promote plant regeneration. In this study, we tested GRF-GIF chimeric proteins from different plant species for their ability to enhance regeneration in multiple lettuce genotypes. One genotype tested, Armenian999, was known to be inefficient at regeneration. We found that the GRF-GIF fusion from grape with a mutation that renders it resistant to regulation by miR396 (rGrape GRF-GIF) demonstrated the highest stimulation of regeneration, especially in Arm999. We then tested whether co-transformation with rGrape GRF-GIF, followed by different antibiotic selections increased regeneration activity in Armenian999 yielded more transgenic plants with a gene of interest than the controls. Through this study, we determined that co-transformation of a gene of interest along with rGrape GRF-GIF, followed by antibiotic selection for only the T-DNA with the gene of interest increases both regeneration and the recovery of transgenic plants. We conclude that this is an efficient strategy for boosting the production of transgenic lettuce plants from recalcitrant genotypes.

Can Machine Learning predict Mutation Rates of CRISPR Guide Sequences used to edit Plant Genes?

Peter Reifenstein
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

CRISPR Cas-9 is an effective tool to test the function of genes in plants. By inserting the Cas-9 gene and guide sequence into plant tissue using *Agrobacterium*, the expressed Cas-9 protein will cut the plant's DNA in any regions that match the guide. After the cell repairs the double stranded break using non-homologous end joining, the gene will be mutated and cannot function. The phenotype can then be compared to a normal plant's to determine the gene's function. When designing an experiment, researchers are presented with many possible guide sequences targeting their gene of interest. However, different guide sequences have proven to vary in mutation effectiveness, so it is useful to have a prediction of which one(s) are most likely to introduce mutations. Many predictor algorithms already exist, but as they are trained using data from CRISPR experiments with animals, they have been shown to not predict guide effectiveness well in plants. The goal of this project is to train a neural network to predict the mutation rate of guide sequences in plants using a newly gathered set of training data.

Impact of Microplastics on Protozoan Pathogen Acquisition by Shellfish

Chloe Resngit
Sponsor: Karen Shapiro, D.V.M.,Ph.D.
VM: Pathology, Micro, & Immun

Concern for microplastic consumption has risen because microplastics can be found in many foods especially in seafood. Contamination of protozoan parasites via microplastic transport in seafood is an important food safety and wildlife health concern and we aim to explore whether microplastics can increase the presence of *Toxoplasma, Cryptosporidium,* and *Giardia* in shellfish by "hitchhiking" within the microplastic biofilm. To achieve this, oysters were experimentally contaminated by exposure to target pathogens under the presence or absence of microplastic fibers in static aquaria. After acute exposure, oysters were transferred to flow-through clean seawater tanks and sampled periodically for pathogen enumeration. Immunomagnetic separation (IMS), direct fluorescent antibody (DFA), and membrane filtration (MF) were then used to quantify protozoan parasites using a fluorescence microscope. Preliminary data suggests that protozoa within microplastic biofilms may lead to higher contamination in oysters when compared with oysters that were exposed only to protozoa. Pathogenic protozoan presence in food and possible increased contamination due to microplastics demonstrate the gravity of microplastics as a threat to safe seafood consumption. Results will lead to better understanding of the ecological and anthropogenic influences of protozoan contamination in seafood in order to improve coastal sustainability and human health.

Balancing *Familismo* and Ambition: The Distinct Experience of Career-Decision Making for First-Generation Latina College Students

Xochil Reyes-Morales
Sponsor: Monica Torreiro-Casal, Ph.D.
Chicano Studies

In this study, I am investigating the particular relationship among *familismo* values, balancing career ambitions, and Latinas resulting career decisions. In the literature about first-generation Latina academic success and *familismo* values, we see the positive effects *familismo* has on college success but its effects on ambition, career-making, and the Latina experience of balancing such events need to be further investigated. In this study, *testimonios* will be used and collected from graduating first-generation Latina college students. Their *testimonios* will focus on their experience upholding *familismo* values, its conflict, and its influence on their career ambitions. We expect that *familismo* values contribute to feelings of isolation, guilt, fear of disrupting family belonging, and conflicting priorities. We also expect positive contributions like family motivation, inspiration, and Latinas as trailblazers. The findings from this study aim to highlight the experiences of first-generation Latina navigating *familismo* values and their career ambitions, in order to have a better understanding of the conflicts and considerations Latinas experience when deciding about their future.

A Novel Method for Whole-Mount Volume Imaging of the Nasal Cavity

Emily Ripperdan
Sponsor: Qizhi Gong, Ph.D.
MED: Cell Biology & Human Anat

Odors in the environment are detected by olfactory sensory neurons (OSNs) in the olfactory epithelium (OE). The OE is a sheet of neuroepithelium wrapped around turbinates in the nasal cavity, and is constantly exposed to environmental pathogens that could cause OSN damage. Due to its convoluted morphology, it is challenging to describe and quantify cellular and molecular changes in the OE. Recent tissue clearing and visualization techniques have presented a promising method to study histological changes in the OE. To identify OSN apoptosis and macrophage activation under viral infection, we adopted and modified the iDISCO/iDISCO (ace) tissue clearing methods to achieve clearing of the whole nasal cavity with bony turbinates for the purpose of whole-mount immunostaining and volumetric imaging. The cleared nasal tissues are immunostained for apoptotic markers or carry transgenic reporters, and imaged using Zeiss Lattice Lightsheet 7. Using Imaris software, we are able to 3D render the nasal cavity to quantify the number and spread of apoptotic cell nuclei of the OSNs and visualize macrophages in reporter mice. This modified nasal tissue clearing technique has great prospects to be used in characterizing spatial and quantitative changes in the OE in viral infection and neurodegenerative disease mouse models.

Characterization of Fibril Formation by Disease Mutants of the Intrinsically Disordered Domain of the RNA-Binding Protein TIA-1

Nicholas Robertson
Sponsor: Dylan Murray, Ph.D.
Chemistry

T-cell restricted intracellular antigen-1 (TIA-1) is an RNA binding protein consisting of three RNA recognition motifs and a C-terminal intrinsically disordered low-complexity domain (LCD). Mutations in this region have been associated with neurodegenerative diseases such as amyotrophic lateral sclerosis and frontotemporal dementia. TIA-1 forms membrane-less organelles called stress granules that sequester mRNA when the cell is under stress. Disease associated mutations in the LCD cause the stress granules to irreversibly rigidify and form fibrils which is the pathology associated with the diseases. My research focuses on characterizing how disease mutations alter which segments of the LCD form rigid structures and stabilize structures formed by the wild type protein. The Murray Laboratory is using solid state nuclear magnetic resonance and kinetic assays to inform on how disease mutations might accelerate the formation of disease pathology. Here, I present my efforts to optimize and express sufficient quantities of three mutants for nuclear magnetic resonance and kinetic experiments. Future research will focus on obtaining an atomic resolution structure for the mutant fibrils for comparison to the fibril structure of the wild type protein.

Management of Ducks in Backyard and Small-Scale Production Flocks

Madison Rodriguez
Sponsor: Maja Makagon-Stuart, Ph.D.
Animal Science

Owning ducks in backyard or small-scale environments is popular, yet the amount of information related to the housing and welfare of ducks within these environments is significantly lacking. To fill this knowledge gap, our study aims to collect information about duck management practices in these small-scale environments within the United States. In our survey, small-scale flocks are defined as flocks with less than five thousand ducks per flock. We have launched a survey to identify the reasons for ownership of ducks, assess the common housing and management practices, find out owners' perceptions of key duck welfare issues, and identify areas of needed support among backyard and small-scale flock owners. The survey was circulated amongst online forums for backyard enthusiasts and various other interest groups centered around ducks, using the snowball sampling method. This will guide the creation of future educational tools, outreach, or extended research that can minimize management issues while maximizing duck welfare.

Dr. BOT: Using AI to Bridge Communication Gaps and Prevent Missed Diagnoses in Healthcare

Michael Rourke
Sponsor: Prabhu Shankar, M.D.
MED: Public Health Sciences

The aim of this project is to address the issue of missed medical diagnoses due to miscommunications or underreporting during doctor visits. Many patients lack detailed medical literacy, which can result in unreported signs, potentially leading to serious, even deadly, consequences. Using Chat GPT, the project seeks to create a system that generates unbiased questions and a list of potential diagnoses for patients. The proposed method would create prompts, pinpointing symptoms or signs that patients may struggle to express. It would then put the results from these questions into a database of various diseases, flagging for one if certain combinations of answers were put together. This system would not only allow physicians to rule out certain medical cases, but also provide patients with possible questions that may be relevant. Based on our pre-trial run, it effectively probed for symptoms using individualized speech and provided an accurate list of diagnoses.Providing patients with better tools to communicate their symptoms and generating a list of potential conditions could help prevent missed diagnoses and improve patient outcomes. Additionally, it could save time during pre-screening and help patients feel more at ease by narrowing down options for their condition.

Evidence of Local Adaptation in a Marine Species with High Levels of Gene Flow

Evan Roybal
Sponsor: Rachael Bay, Ph.D.
Evolution & Ecology

Marine organisms are known to have extensive gene flow that could reduce or prevent local adaptation. Whether local adaptation can occur in the face of gene flow depends on environmental heterogeneity, genetic variation, and the genetic architecture of the selected traits. To identify whether local adaptation can occur in the face of gene flow, we obtained whole genome sequencing data from 117 individuals from seven populations of the sea slug *Alderia willowi* along the California coast. We found a pattern of moderate to high levels of gene flow and an overall pattern of isolation by distance. In OutFlank and pcadapt we found evidence for local adaptation and an RDA showed that several environmental variables shape genetic variation despite extensive gene flow in *A. willowi*. These results illustrate that local adaptation can in fact occur alongside extensive gene flow and hint that population structure could also develop in the presence of gene flow.

Examination and Notes on Expansion of Cultural Competence in Counseling Education

Maram Saada
Sponsor: Flagg Miller, Ph.D.
Religious Studies

Current counseling standards by the Board of Behavioral Sciences require therapists to familiarize themselves with multicultural issues; however, there has been little research about the scope of their implementation in the educational curriculum. My research aims to analyze California State University (CSU) counseling Master's programs by examining the breadth of their multicultural education through analysis of their syllabi. By utilizing a keyword search derived from the definition outlined by the American Counseling Association (ACA), I determined the topics discussed in the curriculum, inferred the educational model used to dissipate the knowledge, and analyzed whether it encompasses the topics and issues the ACA highlighted. Findings indicate that most CSU schools utilize a single course model; however, due to the lack of standardization in the curriculum, some graduate programs lacked inclusion of some subjects that the ACA emphasized as topics requiring consideration. By noting the relationship between the educational system and modes of further education, like continuing education credits, I endeavored to highlight methods to expand the curriculum further. This included incorporating topics seldom taught, such as spirituality and religion.

The Effects of Repetition on Word Recognition in Infants

Shelly Sagy
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Repetition is a vital aspect of learning. Research indicates that repetition is a common aspect of caretakers' infant directed speech, and is related to language learning in infants. Caregivers provide input to their infants in the form of repetitions of words and phrases, which has a positive relationship with infant vocabulary development. However, we don't know yet how hearing repetitions of words affects how effectively infants recognize words. In this study, we will examine whether the amount of caregivers' word repetition relates to infant word recognition. We will test 24 10- to 14-month-old infants in an experiment with two tasks. In the first task, each parent-infant dyad plays with a set of farm animal toys and reads books about farm animals. Repetition will be measured by recording the number of times caregivers state each animal name. The infants' word recognition accuracy will be assessed in the second task where their eye movements are tracked as they are shown photos of animals while being verbally directed to look at one animal. We predict that if infants hear more repetitions of certain animals, then they will recognize those words more quickly and accurately than infants who hear fewer repetitions.

Using Machine Learning to Bring Physical Dynamics Awareness to a Vehicle Cruise Control System

Ayush Saha
Sponsor: Shima Nazari, Ph.D.
Mechanical & Aerospace Engr

The self-adaptive vehicle cruise control system is a well-known tool used for autopiloting vehicles. It allows vehicles to output and adjust their own acceleration and braking, ensuring the passengers stay safe. With the move toward autonomous road vehicles and the increase in nuance on city streets, the demand for safer, smarter autonomous cruise control systems increases. Our goal is to build a self-adaptive vehicle cruise control system which scans, interprets, and forecasts the ahead objects in its environment. To these ends, we develop an algorithm that constantly measures the speed and position of ahead objects in the environment and outputs a command to control the vehicle speed so as to minimize chances of collision, yet maximize rate. We test our system in simulation, and ensure it meets our needs by simulating different situations with different kinds of vehicles ahead braking with different deceleration rates. We also set a maximum deceleration rate for our control vehicle, and test that our control system can properly identify this shortcoming and appropriately learn to adjust its speed.

Proper Temperature Cycling Promotes Longevity in *Drosophila melanogaster*

Jalal Saleh
Sponsor: Fumika Namekawa, Ph.D.
Neuro Physio & Behavior

Previous scientific research suggests that circadian rhythms are often affected by environmental temperature. As an ectotherm, internal temperature regulation in *Drosophila melanogaster* is dependent on its external environment, allowing us to consider the impact of body temperature. Body temperature rhythm plays an important role in homeostasis in *D. melanogaster*. Would maintenance of a constant temperature or a proper cycle of temperatures support a longer lifespan? Based on our past research on the temperature preference rhythms (TPR) of *D. melanogaster*, we investigated the effect during day (7AM-7PM) and night (7PM-7AM) phases of the proper temperature cycle (TPTC, 21?:27?:21? at 7AM:7PM:7AM), inversed temperature cycle (TITC, 27?:21?:27? at 7AM:7PM:7AM), and constant temperature (TC, 25? at all times) on the lifespan of *D. melanogaster.* Unexpectedly, *D. melanogaster* incubated at TPTC displayed a longer lifespan than those at TC. Incubation at TITC and TC presented a similar pattern of longevity. The results propose the attribution of the longevity of *D. melanogaster* to a thermally affiliated gene intrinsically linked to its circadian rhythm.

Cultural Engagement and Self-Efficacy in Study Abroad Students

Ananya Sampath
Sponsor: Emorie Beck, Ph.D.
Psychology

Self-efficacy refers to an individual's belief in their ability to succeed in a specific task or situation. More self-efficacious people tend to have more positive life outcomes, such as occupational and academic success. Thus, finding ways to foster greater self-efficacy can contribute to the positive development of college students. Previous research has shown that certain life experiences during the college years, like studying abroad, may be related to self-efficacy, although research is mixed. Evidence may be mixed in part because of little attention to how the various experiences abroad relate to self-efficacy. In the study, we will examine whether engagement with the host culture is a predictor of self-efficacy in a sample of study abroad students (N = 154) over 1.5 years. We expect greater engagement (i.e., interacting with host nationals, cultural participation, language development, and host culture identification) to positively predict self-efficacy. We expect less engagement (i.e., interacting with co-nationals and homesickness) to have a negative relationship with self-efficacy. We will test our study hypotheses using multi-level modelling to examine the effects of each predictor on self-efficacy.

Personality and Growth Mindset: An Examination of the Big Five Traits

Max Samuelson
Sponsor: Richard Robins, Ph.D.
Psychology

A growth mindset has been shown to lead to several positive outcomes, such as increased academic performance, and improved mental health and well-being. However, little research has been done on whether people's personalities are predisposed to a growth mindset. To test this, we will measure participants' personality scores from the Big 5 and their associations with participants' growth mindset scores. We hypothesize that high openness to experience and conscientiousness will have statistically significant higher pre-existing levels of growth mindset; agreeableness and extraversion will have no effect, and neuroticism will have statistically significant lower levels of growth mindset. We will be drawing data from a longitudinal quantitative study with 508 4th-year UC Berkeley students (43% Asian, 36% White, 12% Latinx, 5% African-American, 4% Multiracial/Other). Statistical analyses, including multiple regression analysis, will be conducted to test the hypotheses. The findings of this study will contribute to the growing body of research on the relationship between personality and growth mindset. By identifying the personality traits that are associated with a growth mindset, this study will provide valuable information for educators and individuals seeking to develop a growth mindset.

Twins (tws) Regulates Seasonal Physiology in *Drosophila melanogaster*

Madison Sandler
Sponsor: Joanna Chiu, Ph.D.
Entomology/Nematology

Changes in photoperiod and temperature modulate organismal physiology and behavior over the calendar year. Adaptations to these changing conditions are crucial for survival and even impact cycles of human physiology and disease. The protein EYES ABSENT (EYA) has been shown to sense seasonal cues in both insects and mammals. In *Drosophila melanogaster*, EYA has been demonstrated to regulate seasonal reproductive dormancy, but the molecular mechanisms underlying this function remain unclear. In mammals, a protein called TWINS (TWS) was shown to interact with EYA and mediate its activity in tumorigenesis. We therefore hypothesize that TWS may play a role in regulating *Drosophila* seasonal biology alongside EYA. To determine whether *tws* expression is modulated in response to changing seasonal conditions, we assayed *tws* mRNA expression in wild-type flies subjected to different temperature and/or photoperiod to simulate seasonal changes. After 7 days, flies were collected every 4 hours over a day-night cycle and *tws* mRNA expression was assayed by quantitative RT-PCR. Preliminary data on *tws* mRNA expression indicate that *tws* expression varies under different temperatures, suggesting that *tws* plays a role in regulating *Drosophila* seasonal physiology.

UC Davis Students' Thoughts and Feelings about Starting College 2019 - 2021

KARLA SANTANA VALENTON
Sponsor: Kali Trzesniewski, Ph.D.
Anr Human Ecology

There are debates about how COVID-19 impacted the mental health and feelings of connectedness for youth. Many have pointed to increased social isolation brought on by sheltering in place, but there is little research comparing students' social and academic expectations about college from pre- to post-COVID. The present study investigated the following research question: In what ways did incoming UC Davis undergraduate students' thoughts and feelings about starting college change from before COVID to the first couple of years of COVID? Each summer from 2019 to 2021, we assessed incoming UC Davis students' thoughts and feelings about starting college (N = ~16,000). Specifically, we assessed (1) academic and social expectations between the first year and the end of the second year and (2) perceived difficulty transitioning to a 4-year institution. Surprisingly, students had better expectations of belonging at UC Davis and lower levels of stress and anxiety about starting college between 2020 and 2021 than in 2019. We found no differences in thoughts and feelings about starting college between 2020 and 2021. Follow-up analyses will examine differences in this trend across demographic groups (e.g., low-income, first-generation).

Experimental Investigation of the Social and Ecological Effects of a Green Roof Environment on California Grassland Plants

Summer Santich
Sponsor: Anna Kiers, M.L.A.
Human Ecology

As urbanization expands and continues to displace natural habitats, elevated ecosystems, particularly green roofs, offer a way to restore biodiversity and improve human well-being. The UC Davis Green Roof Research project is a multidisciplinary study exploring the ecological and social benefits of California native grassland plants in green roofs. The site, located outside the third floor of the UC Davis Student Health and Wellness Center, is adjacent to a public area for students and members of the UCD community. The project trials untested grassland plants for their adaptability to a green roof environment and their potential to mimic local native habitats and support pollinators. It additionally examines the social significance of planted natural spaces within urban landscapes. Data collected, including plant growth and vigor, floral display, and pollinator abundance, along with qualitative assessments obtained through surveys and observations, will ultimately contribute to a better understanding of the ecological impact of grassland plants and their relationship to pollinators such as bees, hummingbirds, and butterflies within the urban environment.

Creating a Topological Knot Ladder for Analysis of P4 Bacteriophage DNA

Camila Sanudo Thomas
Sponsor: Francisco Arsuaga, Ph.D.
Mathematics

A P4 bacteriophage is a virus that infects DNA, and is used an a model organism to investigate properties of DNA. When DNA extracted the bacteriophage was examined, it was found to be knotted. The DNA will create torus knots with 2n+1 crossings. The goal of this project is to generate a torus DNA knotted reference ladder for comparison to knotted P4 bacteriophage DNA. This ladder will fill a gap knowledge and help researchers who work with P4 bacteriophage DNA identify the types of knots in their samples. In this project, the Cre Recombination system of bacteriophages is utilized to create right-handed torus knots in a pCS1.3i plasmid. The Cre Recombination system binds to the inverted loxP sequences in the plasmid, and catalyzes recombination between them. This creates torus knots with 2n+1 crossings, which are then visualized using gel electrophoresis. The goal of the gel is to be able to visualize up to knots with nine crossings.

Thermal Characterization and Modeling of a CubeSat in Low Earth Orbit

Ayaan Sarang
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

The Space and Satellite Systems (SSS) club's REALOP mission is to create a 2U CubeSat which is designed to deploy out of the ISS. As a sub-department of SSS, Structures Thermal Analysis' (STA) goal is to simulate the thermal environment of a transient orbit around the Earth to verify CubeSat nominal temperatures. To create the simulations, STA utilizes Thermal Desktop to build a thermal model of the CubeSat. These simulations will help determine which components aboard the CubeSat need to be adjusted or reinforced thermally. The software CES Edupack is used to gather optical and thermophysical properties required to fully detail the CubeSat model. STA is in the process of modeling the entire structure with internal components to understand the temperature changes the CubeSat will undergo as it is exposed to the extreme space environment. This will showcase the effects of radiation on the external faces of the structural frame, as well as internal heat transfer between the inner components/faces of the frame. The overall goal of the STA team is to ensure the CubeSat stays thermally safe throughout its operational lifespan.

Maternal Risk Factors Present in First 5 Yolo Welcome Baby Populations

Nikita Satish
Sponsor: Leigh ann Simmons, Ph.D.
Human Ecology

First 5 Yolo Welcome Baby (WB) is a nurse and community health worker home visiting (HV) program designed to help Yolo County families, amidst the pandemic, get connected with health and social support resources following childbirth. Families enroll in WB during a mother's prenatal visit, at the hospital, or within 2 weeks of childbirth. A nurse provides the first home visit and assesses the dyad's needs, including future risk (e.g., maternal age, substance use, mental health diagnoses) and expanded HV program eligibility. The purpose of this study is to describe mothers who are characterized as high-, medium-, and low-risk during the initial WB screening. To date, WB has enrolled 585 dyads. Average age is 28. The self-reported racial/ethnic background of participants is 3% Black/African American, 2% Alaska Native/American Native, 12% Asian, 2% Multiracial, 66% Hispanic/Latino, 1% Native Hawaiian/Pacific Islander, and 14% White-Non Hispanic. Approximately one-third (N=190) of participants were categorized as medium- (N=103; 17.6%) or high- (N=87; 14.8%) risk. Further analyses will associate risk factors with risk level to increase understanding of these vulnerable populations and help to develop targeted preventive care and education to reduce adverse health outcomes.

Reading People: The Relationship Between Reading Comprehension and Empathy in Fourth-Grade Students

Nadeen Sawyer
Sponsor: Elizabeth Montano, Ph.D.
Education

This interdisciplinary study investigated whether the ability to identify and relate to others' emotions through empathy would be connected to an equally effective ability to interpret and comprehend texts, as in reading comprehension. There is a well-researched link between empathy and reading comprehension, most likely due to factors such as perspective-taking and emotional intelligence informing both abilities. This study comes at a significant time, as current education literature suggests that elementary reading comprehension scores have been steadily declining for the last decade, spurring debate on what could contribute to increasing reading comprehension rates. Current psychological literature also suggests that general empathy levels are declining, with empathy fluctuating throughout one's lifespan. Developmentally speaking, the sharpest empathy decline occurs during the transition to middle school, marking fourth and fifth grade as ideal environments for empathy interventions. This study measured empathy, reading comprehension, and reading comprehension confidence in fourth graders, while investigating whether empathy could be manipulated in the short-term through evidence-backed interventions. The conclusion of this study was that more in-depth research is necessary to establish a relationship between empathy and reading comprehension, but a tentative positive correlation can be seen between confidence in one's reading comprehension and their empathy levels.

Improving Surveillance for Patients with Known Aortic Aneurysms

Dena Sayrafi
Sponsor: Misty Humphries, M.D.
MED: Surgery

More than 200,000 abdominal aortic aneurysms (AAA) are diagnosed each year in the US, a condition that becomes life-threatening if not identified and treated appropriately. Currently, the majority of primary healthcare providers adhere to the US Preventive Services Task Force (USPSTF) screening guidelines when evaluating patients for AAA, though up to 40% of patients miss these recommended screenings. We sought to use Natural Language Processing (NLP), a form of machine learning, to review patient imaging to improve identification of AAA. Across a large tertiary care system, 3859 patients with aneurysms (aortic dilation >3 cm) and ectasia (dilation between 2.5-3 cm) were identified by NLP. After exclusions, we evaluated demographic data for 1924 (55%) of these patients. Minorities represented 38% of aneurysms among patients under 65 years. Additionally, the average age at diagnosis in Hispanic patients was 50 compared to 59 in non-Hispanic patients. White and black patients were more likely to be captured by screening guidelines than Asian and Other patient groups, and Asian patients were significantly more likely to be diagnosed after 75. Incorporating NLP enhances screening practices and successful detection of aneurysms especially within minority populations more likely to be excluded by USPSTF screening guidelines.

Evaluating Genetic and Phenotypic Diversity of *Fusarium oxysporum* Pathogens Affecting Diverse Allium Crops

Laurel Schmidt
Sponsor: Cassandra Swett, Ph.D.
Anr Plant Pathology

Fusarium oxysporum f sp. *cepae* (Foc) is a fungal pathogen that causes Fusarium Basal Rot in Allium crops (garlic, onion, leek, and shallot). The objective of this study is to evaluate both the genetic and phenotypic diversity of Foc affecting diverse Allium crops. Recent research has identified SIX (secreted in xylem) homologs along with other novel genes as potential molecular diagnostic tools for Foc, but these have only been studied in onion isolates. Five effector genes (SIX3, SIX5, C5, CRX1, and CRX2) were used to study the genetic diversity of 33 *F. oxysporum* isolates coming from diseased onion, garlic, and leek. These regions were not specific to the putative Foc isolates tested and contain multiple polymorphisms, demonstrating significant genetic diversity. Ten of those isolates were further analyzed for identity as Foc by inoculating Foc resistant and susceptible onion cultivars. While some isolates from onion and garlic had an Foc phenotype, others from all three crops killed both cultivars indicating that an additional pathogen is present. In addition, two isolates from leek were non-pathogenic. This work suggests that there is greater diversity in this pathosystem than previously recognized, and can be used to improve diagnostic tools and management decisions.

Comparison of Proteases Used in Histone PTM Analysis of Mozambique Tilapia Gills

Sophie Scott
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

Proteases have practical use in histone post-translational modification (PTM) analysis, particularly using liquid chromatography mass spectrometry methods. It is beneficial to know what protease will be the most effective at revealing the desired histone PTMs in a given study. Four proteases were identified to have promise in revealing unique histone PTMs. We used Trypsin platinum, ProAlanase, Thermolysin, and Pepsin to digest Mozambique tilapia (*Oreochromis mossabicus*) gill tissue samples. The *O. mossabicus* samples were obtained from fish that had experienced two different salinity treatments. One group of fish had experienced freshwater (0 ppt) conditions and the other group had experienced seawater (30 ppt) conditions. All gill samples were aliquoted and processed using each of the four proteases. A second goal of the experiment was to investigate the differences in the global histone PTM landscape between fish inhabiting freshwater versus saltwater conditions. By comparing these proteases' effectiveness in revealing desired histone PTMs we establish which is the most beneficial to use.

Otteromics: the Evolutionary History and Genetic Diversity of *Lontra canadensis*

Maddie Seidman
Sponsor: Trish Berger, Ph.D.
Animal Science

The North American river otter *(L. canadensis)* lives in a wide range across the U.S. and lives in an even wider range of climates. While not endangered, they have been extirpated from some states due to hunting, leaving affected regions lacking an important keystone species in their river ecosystem health. With the Hoffman Lab at the University of Central Florida, we sought to determine whether otters would demonstrate genetic differences based on region, and if any genetic variations found could be correlated to population history. Extracting DNA from deceased otter biopsies and using polymerase chain reaction (PCR) technology, we sequenced and compared the mitochondrial DNA of 55 individual otters across eight states to determine the extent of any regional genetic differences. We found that of the river otters sampled, there is no evidence for historic genetic structuring in the national population, suggesting that North American river otters are relatively panmictic -- genetically homogenous and able to interbreed across their range without loss of biodiversity. However, our newest findings in our research show statistically significant evidence for recent genetic structuring in the population, suggesting that despite the species being largely panmictic, they may be in the midst of genetically diverging.

Optimizing Lettuce Downy Mildew Response to Fungicides

Shivan Seneviratne
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

Lettuce downy mildew, caused by *Bremia lactucae,* has proven to be a devastating threat to lettuce crops around the world. Fungicides are often the primary treatment for this disease, however due to the adaptable nature of *B. lactucae*, some isolates of this pathogen are able to resist certain fungicides. The ability for *B. Lactucae* to resist the fungicide metalaxyl has been studied previously, but recently the lab has tried to extend its research to newer fungicides such as Forum, Revus, and Orondis. The data of these recently researched fungicides is not always consistent with previous results. This project will attempt to optimize the fungicide screening protocol by testing the ability of *B. lactucae* to sporulate at varying concentrations of fungicide. Another experimental variable that will be tested is the time between fungicide application, and pathogen inoculation. The results of this project will help identify the best conditions for fungicide effectiveness.

The Influence of Emotion Regulation on Children's Performance During a Stress Task

Kelsey Sennett
Sponsor: Camelia Hostinar Caudill, Ph.D.
Psychology

Children exhibit a wide range of emotions throughout development. There is significant evidence that the ability to regulate emotions may enhance social and behavioral competence, which act as important foundational skills for future development. As childhood anxiety becomes increasingly prevalent, there is a growing need to examine whether the ability to regulate emotional experiences may mitigate stress responses in early childhood. Parental presence also plays a role in influencing children's responses to both stress and challenge by acting as "social buffers" and reducing children's endocrine responses to acute stress. We will examine whether emotion regulation influences children's performance during a laboratory-based stress task. Children (ages 9–11 years old, M = 9.9 years, SD = .58) were randomly assigned to either participate in a version of the Trier Social Stress Test modified for children (TSST-M) with a parent in the room (N=59), with no parent in the room (N=60), or to a control condition with no stress task (N=61). We will examine the association between emotion regulation and task performance, and explore the role of parental presence or absence during this stressor.

Gonadal Hormones Act During Puberty to Reduce the Reactivity of Oxytocin Neurons in the Anterior Paraventricular Nucleus

Alexandra Serna Godoy
Sponsor: Brian Trainor, Ph.D.
Psychology

Social anxiety is a common mental health condition more prevalent in women than men in adulthood. Sex differences in anxiety-related behaviors emerge after puberty but the underlying mechanisms are unknown. Previous studies have shown that the removal of androgens in adolescence in California mice results in stronger social anxiety-like responses in females versus males. Adult female California mice exposed to aggression exhibit reduced social approach and increased social vigilance during stress, driven in part by oxytocin. We hypothesized that androgen removal before puberty would increase oxytocin neuron activation after stress. To assess this, we used immunohistochemistry for oxytocin and co-stained for a marker of neuronal activity (c-fos) in samples of castrated and sham surgery male mice exposed to social defeat or control. We examined the paraventricular nucleus (PVN), an area associated with many oxytocin neurons. In anterior PVN, stress increased oxytocin/c-fos colocalizations in castrated but not and sham males. In the posterior PVN, castration increased oxytocin/c-fos colocalizations across both control and stressed mice. In the future, we will use fiber photometry to test if gonadal hormones reduce the activity of neurons after stress. This would help us understand the role of pubertal hormones in sex differences associated with anxiety-related behaviors.

Analgesic Effects of Soluble Epoxide Hydrolase Inhibition in a Rat Model of Chemotherapy Induced Neuropathic Pain

Sophia Serrano
Sponsor: Karen Wagner, Ph.D.
Entomology/Nematology

Chemotherapeutics are well known for their effective treatment of cancer. Unfortunately, chemotherapy treatments are also known for their life-altering adverse side effects, such as chemotherapy induced peripheral neuropathy (CIPN). Painful CIPN can be severe enough to cease dosages of lifesaving chemotherapy which can also develop and/or worsen after cessation of treatment. Therefore, new approaches are needed. The soluble epoxide hydrolase enzyme is a regulator of endogenous lipids that have demonstrated anti-hypertensive, anti-inflammatory and analgesic properties. Inhibiting the sEH is a strategy for producing analgesia against chronic pain conditions. Our hypothesis is that chronic treatment with sEHI will provide analgesic relief against painful CIPN caused by chemotherapy. We will use nociceptive assays including the cold plate, von Frey and functional assays such as the open field and grip strength tests assess nociceptive behaviors in a rat model. It is expected that CIPN rats with sEHI treatment will have improved outcomes in these assays as compared to CIPN vehicle controls. If successful, this has the potential to translate to the clinical setting and offer potential relief to humans experiencing painful neuropathy.

Self-Control and its Relation to Daily Smoking Habits

Jake Shab
Sponsor: Shelley Blozis Villarreal, Ph.D.
Psychology

Self-control is an essential part of everyday life as it is behind many of the decisions that people make on a daily basis. Whether someone chooses to continue to work on a paper or make a decision to indulge in watching television instead, it is a person's level of control that influences what they choose to do. This paper compares cigarette smokers to non-smokers with regard to their levels of self-control using a large, representative sample of adults in the U.S. Self-control was measured using a scale designed to look at things such as how it relates to the way one handles their emotions or how one carries themselves in different settings. This paper hypothesizes that, on average, a smoker will display lower levels of self-control relative to non-smokers. The implications of this study are numerous, such as providing health professionals with a better understanding of the self-control levels of smokers and how they might differ from non-cigarette smokers. This paper builds on previous research that has focused on how self-control influences the health of individuals.

The Role of RAD54B in Homologous Recombination

Hammad Shahid
Sponsor: Wolf Heyer, Ph.D.
Microbiology & Molec Genetics

DNA can be damaged through endogenous or extrinsic processes. Double-strand breaks (DSBs) are among the deadliest DNA lesions, and they are repaired through the Homologous Recombination (HR) pathway. HR is a pivotal DSB repair pathway, and its hallmark is the use of a homologous template for DNA synthesis to restore lost genomic information. Homology search and DNA strand invasion are the signature reactions of HR. RAD51 and RAD54 are critical factors for DNA strand invasion. As a motor protein, RAD54 uses energy from ATP hydrolysis to track along dsDNA and modify the topology of the donor DNA dissociating Rad51 from dsDNA. RAD54 paralog B (RAD54B) has biochemical properties like RAD54, but its function in DNA repair remains poorly understood. We intend to study the role of RAD54B in HR. Our hypothesis is that RAD54B acts on HR regulation by modifying RAD54 and RAD51 activities. Currently, we have purified human RAD54B and its mutated form, the RAD54B-K332R mutant that lacks ATP hydrolysis activity, to define the ATP-dependent and -independent functions of RAD54B. Understanding RAD54B's function in HR may provide critical knowledge to uncover the processes of genomic stability maintenance.

The Obscurities of Asylum: A Case Study of Indo-Fijian Asylum Seekers

Ashneet Sharma
Sponsor: Cecilia Tsu, Ph.D.
History

Although asylum systems, being rooted in international law, are designed to be universally just and produce similar outcomes across countries, these systems in practice are plagued by biases and peculiarities that prevent consistent administration. How do these systems differ from one another, and why? The stories of Indo-Fijian asylum seekers in Australia and the United States help us make sense of this dysfunction. The 1987 Fijian coup and the coup culture that overtook the nation in the ensuing decades led to the widespread persecution of the island's Indian population, creating an exodus of refugees. I utilize the cases of Indo-Fijians who applied for asylum in Australia and the U.S. to illustrate the critical role of the courts in determining who is and who is not to be considered a refugee. Further, I argue that the differences between how cases are decided by courts in each country are directly related to the nations' unique immigration histories. Despite the ethnic group's shared experiences, the manner in which asylum appeals courts treated an Indo-Fijian hinged on the nation they fled to, a reality that subverts the principles underlying the institution of asylum established by the UN.

Radial Chromosomes- What are they and how do they form?

Leanna Shebib
Sponsor: Jacqueline Barlow, Ph.D.
Microbiology & Molec Genetics

Chromosomal instability arises from defective DNA repair and can lead to chromosomal rearrangements, which contribute to carcinogenesis. One of the most severe chromosomal rearrangements is radial chromosome formation. A radial chromosome involves chromatid breaks on two different chromosomes and their consequent fusions. The detection of radial chromosomes is the determining factor for the diagnosis of Bloom syndrome and Fanconi anemia, which are characterized by increased cancer risk. The mechanism of radial chromosome formation remains unknown. We hypothesize that ineffective homologous recombination repair (HR) leads to radial chromosome formation. One of the key components of HR is ataxia telangiectasia and Rad3-related protein (ATR). ATR has multiple functions, including DNA damage checkpoints activation and regulation of early stages of HR. Here we study the effect of ATR suppression on radial chromosome formation caused by aphidicolin-induced replication stress. In our study we use small-molecule ATR inhibitors to suppress ATR activity. Our preliminary results show a statistically significant decrease in radial chromosome formation caused by aphidicolin with the addition of ATR inhibitors. This data suggests that ATR plays a significant role in radial chromosome formation.

Exploring the Relationship between Nutrition Knowledge and Dietary Fat Intake in University Students

Audrey Sheehan
Sponsor: Francene Steinberg, Ph.D.
Nutrition

Knowledge pertaining to nutrition literacy may influence diet-related behaviors. The relationship between nutrition knowledge and dietary fat intake was explored to determine if consumption of unhealthy fats (trans and saturated fats) or health-promoting fats (monounsaturated and polyunsaturated fats) are associated with knowledge. A prospective cohort study was conducted from April 2022 – June 2022 in a diverse population of university students (n=123). Dietary intake and diet patterns, emphasizing fat intake, were collected using Diet ID™, and nutrition knowledge was assessed through a validated questionnaire. Data was checked for normality using Shapiro Wilks. Diet quality, assessed using the Healthy Eating Index, was found to be significantly correlated with nutrition knowledge ($p=0.02$), and the consumption of mono and polyunsaturated fats ($p<0.001$). There was a negative correlation between consumption of trans and monounsaturated fats, confirming that individuals who consumed high amounts of unhealthy fats also consumed lower amounts of health-promoting fats ($p=0.004$). There was no direct correlation between nutrition knowledge and consumption of healthy nor unhealthy fats. This may indicate that other intrinsic, extrinsic, or environmental factors may influence dietary fat intake other than nutrition knowledge. Further research should explore individual factors to determine what characteristics impact the consumption of dietary fats.

The Impact of Audiovisual Cues on Speech Recognition: an ERP Study

Sana Shehabi
Sponsor: David Corina, Ph.D.
Linguistics

Phonological competition occurs when spoken words have similar sounds and are harder to recognize ("cap" - "cat"). Previous research found that phonological competition influences brain wave (event related potential; ERP) components elicited during spoken word recognition. Specifically, the N400 is a response appearing when we process meaningful stimuli; it is more negative in response to unexpected spoken words. This study expands previous work by using audiovisual (AV) stimuli, which involves hearing and seeing a speaker. Visual speech cues may influence word recognition and the N400. To test these effects, undergraduate students (N=10) will match pictures and AV spoken words based on meaning while we collect brain wave data. We will use phonological conditions of matches (ball-BALL), rhymes (ball-DOLL), word initial cohorts (ball-BAT), and unrelated words (ball-JET). Upon analysis of ERP data, we expect to see a more negative N400 component on the unrelated, rhyme, and cohort conditions compared to the match conditions, because unexpected word forms cause a more negative N400. This study will advance our understanding of how different speech cues interact when there is phonological competition. The findings will have implications for improving speech recognition technology and underscore the need for visual speech cues for hearing-impaired individuals.

Developing New Tools for Early Detection of *Botrytis cinerea* on Strawberry Fruit

Dilasha Shenaz
Sponsor: Barbara Blanco-Ulate, Ph.D.
Plant Sciences

Strawberries are soft fruit that gets easily damaged along the market supply chain through handling. Physical damage increases their susceptibility to fungal pathogens, particularly to B. *cinerea*, resulting in moldy fruit which faces consumer rejection and significant economic losses. The present study aims to develop new tools to detect the infection in its early stages to prevent fruit loss and reduce food waste by combining two different methodologies: profiling of volatile organic compounds and multispectral imaging. For volatile compound profiling, we inoculated strawberries with B. *cinerea* and collected volatile compounds at early time points after inoculation. Volatile compounds will be analyzed to find those specific to B. *cinerea*-infected strawberries. For multispectral imaging, we monitored visual changes of infected and healthy fruit at early time points after treatment. Light reflectance profiles will be compared to identify areas of the light spectrum with potential for B. cinerea detection. Additionally, we collected infected and healthy strawberry tissue to perform RNAseq that will reveal genes and biochemical pathways involved in strawberry fruit interaction with B. *cinerea*. Our future research will continue to investigate the outcomes of this study to develop applied solutions to early detect B. *cinerea* and reduce food and economic losses.

Developing and Testing of a Nanobody-based Immunoassay for Aflatoxin in Mouse Brain Tissue

Rachel Shey
Sponsor: Bruce Hammock, Ph.D.
Entomology/Nematology

Have you ever forgotten about a bagel on the counter and come back a few days later to find that it has grown a thin layer of fuzzy green mold? Most people know not to eat it, but why not? Aspergillus fungus produces a toxin called aflatoxin, which is the reason moldy bread, bitter peanuts and other foods may not be safe to eat. Aspergillus grows on virtually all major crops in the world, and aflatoxin is present wherever Aspergillus grows. I am developing a nanobody-based competitive immunoassay for aflatoxin B1 in conjunction with several senior scientists in the Hammock Lab. Nanobodies are small antibodies which are derived from camelids and sharks. Unlike regular antibodies, nanobodies are made of only heavy chains and are therefore about ten times smaller than traditional monoclonal antibodies or polyclonal antibodies. They can be grown in E. coli cheaply and in large amounts. Once the nanobody sequence is known, it is immortal. I am using nanobodies previously discovered by Dr. Dongyang Li, to detect aflatoxin levels in mouse tissue samples. The technology I am working on will make this monitoring process cheaper, faster, and more sensitive.

Determination of Almond Co-product Ratios in Fourteen Varieties of California Almonds

Liu Shi
Sponsor: Alyson Mitchell, Ph.D.
Food Science & Technology

The Agri-food industry is responsible for the generation of high volumes of organic wastes (co-products), reaching up to 140 billion tons annually. Disposing of these byproducts is expensive for processors and harms the environment, which emphasizes the need to repurpose them for sustainable food systems. Almonds (*Prunus dulcis*) are one the most consumed tree nuts worldwide and California grows about ~80% of world almond production. In 2019-2020, 1.645 billion pounds of shells and 4.031 billion pounds of hulls were created in California. To date, there is little information on co-product ratios (i.e. hulls, shells, kernels) based upon the weight of individual almond varieties. To address this, we have determined the fresh and dry weights of the hulls, shells and kernels in fourteen varieties of California almonds and calculated the co-product ratios of each material. Approximately 100 grams of almonds in each variety were shelled and separated into groups representing the hulls, shells, and kernels. The fresh weights were measured, and the dry weights were determined by measuring the moisture content by a vacuum oven (90 °C, 26kPa and 6 hours). Knowing the co-product ratio for each variety will help almond farmers and processors better predict co-product streams and usages.

Dynamics of the MKK6 kinase during cytokinesis in Arabidopsis

Yibo Shi
Sponsor: Bo Liu, Ph.D.
Ag Plant Biology

Plant cytokinesis is brought about by the phragmoplast assembled by an anti-parallel microtubule array and results in synthesizing the cell plate. The mitogen-activated protein (MAP) kinase cascade including the MKK6 kinase plays important role in plant cytokinesis by regulating the remodeling of the cytokinetic apparatus. In the flowering plant Arabidopsis thaliana, MKK6 localizes in the equatorial plane of the phragmoplast to activate microtubule turnovers during cell plate assembly. It was hypothesized that the microtubule motor kinesin NACK1 activates the MAP kinase cascade and is required for the phragmoplast localization of MKK6. To test this hypothesis, I made an expression construct for an MKK6-3xCitrine fusion protein. This fluorescent MKK6-3xCitrine was detected in the phragmoplast by a transient tobacco infiltration test. I then used the construct to rescue the homozygous mkk6 plant which had a seedling lethal phenotype, indicating that MKK6-3xCitrine was functional. The construct was then transformed into heterozygous nack1 plants because the homozygotes were seedling-lethal. I am going to carry out live-cell imaging experiments to capture the dynamics of MKK6-3xCitrine fusion protein in the presence or absence of NACK1. The results to be acquired will allow me to conclude whether kinesin plays a critical role in MKK6 localization.

Anaerobic Fungi Proteins

Moriah Shih
Sponsor: Matthias Hess, Ph.D.
Animal Science

Agricultural systems generate a lot of plant biomass waste, so understanding how to break down that plant matter is important for developing methods of reducing and eliminating these waste products. However, the most efficient mechanisms of plant biomass degradation are mediated by microorganisms and these interactions are not well understood. Further research into these interactions is therefore crucial. Ruminants are efficient digesters of plant biomass, and this study was performed to further characterize potential proteins from the dairy cow rumen that are important in plant digestion. In this study, we assayed clones that were selected and synthesized in a previously generated metatranscriptomic data set of putative anaerobic rumen fungi proteins. The chosen proteins were cloned in *E. coli* BL21 (DE3), and this experiment focused on 9 clones in particular from a wide range of members of glycoside hydrolase families. Several assays were performed to characterize the relative carbohydrate digestive activity of each clone. In the end, significant activity by each of the clones was not found, but the results provide valuable insight for further experimentation.

Pedagogy in Jane Austen's Novels: How men "Educating" Women Influences Female Agency and Marriageability

Julia Shurman
Sponsor: Tobias Menely, Ph.D.
English

This essay explores the connection between men educating women, how knowledge affects one's marriageability, and the implications of women learning according to male standards. I examine female protagonists across novels by Jane Austen such as *Emma*, *Lady Susan*, and *Northanger Abbey* to highlight how their evolutions throughout the texts exemplify their embodiment of lessons learned from their male love interests. The narrator in *Northanger Abbey* states women should present themselves as unknowledgeable—a trait consistently displayed by Austen's protagonists. As Austen depicts only her male interests as knowledgeable, she demonstrates how there is a double standard for intellect between genders. To determine the consequences of men teaching women, I juxtapose spinsters and mothers as they respectively represent women who don't adhere to male lessons and women who submit to their husbands' knowledge. I find spinsters demonstrate a degree of agency and self-knowledge married women cannot achieve. Thus, Austen suggests women are disempowered by their deference to men's intellect. By reading Austen's works in conversation with feminist theorists like Wollstonecraft and focusing on the impacts of pedagogy by contrasting groups of women, I connect patriarchal themes found in the texts to understand better the relationships between knowledge, marriage, and female empowerment.

To investigate the presence of Epidermal Growth Factor receptor in bovine ovarian preantral follicles

Olivia Silvera
Sponsor: Anna Denicol, D.V.M.,Ph.D.
Animal Science

A greater understanding of the development of ovarian follicles is critical to develop better strategies for fertility preservation and infertility treatments. However, the lack of an optimized protocol for follicle isolation presented a barrier in this field of research. We developed a streamlined and efficient mechanical method of preantral follicle isolation from bovine ovaries that consistently yields a greater number of follicles in a shorter time compared to previous protocols. This protocol consists of serial steps of cutting, homogenizing, and filtering the ovarian tissue for the obtention of small ovarian follicles in preantral stages and measuring between 40 and 300 µm. This method will be used to investigate the presence of the Epidermal Growth Factor (EGF) receptor, which is known to have a critical role in the development of later stage follicles. Although EGF has been used in culture media for the growth of preantral follicles in vitro, the presence of its receptor in bovine follicles has not been defined. Confirming the presence of the EGF receptor in preantral follicles will be the initial step of investigation of the cellular roles of this factor, and will create a broader understanding of early folliculogenesis.

Investigation of the dopaminergic and serotonergic neuronal activity underlying the development of tau pathology following traumatic brain injury in a *Drosophila* model

Aishini Singh
Sponsor: Kassandra Ori-Mckenney, Ph.D.
Molecular & Cellular Bio

One of the major hallmarks of Traumatic Brain Injury (TBI), a leading cause of neurological deficits and a risk factor for many neurodegenerative diseases, is the presence of hyperphosphorylated tau in the brain. Tau is a microtubule-associated protein, which upon hyperphosphorylation is thought to self-associate and form aggregates correlated with neurodegeneration. The series of events that cause tau hyperphosphorylation and aggregation in response to injury are not well established. We studied the behavioral effects on *Drosophila melanogaster* as a consequence of tau pathology induced by TBI. Subjecting flies expressing human tau to TBI led to an increase in inter-male aggression prior to copulation. To uncover the mechanism through which tau pathology leads to increased aggression post-TBI, we acutely activated dopaminergic neurons we identified as contributors to this increased aggression. Activation of this subset of dopaminergic neurons mirrored the increase in aggression seen in flies expressing tau following TBI. Along with the hyperactivity seen in the locomotion assay, these results indicate that TBI in the presence of human tau leads to neuronal hyperactivity. Ultimately, we hope to uncover the neuronal mechanisms through which TBI contributes to tau hyperphosphorylation and aggregation, and leads to alterations in brain function and behaviors.

Characterizing Mealworm (*Tenebrio molitor* L.) Individuality: A Study on Intraspecific Variation of Cognition

Lauren Sique
Sponsor: Christian Nansen, Ph.D.
Entomology/Nematology

Intraspecific genetic variation is essential for natural selection to occur, entailing morphological variation as well as behavioral variation and cognitive variation. This intraspecific variation characterizes "individuality" within a population. Advanced cognition is a topic widely observed and classified in vertebrates but less in invertebrates. In this study, mealworms (*Tenebrio molitor* L.) will be challenged in a series of experiments to ascertain their individual cognitive ability and to examine the variation within the population. Moreover, tests of cognitive variation in problem solving will involve a maze, two food sources, and two grades of sandpaper. The latter is to test whether mealworms can associate surface texture with availability of food. This study will test the overall hypothesis that mealworms raised in the same conditions will display significant cognitive variation. We expect to see intraspecific variation of cognitive ability and that individuals who excel at solving a maze will also do well in the sandpaper association task. These results will indicate the degree to which mealworm cognition varies, offering a characterization of the individuality of these mealworms.

Utilizing Social Network Analysis to Determine Collaboration Dynamics Between Providers and Families with Young Minimally-Verbal Autistic Preschoolers

Nikki Sisodia
Sponsor: Sarah Dufek, Ph.D.
MED: Psychiatry & Behav Sci

Early intervention is standard for young children diagnosed with autism; however, communication outcomes are highly variable. For example, after treatment some autistic children communicate with vocal language, some with alternative augmentative communication (AAC) strategies, and some continue to have difficulty communicating. AAC strategies are the most frequently utilized evidence-based practice for minimally verbal autistic children. These strategies include communicating though pictures, choice boards, and electronic devices and require high levels of collaboration between the child's treatment team and family to ensure that the AAC device and system is implemented consistently. Ongoing challenges with communication often lead to increased behavior challenges and poorer long-term outcomes regarding school placement, intervention costs, and adaptive behavior scores. Some experts have suggested that the effectiveness of AAC strategies is influenced by collaboration and communication between service providers and families around treatment. This study uses social network analysis to determine collaboration dynamics between providers and families to determine how the strength of team communication can influence social communication outcomes for autistic preschoolers who use AAC.

Effects of Maternal Environment on Seedling Traits and Drought Performance in Squirreltail Grass (*Elmyus elymoides*)

Carly Skiba
Sponsor: Jennifer Funk, Ph.D.
Plant Sciences

Droughts are becoming more frequent and severe, negatively affecting many ecosystems. As the global climate changes, restoration interventions are increasingly important to maintain biodiversity and ecosystem services such as reducing erosion, nutrient cycling, and carbon sequestration. Within restoration sites, seedling establishment and early survival are extremely important. Maternal plant environment may affect offspring traits and success through resource allocation to seeds and transgenerational epigenetic inheritance. This study seeks to examine how maternal environment affects seedling traits and response to drought in Squirreltail grass (*Elymus elymoides*), a perennial bunchgrass prevalent across the western United States. It is particularly valuable in restoration efforts due to its ability to tolerate dry climates and compete with invasives. Seeds were collected from maternal plants subject to wet, dry, or control conditions and grown in a greenhouse with normal or reduced watering before collection and trait measurements. Our predictions include that seedlings collected from maternal plants grown in dry conditions will have root traits that align with methods of resource conservation, and therefore will be more drought-tolerant. This research will help inform future restoration efforts by showing how maternal traits affect seedlings, and how we can apply this knowledge to sourcing seeds to maximize plant survival.

Eco Materials Library

Emma Smith
Sponsor: Beth Ferguson, M.F.A.
Department Of Design

Through close examination of existing material libraries, bio-based materials, and prototyping processes, this project aims to increase accessibility and awareness of eco-materials in the undergraduate academic setting. While material libraries are standard in architectural and design firms internationally, few universities have libraries available for student use. Plastic and the design industry have been inextricable since the 1950s, so as twenty-first century designers, we are responsible for reversing the damage caused by single-use plastics and planned obsolescence in product design. Bio-based materials are made from biological materials and/or waste products and have the potential to replace plastics in product design iun order to minimize environmental degradation. Reducing reliance on plastic begins with increasing awareness and education as well as providing better alternatives. The Eco Materials Library, located in the Cruess Hall makerspace, will be a physical and online collection of curated environmentally-friendly materials that students may touch, feel, research, and use in their designs. The library will increase student awareness of and access to sustainable materials in design, as well as serve as a functional resource for students to inform their design process.

Development of Attitude Determination and Control System Software for Low Cost Satellite Control Methods

Kemma Snyder
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

Our poster discusses the Attitude Determination and Control System (ADCS) software architecture for REALOP, UC Davis' first, and completely undergraduate-led, CubeSat mission. Once launched into space, the CubeSat will rotate in an unpredictable manner, known as tumbling. ADCS is in charge of detumbling and pointing the Raspberry Pi camera on the satellite towards the Earth. While in orbit, Sun and magnetic field sensor data is used to determine the orientation of the satellite. Once the current orientation is determined, the ADCS software calculates how to best control the actuators, which are the hardware mechanisms used to point the satellite in the desired direction. These actuators include magnetorquers, which are used to reduce tumbling in the satellite, as well as reaction wheels and hard disk drives (HDDs), which are used to rotate the satellite about one axis to point toward the Earth. Combined with additional subsystems, ADCS will be used to demonstrate the feasibility of low-cost satellite control methods.

Healthy Minds and Healthy Schooling: The Impact of Special Education Mental Health Spending on Student Outcomes

Matthew Snyder
Sponsor: Giovanni Peri, Ph.D.
Economics

The costs of poor mental health are significant both on the individual and societal level. Those who suffer from mental health related issues earn less than their mentally healthy peers, and there is around $300 billion in GDP lost annually due to decreased productivity associated with mental health issues. Thus, helping people who suffer from mental health related issues is of paramount importance economically. One such way to do so is through early intervention in public schools. Using plausibly exogenous variation from the introduction of a new federal grant targeted at mental health spending in special education in California schools, I construct a difference in differences model to estimate the causal impact of mental health services on student academic and behavioral outcomes. While there is an extensive literature regarding mental health and special education resources independently, their intersection warrants further study, particularly given the potential increased risk for mental health problems among special education students. Therefore, this paper hopes to give researchers a richer perspective regarding the impact of school mental health resources in order to help answer the question of how to optimize school spending.

Neuropsychiatric Symptoms and Hippocampal Volume Associated with Memory are Differentially Represented Across Ethnoracial Groups

Mae Yue So
Sponsor: Charles Decarli, M.D.
MED: Neurology

Neuropsychiatric symptoms (NPS) and brain morphometric measures have been associated with accelerated cognitive decline. However, their association across ethnoracial groups have not been studied. This study examines whether (1) NPS and (2) neurodegeneration are associated with episodic memory (EM) performance and change across three ethnoracial groups. We used a longitudinal cohort of cognitively normal older adults (n=295, mean baseline age=73.48(6.90) years, 64.4% female) from the University of California, Davis-Alzheimer's Disease Research Center, including 110 African American, 108 Hispanic, and 66 White participants. NPS were assessed with Neuropsychiatric Inventory Questionnaire (NPI-Q) and neurodegeneration was measured with hippocampal volume. Statistical analyses included latent growth modeling to establish a latent EM growth factor, and linear regression analyses. A random intercept, random slope growth model provided the best fit for the EM latent factor. Higher NPI-Q score was associated with lower EM performance only in African American participants (β=-0.045, SE=0.014, p=0.001). Larger hippocampal volume was associated with higher EM performance only in Hispanic participants (β=0.344, SE=0.094, p<0.001). No significant association with EM slope was observed. The impact of NPS and neurodegeneration on cognition may be differentially represented across ethnoracial groups. Accounting for such differences may improve early intervention strategy in cognitively unimpaired older adults.

Physiological Effects of Hyperosmotic Conditions on *Leuresthes tenuis* Cell Lines

Harris Sobottka
Sponsor: Dietmar Kueltz, Ph.D.
Animal Science

California grunion, *Leuresthes tenuis*, have a unique adaptation: the eggs incubate out of the water on the sandy beaches of Southern California. Due to these novel conditions, the embryos may be vulnerable to fluctuations in this limited-moisture environment. They may naturally experience a wide range of salinities, between 21 and 42ppt. With the continuation of anthropogenic climate change, the interstitial fluid between the sand grains of their environment may evaporate with extreme weather events such as drought, causing their environment to become even more hyperosmotic. Knowledge of their salinity tolerance will be critical to ascertain how this indicator species may fare in the future under such conditions. In this study, we exposed replicates of the first established *L. tenuis* embryonic cell lines to different environmentally relevant salinities, ranging from 300 milliosmol/kg (isosmotic conditions) to 800 milliosmol/kg (hyperosmotic conditions) for 96 hours to determine acute salinity response. After 96 hours, organelle-specific fluorescent dyes were used to determine cell proliferation, survival, mortality, and morphological differences amongst treatments. These characteristics are compared for three separately derived *L. tenuis* cell lines established from geographically distinct grunion populations. Funded by NSF MCB- 2127516.

Cytotype variation and climate adaptation in *Andropogon gerardi*

Britney Solomon
Sponsor: Jeffrey Ross Ibarra, Ph.D.
Evolution & Ecology

Polyploidy, a condition in which an organism has two or more complete sets of chromosomes, is a prevalent phenomenon in plants. The prairie grass *Andropogon gerardi* has two common cytotypes – individuals with 6 sets of chromosomes (6*x*) and 9 sets of chromosomes (9*x*). The 9*x* cytotype occurs in regions with higher diurnal temperatures and lower summer precipitation, but the factors that allow different cytotypes to adapt to different environments are unknown. One possible mechanism of environmental adaptation is stomatal variation between cytotypes. Stomatal variation has been shown to correlate with climate parameters, such as humidity and carbon dioxide concentration, and stomata size is expected to increase with genome size. To study environmental adaptation in *A. gerardi*, we analyzed stomatal length and density in *A. gerardi* populations across the United States. Fourteen populations were grown in a common garden experiment and stomatal trait data was collected. Linear mixed models were used to test the effect of population and cytotype on stomatal variation. Our preliminary results suggest that cytotype has no influence on stomata length or density. While data analysis is ongoing, this study will inform our understanding of the relationships between plant functional traits, polyploidy, and climate adaptation in plants.

Fruit sRNAs will Provide Clues on Genetic and Environmental Factors That Impact Seed Development

Shruthi Somasundaram
Sponsor: Barbara Blanco-Ulate, Ph.D.
Plant Sciences

Increasing global temperatures due to climate change pose a threat to sustaining crop and seed production. To develop crops that can adapt to stressful conditions, it is essential to understand how plant genotypes and the environment interact to influence plant growth and reproduction. Small RNAs (sRNAs) regulate processes related to seed development and adaptation to heat stress in several plant species. To study how sRNAs affect tomato seed development, we plan to sequence sRNA from fruit placental tissue and seeds. We hypothesize that the placenta is where communication of environmental conditions from maternal tissues to the seed occurs. The Blanco Lab will compare the sRNA expression of placentas and seeds from different tomato genotypes at different stages of fruit development under heat stress and normal conditions. As part of this project, I have helped establish a protocol to extract, quantify, and determine the quality of sRNAs and large RNAs from placental tissues. Several steps of this process were optimized to obtain higher quality sRNA including an effective method for grinding the tissue. Ultimately, this protocol will be key to obtain meaningful sRNA expression data to elucidate the role of the maternal environment on seed development.

Pathogen Effectors Increase Microbial Fitness during Infections

Sunyangzi(Kelly) Song
Sponsor: Savithramma Dinesh-Kumar, Ph.D.
Plant Biology

Pathogen effectors are proteins secreted by pathogens used to suppress the plant immune responses and aid infection through various characterized and uncharacterized ways. In my project, the effectors were taken from *Pseudomonas syringae pv tomato* (*Pst*) DC3000 strain, a well-studied tomato pathogen, and transformed into *Pseudomonas fluorescens* Pf0-1, a non-pathogenic soil bacterium that can deliver pathogen effectors with an engineered T3SS (Type III secretion system). We tested if selected effectors from *Pst* DC3000 will suppress plant immune responses and increase bacterial fitness. For this, we delivered the selected effector proteins using non-pathogenic Pf0-1 via infiltration into *Arabidopsis thaliana* plants and looked for increased bacterial growth of Pf0-1. We were able to detect the effector protein *in planta* by immunoblotting and quantify the Pf0-1 fitness increase by conducting a bacterial growth assay. Together, our experiment shows that some effectors from *Pst* DC3000 can suppress the plant immune response in *Arabidopsis thaliana* and increase Pf0-1 fitness.

Specific Protein Domains are Required for Localization and Function of MHCI H2-Db in Neurons

Jennifer Song
Sponsor: Anne Usrey, Ph.D.
Neuro Physio & Behavior

The development of the central nervous system (CNS) requires appropriate synaptic connections to be established. The major histocompatibility complex class I (MHC I) proteins, aside from their significant role in the immune system, are key regulators of neuronal synapse formation. Although the MHC I protein, H2-D^b, regulates early synapse formation in the developing brain, the mechanisms underlying this function remain unknown. Using a biochemical screen in cultured neurons, we found that H2-D^b interacts with the synapse limiting proteins Neuropilin-2 and Plexin-A4 through the extracellular alpha domains on H2-D^b. However, the specific alpha domains critical for this interaction remain unknown. To address this issue, we created mox-Venus tagged H2-D^b constructs with deletions of each of the alpha domains and co-expressed them in HEK 293T cells with Neuropilin-2 and Plexin-A4 to test their interactions by co-immunoprecipitation and Western blotting. We hypothesize that the deletion of at least one of the alpha domains will disrupt the interaction of H2-D^b with Neuropilin-2 and Plexin-A4. This study will provide the tools and premise for follow-up experiments in neurons to test which domains of H2-D^b are required for limiting synapse density and whether interaction with Neuropilin-2 and Plexin-A4 contribute to this process.

How the Personality of Captive Raptors Influences Their Engagement With Novel Enrichment Objects

Katie Sontag
Sponsor: Kristina Horback, Ph.D.
Animal Science

There is little information in literature about enrichment (i.e., physical or sensory stimulation) preference for birds of prey. Due to this knowledge gap, this study will investigate individual differences in enrichment use among 6 birds [Turkey Vultures (n=2), Red Tailed Hawks (n=2), and Great Horned Owls (n=2)] housed at the California Raptor Center. Birds will be observed for a 3-hour time, once a week for two weeks per treatment. Treatments will be (1) enrichment (cardboard tube, lettuce, bumble ball or firehose ball) (B) baited enrichment (same object with meat from standard diet) and (C) keeper-initiated enrichment. There was a significant difference in roosting behavior across the treatments ($\chi 2$ (2) = 6.95, P=0.03), with more roosting behavior being recorded during the baited (M=29.67±45.86) and keeper-interaction (M=23.50±29.32) treatments as compared to the un-baited treatment (M=14.33±22.33). There were no other significant differences in behaviors recorded across the treatments. Results from this study indicate that zoological facilities should pair positive associations, such as food or keeper encouragement, with enrichment or other novel stimuli for captive raptors.

Autophagy Pathways in Suppressing a-synuclein Induced Cell Toxicity

Sejal Sripadanna
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

Alpha-synuclein is a protein associated with neurodegenerative disease (ND) that can cause proteotoxic stress in cells. Autophagy is a pathway identified as being protective for neurodegenerative disease. Multiple genetic studies have identified the association between alpha-synuclein and autophagy using a variety of animal models, as well as in the budding yeast model, but it is unclear which autophagy pathways are required and what cargo is being transported to the vacuole. To further elucidate what autophagy pathways are required to reduce toxicity caused by over-expression of a-synuclein, we are testing cell viability and growth in specific pathway mutants. Based on findings from the Kaplan lab and published genetic studies, we hypothesize that mutations that inhibit ER and nER autophagy are critical for suppressing cell toxicity induced by alpha-synuclein. To test this, we are analyzing deletions of the nER autophagy pathway genes, *NVJ1* and *VAC8*. Preliminary results with *nvj1* suggest that the mutant strains have a lower viability than wild type. This result supports our hypothesis that nuclear-vacuolar junctions and nER autophagy suppress toxicity from a-syn over-expression. Finally, I plan to measure doubling times in each genetic background.

Using Machine Learning to Model Anxiogenic Drug Induced Neuron Activation in Serotonergic Systems

Akshanth Srivatsa
Sponsor: Joel Ledford, Ph.D.
Plant Biology

Serotonergic systems modulate behavioral and emotional states. One can view how serotonergic neuronal activation by anxiogenic (anxiety inducing) drugs are expressed topologically. Using data which modeled human serotonergic systems with rats' dorsal raphe nucleus (DR), we could see the rate of expression of protein indicators in the neurons. Neural activation was indicated by c-Fos expression, while serotonergic activation was represented by tryptophan hydroxylase. The goal of this study is to find a model which accurately represents the topographic distribution activated of the neurons. We plan to use supervised machine learning to identify a model of the data which maximizes the R2 value as well as minimize the error and loss within our models. These methods will go over regression, classification, naive bayesian, random forest, and nearest neighbor models. Using a machine learning model will help minimize human error that commonly occurs in these studies and allow for further innovation in serotonergic analysis.

Screening for Novel Candidate Transcription Factors in the Parasite *Giardia* Using the Gateway Cloning System

Emmet Stephenson
Sponsor: Scott Dawson, Ph.D.
Microbiology & Molec Genetics

The eukaryotic parasite *Giardia duodenalis* causes roughly 200 million cases of the diarrheal disease giardiasis annually. Regulation of gene expression in *G. duodenalis* has been poorly studied despite being integral to its function and subsequent ability to cause disease. While the *G. duodenalis* genome was published in 2007, over half of the genome is annotated with simple domains or remains unannotated due to the dissimilarity between *G. duodenalis* and model eukaryotes. To better understand gene regulation, thirty predicted transcription factors (TFs) were chosen using homology-based computational methods. Selected genes included known TFs such as GL50803_8722 (Myb2), a well-studied protein implicated in encystation (e.g., the process by which *Giardia* trophozoites become cysts). To determine DNA binding functions, we first amplified all thirty suspected TFs from genomic DNA and *TOPO* cloned them into a Gateway compatible Invitrogen pEntr-D-*TOPO* entry vector. We then used Gateway cloning to shuttle candidate TFs into destination vectors for subsequent confirmation of DNA binding activity. This Gateway cloning marks the first step in determining the function of highly divergent candidate TF proteins in the understudied protist *G. duodenalis*, with possible future implications for evolutionary biology and human pathology.

How Sample Characteristics in Scientific Paper Titles Influence Readers' Judgments

Layla Stroer
Sponsor: Alison Ledgerwood, Ph.D.
Psychology

Current publication practices within psychology are biased to favor dominant over marginalized samples in the publication process. For example, studies coming from White and western countries are more likely to be published in high-ranking journals compared to those from the rest of the world. The field's tendency to prioritize research conducted with dominant group samples can have detrimental effects, such as neglecting meaningful research and driving the assumption that the psychological experience of a very narrow set of people generalizes to all humans. In response to this problem, some psychology journals are beginning to require authors to specify sample characteristics in their titles. However, in the absence of empirical evidence on how this information affects readers, it is difficult to design effective policies. Our study aims to assess how people from various backgrounds might react to literature titles that include different types of sample characteristics. Participants will see three study titles: (1) a control title with no sample characteristics, (2) a dominant sample title (e.g., "among White participants"), and (3) a marginalized sample title (e.g., "among participants of color"). For each title, they will assess how interesting, important, and applicable they find each study.

Food Fight

Morgan Strong
Sponsor: James Housefield, Ph.D.
Department Of Design

Food Fight inspires creativity and exploration of food, promoting awareness around common ingredients. The game mechanics are simple: like *Apples to Apples*, there are question cards for which each player plays their strongest "Ingredient" card in hand. The difference is that the players briefly argue for their card to the judge. The discussion promotes the exchange of ideas and exposes how players use and think about varying ingredients. The questions range from practical applications like "What's the most versatile ingredient?" to fantastical ones like "What ingredient would you give to an alien that best represents Earth?" The ingredient cards are aimed to cover all ingestible items: proteins, vegetables and fungi, fruits and sweeteners, dairy and fats, grains and beans, nuts and seeds, herbs and spices. It is a take on intuitive eating that disrupts habits and associations in a new way. The visually-oriented game promotes discourse and competition with the underlying current of learning about other cultures' food uses. There are vast resources available, but the overwhelming marketing campaigns ultimately restrict individualized experimentation. This game is designed to ground the players and expand the possibilities of ingredients.

Stable Isotope Analysis of Avian Species Recovered From the East Bay Archaeological Site, CA-ALA-554

Ryann Su
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

As a special group of animals with high sensitivity and great mobility, birds can be a good indicator of natural and anthropogenic environmental changes. Through carbon, nitrogen, and sulfur stable isotope analyses of bone collagen, this study examines the diet sources of several wild bird species in an attempt to discover their foraging patterns. The species include the Canada Goose (*Branta canadensis*), American Crow (*Corvus brachyrhynchos*), Red-tailed Hawk (*Buteo jamaicensis*), etc. These avian remains were excavated from the CA-ALA-554 archaeological site in the East San Francisco Bay Area in California. Radiocarbon dating suggested they span a time period of 1600 years (400 to 2000 years before present). We compare the isotopic signatures of samples from different times to investigate the environmental changes for each taxon over time. Recognizing the birds include both migratory and resident ones, we also evaluate how different life histories influence the bone isotopic characteristics. This study has been conducted in partnership with the Him'Ren Ohlone Tribe.

Shellfish on the Menu in the East Bay Interior: Clams, Mussels, and Oysters in Prehistoric Alameda County, California

Maria (Allie) Suarez
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

In partnership with the Him'Ren Ohlone Tribe (MLD), this project examines the marine shellfish (clam, mussels, and oysters) remains recovered during salvage excavations at archaeological site CA-ALA-554, which is an ancestral Ohlone site in Pleasanton, CA. AMS radiocarbon dates indicate that people lived in this area and deposited the shellfish remains between 400 and 2,000 years before present. Although the site is located over 20 km from the San Francisco Bay, appreciable amounts of marine shellfish (clam, mussels, and oysters) were imported to the site. Through analysis of oxygen isotopes, we reconstruct the seasonality of harvest of a sample of shells (clam, mussels, and oysters). While previous analyses at bayshore sites show year-round harvesting of shellfish, seasonality at interior sites seems to be limited to Winter. Our goal is to document any shifts in shellfish harvesting and to examine whether this pattern holds at CA-ALA-554, and across all three species.

The Willow Clinic Behavioral Health Team: A Model for Reducing Mental Health Care Accessibility Barriers

Jeetu Sujith
Sponsor: Kate Richards, M.D.
MED: Family & Community Med

This innovative quality improvement study uses depression screening to evaluate the Behavioral Health Team (BHT), offered in Sacramento through two student-run clinics, as a model for addressing health disparities and reducing obstacles to mental health care for people experiencing homelessness and people who inject drugs. Unhoused People are disproportionately affected by trauma and depression yet face unjust barriers to mental health treatment. At two of the UC Davis Health student-run clinics serving diverse populations, every person is offered a Patient Health Questionnaire-9 (PHQ-9), a standardized depression screening. A medical provider reviews all questionnaires for crisis intervention, and people at risk for moderate or severe depression are connected, if interested, to BHT, which offers direct psychiatric services and supportive resources. This study evaluates BHT as a model for decreasing obstacles to mental health care for people experiencing homelessness through evidence-based, person-centered care integrated within two student-run clinics by measuring depression screening rates and using outcome data and reiterative changes to address health disparities and promote equitable practices. Through depression screening at student-run clinics, the Behavioral Health Team provides accessible, evidence-based care and highlights the importance of understanding disparities in behavioral health resources.

The Impact of Audiovisual Cues on Speech Recognition: an ERP Study

Plyfaa Suwanamalik-Murphy
Sponsor: David Corina, Ph.D.
Linguistics

Phonological competition occurs when spoken words have similar sounds and are harder to recognize (“cap” - “cat”). Previous research found that phonological competition influences brain wave (event related potential; ERP) components elicited during spoken word recognition. Specifically, the N400 is a response appearing when we process meaningful stimuli; it is more negative in response to unexpected spoken words. This study expands previous work by using audiovisual (AV) stimuli, which involves hearing and seeing a speaker. Visual speech cues may influence word recognition and the N400. To test these effects, undergraduate students (N=10) will match pictures and AV spoken words based on meaning while we collect brain wave data. We will use phonological conditions of matches (ball-BALL), rhymes (ball-DOLL), word initial cohorts (ball-BAT), and unrelated words (ball-JET). Upon analysis of ERP data, we expect to see a more negative N400 component on the unrelated, rhyme, and cohort conditions compared to the match conditions, because unexpected word forms cause a more negative N400. This study will advance our understanding of how different speech cues interact when there is phonological competition. The findings will have implications for improving speech recognition technology and underscore the need for visual speech cues for hearing-impaired individuals.

Synchronization of Digital Fireflies

Hasan Syed
Sponsor: Daisuke Sato, M.D.,Ph.D.
MED: Pharmacology

Synchronization is a universal phenomenon in natural, physical, and mechanical systems. For example, cardiac pacemaker cells are not the same at the cellular level. But when they are coupled, they generate synchronized signals in the heart. Synchronization of fireflies is another example in nature. These systems are not controlled by a command cell or command firefly, but rather synchronization occurs due to entrainment of nonlinear oscillators. In this presentation, we will demonstrate synchronization of mechanical fireflies, through a physical circuit model. The fireflies are built using Arduino, LEDs, and light sensors. The body of the firefly is designed and built using 3D CAD software and the stereolithography 3D printer. We use a mathematical model of the nonlinear oscillator, which is simulated in Arduino, using Pulse Width Modulation. Each firefly emits light from LEDs based on its own oscillation, and then receives light from the other fireflies. The signal from the other fireflies affects the timing of the oscillation, becoming a pulse coupled oscillator. Even when signals from multiple fireflies are initially randomly, as time goes, they synchronize, a phenomenon that will also be shown in our presentation.

The Effect of Horror Video Game Music on Physical and Emotional Responses of a Player

Kellan Ta
Sponsor: Petr Janata, Ph.D.
Psychology

Immersion is the ability of a video game to make a player feel like they are within the game using various techniques. More specifically, in the horror genre, the game weaponizes immersion by triggering negative emotional and physical responses using jumpscares. Both the visual and audio aspects of the game are used to trigger these negative responses, but to what extent does audio play a role? In order to test the extent of video game audio, participants will play through multiple first-person role playing computer horror games with varying audio conditions using headphones. We will analyze the data using a video streaming software that syncs the audio and video together of each playthrough. To measure physiological responses, a heart rate monitor and an EDA monitor will be used. Emotional responses will be measured through a pre and post survey with targeted questions to gauge how each participant felt during the experiment. We predict that participants will experience a decrease in negative responses when playing with the “calming lofi” condition and an increase in negative physical responses but a decrease in emotional responses when playing with the “happy upbeat music” condition. No changes should be observed with the “no audio” condition.

Naphthalene Toxicity in the Lungs of Geriatric Mice and Impact of Ergothioneine Pre-treatment

Shanlea Tabofunda
Sponsor: Laura Van Winkle, Ph.D.
VM: Anat Physio & Cell Biology

As the elderly population increases, it becomes increasingly important to understand their susceptibility to environmental toxicants. Naphthalene (NA), commonly found in car exhaust and wildfire smoke, causes a characteristic lung epithelial cell necrosis in adult mice. NA targets club cells, which help defend against oxidative stress and produce club cell secretory protein (CCSP). We investigated the potential impact of pretreatment with the dietary antioxidant ergothioneine (ET), which accumulates in tissues experiencing high oxidative stress. Geriatric male and female mice, 1 - 1.5 year old, were treated with 70 mg/kg of ET via gavage for 5 days, and then exposed to graded doses of NA. Tissues were collected to assess lung histopathology and gene expression of CCSP and ET transporter (SLC22A4). Females were more susceptible to NA than males, with these effects increasing with age, as shown by a significant increase in CCSP ($p \leq 0.001$) and SLC22A4 ($p \leq 0.01$). ET was protective against NA in the proximal airway club cells of geriatric female mice compared to males. These findings suggest that age impacts susceptibility to NA differentially by sex, and that consuming ET may help ameliorate naphthalene-induced toxicity, with positive implications for the geriatric community.

Exploring Carboxylic Acid Metabolism and RNA Splicing Regulation Proteins in Long-lived Ames Dwarf Mice

Isabella Tan
Sponsor: Aldrin Gomes, Ph.D.
MED: Physiology & Membrane Biol

Ames Dwarf mice are known for their greater longevity in comparison to their larger control counterparts. However much remains unknown about which biological pathways contribute to the Ames mouse's increased life-span, and how the pathways may contribute. Proteomic results suggest that there are numerous biological processes in the Ames mice that deviate from those of the reference mice. Two important pathways were investigated, carboxylic acid metabolism and RNA splicing regulation. Using the PANTHER database and quantitative mass spectrometry data from mice heart samples analyzed in Scaffold, protein differences between Ames mice and reference mice were identified. In comparing the two mice models, I am focusing on 18 significant protein changes in the carboxylic acid metabolic process and 7 relating to the regulation of RNA splicing. My initial findings suggest that when compared to control mice, Ames mice have mostly decreased protein levels in regards to carboxylic acid metabolism, while displaying an enrichment in proteins involved in RNA modification. The mechanisms that can account for these differences are being explored using different approaches.

CalGrant Extension Programs for Fifth Year Students Within the University of California System

Alvin Tang
Sponsor: Janine Wilson, Ph.D.
Economics

Cal Grant is a financial aid program for students in California and provides for a majority to all of a student's tuition. The Cal Grant system currently is provided to eligible students for a time period of four years, but with the heavier coursework many STEM students, in particular engineering students, are taking more time to finish their degrees. This study examines engineering students within the nine undergraduate schools in the University of California and the course work required for graduation within colleges. The study compares students who have received their degree in the traditional four years in comparison to those who complete in five years. Student coursework is analyzed and evaluated to determine if they are required to take a heavier course load per quarter/semester, start with extra units, or take summer courses to finish their degrees faster. The study is part of a growing study for understanding educational policies and the impact on student success rates.

Google Maps as a Resource for Innovation: Four Applications

Marcus Tang
Sponsor: Martin Kenney, Ph.D.
Human Ecology

Determining location is a vital component of human activity. The transition of maps from an analog to a digital format freed them from the constraints of physical media, making the maps editable. As digital objects, maps became resources or "affordances" that other actors could use to introduce new services building upon these objects. These opportunities to build new services have allowed mapping to evolve from simply identifying locations and guiding people to affecting various aspects of everyday life. Digital maps can be integrated with other software and data to display a remarkable variety of information allowing new services to be created and other parties to incorporate mapping data into their applications. To illustrate, Google Maps was initially constructed by digitizing various paper maps and data. It later utilized GPS, layering it on top to create its navigation platform. With the creation of Google Maps, numerous applications have utilized its Application Programming Interface (API) to access the spatial data contained in Google Maps to provide unique services for various target audiences. Using four case studies: Uber, Puget Sound Energy, Pokémon Go, and Seattlefoodtruck.com, this project explores how Google Maps, as a digitized object, became a resource for innovation.

Building a Frameless 7-Meter Cardboard Geodesic Dome Based on an Off-the-shelf Drawing

Kyle Taniguchi
Sponsor: Jiayi Young, M.F.A.
Department Of Design

This project aims to prototype a 7-meter frameless geodesic dome. We based our work on an off-the-shelf drawing of the Goldberg polyhedron geometry and used single-layer corrugated cardboard panels as material for construction. The Goldberg polyhedron geometry is a three-dimensional spherical structure in which groups of polygonal panels of pentagons and hexagons repeat in a rotational pattern. The project's objective is to determine build viability per geometry, the process needed, and the safety protocols required to erect such a dome structure. In this presentation, we explain the geometry, detail the step-by-step building process requiring both digital fabrication and physical construction, specify the hardware used, and discuss our findings. In addition, we share strategies developed that are conducive to building the dome by a small group of around ten people, with consideration placed on efficiency, ease of setup and takedown, and efforts to minimize assembly errors. We are curious about the possibility of such structures serving as emergency shelters and contributing to possible solutions to mitigate looming humanitarian crises such as homelessness and global human migration.

Lettuce Genomic Editing Studies

KATRINE TARAN
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

Our recent studies aimed to evaluate the efficacy of various CRISPR editing designs by targeting the anthocyanidin synthase (ANS) gene. The phenotype change from red to green leaves in shoots was used as an indicator of editing efficiency, which was validated through amplicon sequencing of the target locations in the ANS gene. We first compared two promoters, the Arabidopsis UBI promoter (AtUBI) and the lettuce UBI promoter (LsUBI), for expressing the Cas9 gene. The results showed that LsUBI was more efficient in editing ANS compared to the AtUBI. We then tested whether using the LsUBI promoter to express a different version of the Cas9 gene with 13-introns (CzCas9i) would give even higher editing success. We found that editing frequency was similar to using the LsUBI promoter with the standard Cas9 without introns. This research provides valuable insights into the selection of the appropriate promoter to use for robust Cas9 expression and editing in lettuce, which will inform future efforts in engineering lettuce cultivars with desirable traits.

The Impact of Pushing Fashion Overseas: Economical, Environmental, and Social Issues on Developing Countries

Wesley Tat
Sponsor: Colleen Zern, J.D.
Graduate School Of Management

How does pushing fashion across the border to developing countries affect their economy, their environmental issues, and their social issues? Articles and research studies were reviewed to draw conclusions and answer the question posed. Data have been drawn from these studies and analyzed. Developed countries disregard the detriments that influence developing countries when pushing the assembly of fashion to those countries. There is the slight benefit of bringing new jobs into their economy but how problems arise when the regulations in developing countries do not safeguard workers' rights and wages. There are also environmental downsides to offshoring and outsourcing these labors to developing countries as these countries have loose environmental regulations and the developed countries are offshoring their carbon pollution. The thesis aims to inform the general population about the dangerous impacts and risks that arise when businesses in developed countries push their labor to produce fashion across the sea.

Optimizing Quantitative BOLD Model in Gray and White Matter Brain Regions

Anahita Tavakoli
Sponsor: Audrey Fan, Ph.D.
MED: Neurology

Metabolic markers of baseline brain oxygenation are important for measuring hemodynamic impairment in stroke, Alzheimer's dementia, and other neurological conditions. The quantitative blood oxygenation level-dependent (qBOLD) model with magnetic resonance imaging (MRI) produces non-invasive, quantitative measurements of brain oxygenation. However, a notable issue of the qBOLD model is that brain parameter estimates may be evaluated with wide uncertainties. In this study, we utilized mean squared error (MSE) to control the uncertainties in the brain parameters. Three healthy subjects were scanned on a Siemens 3 Tesla MRI scanner. MRI scans were acquired using Gradient Echo Slice Excitation Profile Imaging Asymmetric Spin Echo (GASE) and T1-weighted structural sequences. The qBOLD model was then applied to quantify brain maps of three physiological biomarkers: oxygen extraction fraction (OEF), deoxygenated blood volume (DBV), and reversible transverse relaxation rate (R_2'). Lastly, we optimized the model by implementing statistical least squares analysis with known covariance (LSCOV).The MSE results demonstrated that the DBV and OEF values changed closer to an expected healthy range of around 3% and 40%, respectively, in both gray and white matter brain regions.

Parent-Child Book Sharing and Child Storytelling: Chinese-American and Mexican-American Head Start Preschoolers

Nereyda Tavira-Virelas
Sponsor: Yuuko Tonkovich, M.D.,Ph.D.
Education

Existing literature shows that parent-child shared book reading predicts dual language learners' (DLLs) early and later vocabulary and reading development. However, little is known about the impact of shared reading practices on children's storytelling skills, especially among DLLs from low-income immigrant families. The current study examined the group differences between Chinese-American and Mexican-American parent book reading practices and the relationships between parent-child shared book reading and child independent storytelling skills among DLL preschoolers. Data from 30 Chinese American (ten boys) and 30 Mexican American (18 boys) DLL preschoolers from low-income immigrant families enrolled in Head Start programs were used. DLLs' independent narratives were coded for macrostructure representing overall narrative quality. Parental narratives from the shared book reading sessions were coded for story components. Preliminary results suggest group differences in both parent and child narrative structures between Mexican-American and Chinese-American groups. Additionally, correlation results suggest no significant relations between DLLs' narratives and parental story components. The results are useful in helping us understand the complex language development of DLLs.

The Role of Adenylyl Cyclase in Incretin Signaling to Improve Type 2 Diabetes Therapies

Gabriella Tenret
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

Type 2 diabetes (T2D) occurs when the body becomes resistant to or fails to produce sufficient amounts of insulin, a hormone secreted by beta cells, allowing for the uptake of glucose. Searching for an effective T2D treatment, researchers focused on incretins, hormones secreted from the gut following food consumption. Incretins bind to receptors on beta cells and initiate a signaling pathway that leads to insulin release. I aim to understand the specific adenylyl cyclase, an enzyme central to incretin signaling, and its role in regulating insulin production. I focus on adenylyl cyclase 6, an enzyme that is highly expressed in beta cells but has no known function. I will test this hypothesis by using wild-type and adenylyl cyclase 6 knockout mice. I will isolate and section tissue from mouse pancreas using a cryostat. To confirm the knock out of adenylyl cyclase 6 in beta cells, I will immunostain with insulin and adenylyl cyclase specific antibodies. I will then compare insulin secretion levels of beta cells from knockout and wildtype mice in response to incretin stimulation. I expect these findings to provide a deeper understanding of the therapeutic mechanism of incretin-based therapies.

Comparing Songbird Migration Between Coast Range and Central Valley Using Nocturnal Flight Calls

Cameron Tescher
Sponsor: Robert Furrow, Ph.D.
Wildlife & Fisheries Biology

Both California's Central Valley and Coast Range are important flyways for migrating songbirds. However, the timing of a species' migration along these flyways may differ, revealing that these migration pathways reflect birds coming from different wintering sites or heading to different breeding areas. Differences in migration timing may also reflect varying phenology of plants and insects within these regions. Nocturnal flight call recordings allow consistent detection of common night-calling migratory species, including *Passerina amoena* (Lazuli Bunting), *Catharus ustulatus* (Swainson's Thrush), *Setophaga petechia* (Yellow Warbler), and *Cardellina pusilla* (Wilson's Warbler). In this study, we made nightly recordings of nocturnal flight calls during spring migration (April 1st - May 31st), comparing species' abundance and peak migration timing as well as general species composition between several Coast Range sites and Central Valley sites. The results of this study may inform variation in vulnerability to climate change and wildfires for birds migrating through California, as well as potentially identify novel migratory pathways of hard-to-detect species.

ICECAP: Influence of Cooling Duration on Efficacy in Cardiac Arrest Patients

Prishha Thiagarajan
Sponsor: Matthew Greer, M.D.
MED: Emergency Medicine

Sudden cardiac arrest is the third leading cause of natural death in the U.S., with over 450,000 deaths on average every year. Over 300,000 people suffer from cardiac arrest outside of the hospital with just a 10% survival rate, while over 200,000 people suffer from in-hospital cardiac arrest with a 25% survival rate every year. In resuscitated comatose patients, therapeutic cooling has increased the rate of positive neurological outcomes. However, poor neurological outcomes are still prevalent in as many as 50% of the cases. The length of time that therapeutic cooling treatment should be provided in resuscitated comatose patients has not yet been determined in a randomized study. The UC Davis Emergency Department is an enrolling site in the ICECAP (Influence of Cooling Duration on Efficacy in Cardiac Arrest Patients) trial. This is a multi-center, randomized, control trial with an adaptive design enrolling post-ROSC patients with both shockable and non-shockable initial rhythms. We hope to determine the optimal time of cooling for maximal neurologic recovery.

Determining Whether Skewed X Chromosome Inactivation in Carrier Females Underlies *CNKSR2*-Related Disorder

Emily Thrall
Sponsor: Janine Lasalle, Ph.D.
MED: Medical Microbiology & Imm

We are investigating the inheritance of a neurodevelopmental and epilepsy disorder related to *CNKSR2* on the X chromosome from 28 known affected families. This disorder is characterized by seizures, developmental delay, and autism spectrum disorder (ASD) in males. Loss of function mutations in *CNKSR2* correlates with this disorder, and in a recent study 10 out of 13 cases stem from de novo mutations. However, 3 of 10 cases appear to be maternally inherited. We hypothesize that skewed X chromosome inactivation in the mothers favors the wild-type *CNKSR2* allele and is the underlying reason behind this inheritance. Therefore, we will use saliva and buccal isolated DNA samples from four female patients, a control male and a control female to test for non-random X chromosome inactivation. This assay uses PCR to amplify the X linked Androgen Receptor (AR) genes on both alleles in intact DNA and the methylated AR gene in HPAII digested DNA to determine the ratio of active to inactive X chromosomes. These results will provide us with a better understanding of *CNKSR2*-related neurodevelopmental disorder and how it is inherited, allowing for further research on its treatment and prevention.

En1 as a biomarker for metastatic pancreatic cancer.

Thae Su Thu
Sponsor: Changil Hwang, D.V.M.,Ph.D.
Microbiology & Molec Genetics

Pancreatic Cancer is one of the most lethal malignancies ranking as the 3rd leading cause of cancer related mortality with an average 5-year survival rate of 12%. Pancreatic ductal adenocarcinoma (PDAC) is the most prevalent type accounting for 90% of all pancreatic cancer. Genetic alterations in *KRAS* and *TP53* initiate the disease progression, driving the formation of pancreatic intraepithelial neoplasia (PanIN). Subsequent epigenetic alterations, driven by transcription factors, promote PDAC progression and metastasis. Upregulation of EN1, a homeodomain transcription factor, correlates with poor patient survival. We hypothesize that certain clones within primary tumors acquire aberrant EN1 expression promoting PDAC metastasis. To test this hypothesis, we are using a transgenic mouse model with an *En1-EGFP* allele to visualize En1 positive cells crossed with a PDAC mouse model, KPC mouse (*Kras*$^{+/LSL\text{-}G12D}$*; Trp53*$^{+/LSL\text{-}R172H}$*; Pdx1-Cre*) to obtain a KPCG mouse (*Kras*$^{+/LSL\text{-}G12D}$*; Trp53*$^{+/LSL\text{-}R172H}$*; Pdx1-Cre; En1-EGFP*). As expected, preliminary GFP Immunohistochemistry data suggest that EN1 is expressed in a certain population of cells in brain. We will further determine when EN1 positive cells appear during PDAC progression and metastasis using KPCG mice. Our study will give us insights into the role of EN1 in PDAC progression and metastasis.

Characterization of *Neprilysin* Mutant Mice as an Animal Model for Age-Related Macular Degeneration

Nicole Tng
Sponsor: Glenn Yiu, M.D.,Ph.D.
MED: Eye Center

Age-related macular degeneration (AMD) is the leading cause of vision loss in older adults, and is characterized by subretinal deposits called drusen. Amyloid beta (Aβ) is a family of misfolded proteins that has been found to be a component of drusen and is associated with AMD. Mutant mice lacking *neprilysin*– an important Aβ degrading protein– exhibit increased deposition of Aβ and may exhibit drusen-like phenotype with age. In this study, we characterize *neprilysin* knockout mutant mice at key timepoints over 2 years using optical coherence tomography (OCT), fundus photography, and electroretinography (ERG) in vivo, as well as histology, immunohistochemistry, and electron microscopy. We did not observe drusen-like deposits on fundus or OCT images, or ERG abnormalities at any time points. Histology revealed stable anatomy compared to wild-type littermates. Mutant mice on a high-fat diet, which exacerbates AMD-like pathology in other mutant mouse models, did not exhibit significant pathological differences compared to wild-type controls on a regular diet. Our findings challenge previous work suggesting the presence of drusen-like pathology in mice deficient in *neprilysin*. Possible explanations include different genetic or epigenetic backgrounds, and different environmental exposures.

Inhibition of Soluble Epoxide Hydrolase Is Protective against the Multi-omic Effects of a High Glycemic Diet on Brain Microvascular Inflammation and Cognitive Dysfunction

Ritz Harley Tolentino
Sponsor: Amparo Villablanca, M.D.
MED: Int Med Cardiology (davis)

Soluble epoxide hydrolase (sEH) enzyme converts neuroprotective and vasodilatory epoxy-fatty acids into biologically less-active diols. sEH inhibitors (sEHIs) are promising therapeutic targets for hyperglycemia, diabetes, Alzheimer's disease (AD), and cardiovascular diseases. Our study aimed to determine the multi-omic effects of sEHI on the hippocampal microvessels of high glycemic diet (HGD) fed male mice and cognitive function. Wildtype mice were fed low glycemic diet (LGD) or HGD with/without the sEHI, trans-4-[4-(3-adamantan-1-yl-ureido)-cyclohexyloxy]-benzoic acid (t-AUCB), for 12 weeks. Hippocampal microvascular gene expression was assessed by microarray. Data was analyzed using a multi-omic approach for differentially expressed coding and noncoding genes (DEGs), gene networks, and functional pathways. Global hippocampal microvascular gene expression following HGD was distinctly different and opposite to HGD+sEHI. Interestingly, the inhibitor reversed the gene expression profile of HGD akin to LGD. The inhibitor response on HGD was characterized by 1701 DEGs, mostly downregulated and involved in similar cellular pathways as HGD: cell signaling, neurodegeneration, metabolism, and cell adhesion/inflammation/oxidation. We also demonstrated that DEGs modulated by HGD+sEHI negatively correlated to gene expression profiles from AD patients. To our knowledge, this is the first study to demonstrate that sEH inhibitor reverses the deleterious effects of HGD, correlating with protection against dementia.

Diseased Democracy: Did COVID-19 Help Undercut Democracy Around the World?

Emma Tolliver
Sponsor: Lauren Young, Ph.D.
Political Science

While it appears that the COVID-19 pandemic expedited the process of democratic backsliding of the United States that ultimately culminated in the January 6th insurrection, there hasn't been a systematic study of the effect the pandemic had on electoral democracy across the international sphere. This work evaluates whether the COVID-19 pandemic hadn't an effect on democratic backsliding around the world. I hypothesized that countries with more COVID-19 cases and deaths in 2020 or 2021 will have larger declines in their electoral democracy index score, and that this relationship will be especially pronounced in countries that are weak democracies, electoral autocracies, and countries that were backsliding prior to the start of the pandemic. To test my hypothesis that COVID-19 cases and deaths are inversely related to electoral democracy index scores, I conducted a quantitative analysis research project, and I expected to find a statistically significant negative relationship between COVID-19 cases/deaths and electoral democracy index scores. The empirical evidence suggests that there is a limited relationship between the COVID-19 pandemic and democratic backsliding, and I propose potential factors mediating and moderating this relationship.

Investigating Novel Gene NHIP interaction with Other Proteins in Human Brain

Christina Torres
Sponsor: Janine Lasalle, Ph.D.
MED: Medical Microbiology & Imm

Oxidative stress is defined as the inability to balance and detoxify the reactive oxidants in the body. Oxidative stress in utero is a prominent risk factor associated with Autism Spectrum Disorders (ASD). Environmental ASD risks are attributed to hypoxia in utero through poor air quality and complications in the mother's pregnancy such as inflammation from asthma or viral infections. The La Salle Lab recently identified novel gene, Neuronal Hypoxia Inducible Placenta associated (NHIP) which is elevated in expression in an oxidative stress environment found only in the primate lineage. NHIP was hypothesized to have neuroprotective properties, as it was found to be expressed in higher concentrations in brain and placenta of the control samples versus the ASD samples. Preliminary evidence suggest that NHIP interacts with other factors such as MeCP2. My project is to confirm the interaction of NHIP with other candidate proteins in human brain. Immunoprecipitation and western blot will be performed to assess any interaction between the MeCP2 and NHIP proteins. The mouse brain will be used as our negative control as NHIP is a primate specific gene. Alternative techniques including dot blots and mass spectrophotometry will also be used to confirm interactions of NHIP and other proteins.

Evaluating the role of Marine Protected Areas; a case study comparing biodiversity inside and outside MPA's

Savannah Torgerson
Sponsor: Christina Pasparakis, Ph.D.
Environmental Toxicology

In 2007, the California Collaborative Fisheries Research Program (CCFRP) was established to help evaluate groundfish populations in Marine Protected Areas (MPAs) as a metric to help understand overall MPA performance. One of six institutions across the coast of California that hosts a chapter of CCFRP, the UC Davis Bodega Marine Lab, monitors Stewart's Point and Bodega Head State Marine Conservation Areas (SMCA). Each year a crew of scientists and volunteer anglers spend upwards of two weeks surveying the MPA's and their corresponding reference sites. In this poster we will analyze data collected inside and outside of the MPA's from the recent 2022 sampling effort to further understand the status of the MPA's off of the Bodega Marine Lab. We will be comparing species richness, abundance, and size differences between fish caught inside versus outside the MPA's. These results will help policy makers to make better informed decisions regarding MPA's and track their use across time. The continued monitoring of Marine protected areas and understanding the data collected plays a critical role in being able to make educated decisions regarding their use and benefits to both people and the environment.

Genetic Transformation Process in Identifying Virulence Genes of the Generalist Pathogen *Botrytis cinerea*

Nathan Tran
Sponsor: Daniel Kliebenstein, Ph.D.
Plant Sciences

In the relationship between plants and their pathogens, virulence and host specificity of the pathogen are modulated by certain genes. Statistical analyses such as GWAS allows for the identification of genes that are likely to affect virulence, however, this data needs to be confirmed experimentally. A process for site-directed genome modifications in our pathogen of interest, *Botrytis Cinerea*, helps accomplish this goal by allowing for the analysis of the overexpression and knock-out of specific genes. Three candidate genes for virulence were selected for a low number of haplotypes within virulence associated gene families: transmembrane transporters and a metabolic enzyme, cyp450. We started with two low copy number plasmids (pRF-HU2 & pRF-HU2E) and inserted amplicons of our genes of interest in the plasmids' linearized forms before cloning and transforming them into E. coli for propagation. Selected colonies were then tested for the presence of amplicon insertion and sequenced prior to transformation into *AGL1*, a strain of agrobacterium suitable for transfecting *Botrytis cinerea*. This genetic procedure is currently undergoing optimization to allow for efficient experimental analysis of additional future genes of interest.

Role of Novel Peptide NHIP in Protecting Against Oxidative Stress

Taylor Tran
Sponsor: Janine Lasalle, Ph.D.
MED: Medical Microbiology & Imm

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder caused by a combination of genetic and environmental factors. Our lab recently discovered *NHIP* (neuronal hypoxia inducible, placenta), a novel gene that encodes a long non-coding RNA and a nuclear micropeptide that is expressed at lower levels in ASD brains compared to neurotypical brains. NHIP appears to have arisen recently in the primate lineage with the expansion of brain size and neuronal activity. We hypothesize that NHIP acts as a protective factor to counter oxidative stress from elevated size and neural activity. To test this hypothesis, we used the LUHMES (Lund human mesencephalic) cell line, which can be maintained as a progenitor or differentiated into neuronal cells. We treated wild-type LUHMES neurons with cobalt chloride to mimic hypoxic conditions and then added NHIP to see whether exogenous NHIP would protect against oxidative stress, as measured by reduced oxygen species (ROS) levels. Our preliminary results suggest that adding exogenous NHIP to undifferentiated WT cells, which do not express high levels of NHIP, results in a decrease in ROS levels. Fully characterizing the function of NHIP and its role in protecting against oxidative stress will contribute to potential treatments for neurodevelopmental disorders including ASD.

Transmission of Expanded *Fmr1* Repeat Elements in a Fragile X Mouse Colony

Monica Tsui
Sponsor: Paul Hagerman, M.D.,Ph.D.
MED: Biochem & Molecular Med

Fragile X-associated disorders are caused by expanded CGG repeats in the 5'-UTR of the *Fmr1* gene. The mechanism by which expansions and contractions occur remains largely unknown and is under active investigation. Mice are hypothesized to share a common molecular basis for repeat instability as humans, making them a potentially useful model to study disease pathogenesis. In the current study, we examined patterns of *Fmr1* transmission in mice over five generations, with repeat tracts ranging from the pre-mutation range (55-200 repeats) to well above the full mutation threshold (>200 repeats). We observed large contractions and expansions upon generational transfer, with repeat number 'jumps' of up to 200 repeats. The overall allele size decreased with each subsequent generation and appeared to stabilize at around 200 repeats. This is potentially a consequence of decreasing allele size in the selected breeders for each generation. Notably, as maternal allele size expanded to 200-300 repeats, the propensity for large contraction events upon transmission to male offspring increased. To our knowledge, this study produces one of the first occurrences of very large intergenerational changes in the *Fmr1* gene. Through these findings, we hope to build on the current understanding of aspects of disease pathogenesis in humans.

Aerodynamics and Acoustics Validation of Parallel Blade Vortex Interactions

Huy Tran
Sponsor: Seongkyu Lee, Ph.D.
Mechanical & Aerospace Engr

One unique feature of rotary wing aircrafts is Blade Vortex Interaction (BVI). Due to their cyclical motion, rotor blades constantly encounter vortices generated by previous rotor blades. Therefore, it is critical to account for BVI when designing helicopters and other vertical takeoff and landing aircrafts. When the incoming vortex travels down the span of the blade, the case is referred to as Parallel BVI. A significant byproduct of this is a large pressure spike occurring on the rotor disk, causing an amplified broadband noise to be emitted into the far field. Considering that Urban Air Mobility is still a budding part of the industry, the public may rally against this concept if the issue persists. I plan to validate test cases in Kitaplioglu's research papers by replicating the experiments using Overflow CFD solver and PSU WOP-WOP acoustic prediction tool. In the future, I plan to rigorously test these cases with different parameters to determine a best practice to further Parallel BVI research for different forms of rotary wing based aircrafts.

Music and Meaning in the Writings of Aldous Huxley and C.S. Lewis

Kamryn Tucker
Sponsor: Erik Peregrine, Ph.D.
Music

Although British author-philosophers Aldous Huxley and C.S. Lewis both recognize an inherent spiritual power to music, their differing beliefs about meaning lead them to separate conclusions about which music(s) is/are intrinsically meaningful–and why. Huxley recognizes the transcendental power of music, but conceives of meaning from a rational perspective and approaches his analysis of music similarly, using technical analysis of musical elements to argue for its expressive power. In contrast, Lewis's Romantic aesthetic values and religious worldview characterize how he views meaning both within music specifically and in the human experience more broadly. Huxley and Lewis's divergent interpretations of meaning in music are clearly illustrated by the authors' polarized reactions to music by Richard Wagner. Huxley claims Wagner's music is not as valuable as the works of Mozart and Beethoven, and writes of his strong reactions against atonality and "Wagner-gone-wrong-chromaticism." C.S. Lewis, before even hearing Wagner's music, was enchanted by the Romantic title Siegfried and the Twilight of the Gods. Using Wagner as a focal point for comparison, Aldous Huxley and C.S. Lewis's differing but sympathetic interpretations of meaning in music are better understood.

Nicotine Exposure Impairs cAMP Signaling in Vascular Smooth Muscle Cells

Riley Turner
Sponsor: Madeline Nieves-Cintron, Ph.D.
MED: Pharmacology

The deleterious effects of conventional smoking on the cardiopulmonary system are well-understood. However, the increased prevalence of nicotine usage through e-cigarettes warrants further investigation, specifically on vasculature effects. 3',5'-cyclic adenosine monophosphate (cAMP) is a ubiquitous second messenger that plays a vital role in regulation of vascular smooth muscle cell (VSMC) function. cAMP levels are regulated by synthesis via adenylyl cyclase after activation of a G_S protein-coupled receptor (G_SPCR), and via degradation by phosphodiesterases (PDE). Mice exposed to nicotine exhibit reduced cAMP levels, yet this mechanism is poorly understood. In this study we hypothesize that regulation of PDEs is pivotal for cAMP reduction following nicotine exposure. We expressed a novel Förster Resonance Energy Transfer (FRET) cAMP biosensor in aortic VSMCs to assess the effects of nicotine on stimulated cAMP with and without PDE inhibitors, where PDE inhibition was found to rescue cAMP levels. Furthermore, an immunostaining assay was used to assess expression and cellular distribution of PDEs, which demonstrated higher levels of PDE in VSMCs of nicotine-treated mice. Taken together, our results suggest that nicotine induces alterations in cAMP signaling, thus contributing to vascular complications in users of tobacco products.

WbLS Attenuation in SAMD

Chineme Uba
Sponsor: Robert Svoboda, Ph.D.
Physics

The purpose of the research is to measure the attenuation coefficient of Water Based Liquid Scintillator(WbLS). WbLS, Water based Liquid Scintillator, is an important liquid because it is cheaper than other Neutrino Detector materials. This allows for detectors to be cheaper and also allows for active reconstruction of neutrino interactions in WbLS. To find the attenuation of WbLS, a 4m tall system with PMTs on the bottom and top, with four lasers on the bottom. The PMT captures the intensity of the laser light, which we collect data on. The intensity of the top over the intensity of the bottom is taken and saved. For the test of the robustness water was used for two weeks to test this. After that the WbLS was tested and found out its attenuation through top over bottom. The optical integration software told us that the ratio of intensity for 450nm is 23m, 410 nm is 15m, 490 nm is 18, and 520nm is 20m. These measurements are going to be used by Brookhaven National Lab for their detectors. These measurements will show how Neutrino interacts and help reconstruct the path and trajectory.

The Effects of Repetition on Word Recognition in Infants

Manpreet Ugra
Sponsor: Katharine Graf Estes, Ph.D.
Psychology

Repetition is a vital aspect of learning. Research indicates that repetition is a common aspect of caretakers' infant directed speech, and is related to language learning in infants. Caregivers provide input to their infants in the form of repetitions of words and phrases, which has a positive relationship with infant vocabulary development. However, we don't know yet how hearing repetitions of words affects how effectively infants recognize words. In this study, we will examine whether the amount of caregivers' word repetition relates to infant word recognition. We will test 24 10- to 14-month-old infants in an experiment with two tasks. In the first task, each parent-infant dyad plays with a set of farm animal toys and reads books about farm animals. Repetition will be measured by recording the number of times caregivers state each animal name. The infants' word recognition accuracy will be assessed in the second task where their eye movements are tracked as they are shown photos of animals while being verbally directed to look at one animal. We predict that if infants hear more repetitions of certain animals, then they will recognize those words more quickly and accurately than infants who hear fewer repetitions.

Automating time series analysis of pancreatic beta and delta cell calcium dynamics

Kelechi Unanwa
Sponsor: Mark Huising, Ph.D.
Neuro Physio & Behavior

Diabetes and pre-diabetes together affect about half of the adult U.S. population. One of the primary causes of diabetes is the loss of functional beta cell mass, which leads to insufficient insulin secretion. Beta cells are clustered in pancreatic islets with other hormone-secreting cell types such as somatostatin-secreting delta cells. Previous studies suggest that dysfunction in beta cell and delta cell communication worsens blood glucose control in diabetes. However, the mechanism of this communication is still largely unknown. To further understand this communication, we simultaneously imaged beta and delta cell calcium activity in intact islets as a proxy for secretion using the green flourescent calcium reporter GCaMP6. Our preliminary data demonstrates that while beta and delta cell calcium oscillations in response to elevated glucose is coordinated, delta cells precede beta cells. Our goal is to create and validate a program using GNU Octave to automatically locate and characterize the kinetics of both slow and fast calcium oscillations in beta and delta cells. This analysis will help us understand how beta and delta cell calcium dynamics are coupled, which in turn can inform future studies aimed at developing novel therapeutics to re-establish beta-delta cell crosstalk in diabetes.

Children and Culture: Associations Between Preschoolers' Self-Regulation and Parents' Mexican-American Cultural Values

Chloe Urias
Sponsor: Daniel Choe, Ph.D.
Human Ecology

Self-regulation is one's ability to control their reactions and behaviors. Children's self-regulating skills are influenced by parent-child interactions, which are informed by parents' cultural values. For example, a study showed adolescents' Mexican-cultural values were positively correlated to their self-regulation. However, there is limited research evaluating relationships between parents' cultural values and self-regulation in Mexican-origin preschoolers. This cross-sectional study examines whether children's performance on lab tasks assessing self-regulation is related to their parents' self-reported values on the 50-item Mexican American Cultural Values (MACV) scale. The MACV scale gives overall scores of Mexican or American values and provides specific subscale reports within those values. Three-year-old Mexican-origin children (N = 37, M_{age} = 36.80 months, SD_{age} = 1.15, 64.9% male) were administered self-regulatory tasks in their preferred language (71.4% English). Preliminary results suggest that children's self-regulation is unrelated to their parents' Mexican-cultural values but is negatively correlated with the specific Mexican value of *respeto* (respect for elders), r = -.44, p = .018. Additionally, children's self-regulation is negatively correlated with parents' American-cultural values, r = -.36, p = .05, and the specific American value of independence and self-reliance, r = -.57, p = .001

Characterizing the Efficacy of the Antiinflammatory Drug Mitotempo in Mitigating Changes in Energy Metabolism and Protein Degradation of Mice Liver Treated With Ibuprofen

Tanishq Vaidya
Sponsor: Aldrin Gomes, Ph.D.
MED: Physiology & Membrane Biol

Prior research has demonstrated a link between prolonged ibuprofen use in mice and significant, possibly negative, changes in liver energy metabolism and protein degradation. These changes are thought to be caused due to inflammation resulting from the increase in reactive oxygen species associated with ibuprofen use. In cells, MitoTEMPO, a mitochondrial ROS scavenger, prevent cell death due to ibuprofen. The aim of this ongoing experiment is to understand the activity of the anti-inflammatory drug MitoTEMPO in curtailing these changes. To this end, male mouse livers were treated with ibuprofen with/without MitoTEMPO. Analysis of the livers from these mice was conducted using 26S proteasome assays to understand the effect of MitoTEMPO on proteasome activity. Western Blotting was also used to characterize specific protein concentration changes. Preliminary results from the 26S proteasome assay suggest that MitoTEMPO only partly prevented decreases in proteasome activity due to ibuprofen. Results of the Western Blotting experiments have revealed significant improvements in key antioxidant system-related enzymes. In combination, these results suggest that MitoTEMPO may be partly effective against the side effects of ibuprofen, but more work is needed to understand MitoTEMPO's full effects.

Evaluating Undergraduate Perceptions of Summative Assessments: A Case Study of Multiple-Choice and Free-Response Questions in Biology Courses at UC Davis

Ariel Valdez
Sponsor: Marina Crowder, Ph.D.
Molecular & Cellular Bio

Undergraduate biology education is pervaded with high-stakes summative assessments (exams) that seek to measure student learning by using exam performances to assign letter grades in a course. Exams have a substantial impact on students' final course grades, so understanding how students perceive exams to be challenging is crucial to develop better exams and academic interventions to support students in undergraduate biology classes. The focus of this project was on two of the most common types of exams: multiple-choice (MC) and free-response (FR) exams. This case study investigated if UC Davis undergraduate students prefer MC or FR biology exams by distributing a survey measuring the constructs of student self-efficacy, assessment anxiety, and self-determination with respect to exam format. The survey was created by adapting components of the Science Motivation Questionnaire and adding new components (e.g., studying habit discrepancies). Furthermore, the survey asked students about the frequency of MC and FR exams in their lower- and upper-division biology classes to possibly draw connections between course level and exam formats. Results are forthcoming, but data will be displayed on frequency plots for Likert scale responses and conclusions drawn by utilizing Mann-Whitney U-tests to quantify differences between responses for MC and FR exams.

Prototyping an Adaptor for a Fully Implantable Neural Recording System in Non-human Primates

Xhivani Valencia
Sponsor: Karen Moxon, Ph.D.
Biomedical Engineering

Neural prosthetics have the potential to benefit individuals with conditions such as locked-in syndrome and paralysis. Currently, many brain-computer interfaces require connectors that pass through the scalp, which limits their potential for daily use at home. The Wyss Center's ABILITY system offers a promising solution in that it's a fully implantable, wireless connector. This system was designed to be compatible with human skulls and has successfully undergone testing on sheep. Before it can be tested in humans the device must undergo validation in non-human primates, who have smaller and rounder skulls than humans or sheep. I will assist researchers at UC Davis in developing an implantable mounting platform for the ABILITY system that can be fitted to individual monkey skulls. I will assist with the translation of CT and MRI images into 3D CAD programs, customization of the platform CAD model to fit each individual skull, and 3D printing of prototypes using biomedical resin. Finalization of this adaptor will enable testing and validation of the ABILITY system in rhesus macaques at the California National Primate Research Center, which will represent an important step toward the realization of fully implantable neural prosthetics for patients.

Impact of Extraction Parameters on Oil and Protein Content of Almond Milk

Luca Vallesi
Sponsor: Juliana Leite NobregaDeMouraBell, Ph.D.
Food Science & Technology

Current commercially available almond milk has a low nutritive value relative to dairy milk since it contains ~2% almond paste by weight. This research goal was to determine the impact of solids-to-liquid ratio (SLR), pH, or enzyme use on protein and lipid extractability from blanched roasted almond paste using the aqueous- or enzyme-assisted aqueous extraction process (AEP or EAEP) to make a more nutritious almond milk. A central composite design was utilized to determine levels of SLR from 1:6 to 1:10, pH from 7-9 (AEP), and enzyme usage from 0.25 to 0.75% (w/w) (EAEP) for each experimental condition. Extractions were performed in triplicate and the resultant almond milk was blended with stabilizers and pasteurized, then analyzed for oil and protein content and a mass balance was performed to determine total oil and protein extractability(TOE/TPE). Enzyme use had the greatest positive impact on protein and oil content and TPE/TOE. Lower SLR resulted in greater extraction but a lower protein content. pH had a minor impact on extraction in AEP. Almond milk with higher protein and fat content was successfully produced using optimized extraction conditions for both AEP and EAEP.

Narratives of Auditory Processing Disorder: Stories Without Endings and the Search for Community

Haley Vandermey
Sponsor: Robert Bayley, Ph.D.
Linguistics

Auditory processing disorder (APD) is a neurological condition that causes disruptions in the processing of auditory stimuli in the absence of hearing loss or damage to the hearing mechanism. While many experts in the field have examined diagnostic criteria, comorbid conditions, and treatment options for APD, few have sought to understand the lived experiences of those who live with the condition. As such, the present study created and examined a corpus of written narratives as published on social media by individuals with an APD diagnosis or symptoms consistent with an APD diagnosis. These narratives were analyzed for patterns in narrative structure as defined by Labov and Waletsky (1997) as well as for persistent themes. The results demonstrated that 88.2% of these narratives deviated from Labov and Waletsky's (1997) standard narrative structure, with 38.2% lacking a resolution section altogether. Among other findings, themes of seeking diagnosis and negative perception of symptoms prevailed as the most frequent main narrative themes. These results demonstrate the overwhelming difficulty with which individuals with APD struggle to navigate their auditory deficits and seek adequate diagnosis and treatment. Therefore, these results are applicable towards recommendations for improving avenues to diagnosis for individuals with APD.

Reclaiming Women's Power, Medieval and Modern: The Anonymous "Roman de Flamenca" and Rosalia's "El mal querer"

Teresita Vargas
Sponsor: Noah Guynn, Ph.D.
French & Italian

This project aims to offer a feminist reading of two works: the thirteenth-century Occitan romance Flamenca and a twenty-first-century pop album that responds to it, Rosalía's El Mal Querer. Previous scholarship on Flamenca analyzes the incomplete manuscript as a novas about courtly love and chivalry, focusing primarily on the fluidity between lyric, narrative, and figurative language and attending to the text's rich situational ironies, analogies, and religious allusions. In my reading, Flamenca depicts the struggle between individual desire and social convention in a traditional society even as it suggests the possibility of women's resistance to patriarchal domination. Reading Flamenca alongside El Mal Querer, I reveal that medieval romance has much in common with contemporary feminist movements and that Flamenca is a text worthy of the attention Rosalía brings to it. I argue for access to a repertoire of ancient literature that provides an understanding of medieval life and traditions while promoting a message of gender equality and feminist empowerment that remains relevant to women and feminists today.

Crimmigration and the 21st Century "Common Sense": Policing the Racialized Other

Luis Vargas Castellanos
Sponsor: Kai wen Yang, Ph.D.
Sociology

Konrad Franco defines the crimmigration process as a system of racial-social control, meticulously weaving together the most punitive aspects of criminal and immigration law. The literature overall largely neglects the settler-colonial relationship between the U.S. and Mexico. Therefore, disregarding the historical relationship between the founding criminal justice system and the current crimmigration crisis. In this article, I reviewed 30 studies published between 2006-2022 examining the mechanisms of the crimmigration system and its internal expansion beyond the border region. I draw from the theoretical framework of Stuart Hall and Ida Danewid on policing a migrant crisis. I argue that the crimmigration process is a hegemonic strategy in policing racialized others. This strategy regulates socioeconomic opportunities through disintegration and the reinforced conception of inadmissibility. The Neoliberal era introduces the border enforcement initiative paired with draconian immigration policy reform. Specifically, the 1986 IRCA policy satisfied the hegemonic regime by providing amnesty to immigrants while also establishing employer sanctions on the hiring of undocumented immigrants. Furthermore, IRCA established the trend of increased immigration enforcement reinforcing the notion of the "criminal alien." This has fundamentally sustained an unprotected class of exploitable labor liable to disintegration on the basis of a revised racial "common sense."

Characterizing the function of CK1α-dependent CLOCK phosphorylation in regulating *Drosophila* circadian rhythms

Cameron Vasquez
Sponsor: Joanna Chiu, Ph.D.
Entomology/Nematology

The circadian clock is an endogenous timer for anticipation of the 24-hour rhythmic environment and regulates timing of physiology and behavior. At the cellular level, the circadian oscillator is a transcriptional-translational feedback loop. In *Drosophila*, the key clock protein CLOCK (CLK) heterodimerizes with CYCLE (CYC) to activate transcription for proteins PER and TIM, which function to repress CLK to terminate their own transcription. CLK is also the master transcription factor for rhythmic expression of hundreds of genes that manifest into daily rhythms in organismal physiology and behavior. Oscillating phosphorylation states regulate the time-of-day function of CLK by modulating its activity, stability, and subcellular localization. Our lab has previously identified Casein Kinase 1α (CK1α) as a novel CLK kinase. We identified four CK1α-dependent CLK phosphorylation sites via mass spectrometry including Serine13 (S13), which is adjacent to the DNA binding domain. We found reduced transcription activity of CLK(S13D) variant determined by luciferase reporter cell culture assay, which is consistent with our findings that S13 phosphorylation reduce its DNA affinity. Intriguingly, a natural CLK variant missing S13 residue, CLK(Δaa13-16), displays indistinguishable transcription activity to full-length CLK(WT), indicating S13 phosphorylation specifically regulate certain CLK isoforms. Our findings highlight the posttranslational regulation of circadian clocks.

A Quantitative Analysis of Frontal Cortical White Matter in FXTAS Tissue

La Rissa Vasquez
Sponsor: Veronica Martinez-Cerdeno, Ph.D.
MED: Pathology & Lab Medicine

Fragile X–Associated Tremor/Ataxia Syndrome (FXTAS) is a late onset neurodegenerative disease characterized by tremors, gait ataxia, and memory loss. FXTAS is a white matter demyelinating disease that stems from mutations in the FMR1 gene (Fragile X messenger ribonucleoprotein 1) critical for brain development. There is no cure for FXTAS. Hence the need to elucidate the pathology to aid in developing effective treatments. Prefrontal cortex tissue samples were collected from 10 confirmed FMR1 mutation carriers and 10 control non-FMR1 mutation carriers. Each sample was cryoprotected, cut into 14um sections, and immunohistochemically stained using Glial Fibrillary Acidic Protein (GFAP) to visualize astrocytes and Ionized calcium-binding adapter molecule 1 (IBA-1) to visualize microglia. Slides were developed using DAB and counterstained with hematoxylin. The number of microglia, astrocytes, and oligodendrocytes were quantified based on stain and cellular morphology at 60x on an Olympus brightfield microscope. Microglia, astrocytes, and oligodendrocytes quantified in the FXTAS tissue showed a significant decrease in astrocyte cells in comparison to the controls. Interestingly, oligodendrocyte counts were higher in FXTAS samples than in non-FXTAS controls. Neurons were not quantified since only white matter was examined and neurons reside predominantly in grey matter. Further analysis is needed to quantify the microglia.

The Effects of Chordwise Wing Flexibility on Bumblebee Flight Endurance

Karen Vazquez
Sponsor: Stacey Combes, Ph.D.
Neuro Physio & Behavior

The Common Eastern Bumblebee, *Bombus impatiens*, possesses highly flexible wings due to an elastic protein, resilin, that is located within specific wing joints. We artificially stiffened the flexible joint *in vivo* to determine how wing flexibility affects flight endurance. Each bee was tested with both experimental and control treatments in a randomized order. In the experimental treatment, we splinted the major resilin joint by gluing a piece of glitter over the joint of both wings. This reduced flexibility in the chordwise direction, from the front to the back edge of the wing. In the control, we applied glitter at a position adjacent to the joint to control for the addition of mass without altering flexibility. Before each treatment, bees were fasted and fed 20% of their body mass in sucrose. Subsequently, they flew in a large, spherical arena that prevented landing, until they reached exhaustion. Their flight time was recorded as a measure of flight endurance. We compared the control and experiment groups to test the hypothesis that wing flexibility increases flight endurance. We predicted that the control group will demonstrate higher flight endurance. This data should add to our growing understanding that flexibility benefits several aspects of flight performance.

Title: What Microbes are found in Watermelon Flowers and Seeds?

Alexander Velasco
Sponsor: Johan Leveau, Ph.D.
Plant Pathology

Seeds are a vehicle for new plant generations, and they also house unique microenvironments in which microorganisms reside. These seed-associated microbes (e.g.fungi and bacteria) have many impacts on their hosts such as affecting germination, protecting against pathogens and bringing in nutrients from the environment. To learn more about these microbial communities, we studied the flower and seed microbes of commercial watermelon (*Citrullus lanatus*), a popular fruit crop grown near Davis. We sampled anthers, stigmas and seeds from watermelon plants in two commercial fields and isolated microbes from them in culture. Through Sanger sequencing, we are identifying the microbes to discover about their community composition and potential functions. There were more bacteria than fungi on flowers, but fungal diversity was higher. Reisolation frequencies from seeds were very low, suggesting a bottleneck in seed microbial community formation. Based on our sequencing results, we can use these data for future experiments revolving around plant health and microbe-microbe interactions.

Attention and Social Communication in Intellectual Disabilities

Ember Venkatesh
Sponsor: David Hessl, Ph.D.
MED: Psychiatry & Behav Sci

Challenges related to attention and processing speed are common for those with intellectual and developmental disabilities, and may also impact their communication skills. The present study investigated the relation between attention and social communication in children and young adults with intellectual disability (n = 175; 68 females, 107 males; M_{age} = 18.0 years, SD_{age} = 5.06). Processing speed and attention were measured using the Speeded Matching (SM) task from the NIH Toolbox Cognition Battery. Communication was measured using interpersonal relationships, receptive, and expressive language raw scores from the Vineland-3. Results of Pearson correlations indicated that processing speed (SM) was significantly related to interpersonal relationships ($r(166)=.294$, $p< .001$), expressive language ($r(131)=.34$, $p< .001$), and receptive language ($r(131)=.22$, $p=.01$) skills. When covarying for verbal IQ, these correlations were no longer statistically significant. The present study indicates there is a significant relation between task-based processing speed and attention, and caregivers' appraisal of their child's expressive and receptive language, and interpersonal relationships. There is also evidence that other areas of cognition and intelligence are likely involved in social communication, and disentangling these factors should be a focus of future work.

The Impact of Smoke from Wildfires on Ecosystem Function in the Sacramento Deep Water Shipping Channel

Adam Vera
Sponsor: Steven Sadro, Ph.D.
Environmental Science & Policy

Wildfires continue to be a globally devastating result of anthropogenic climate change and historic forest management. California is experiencing an increase in wildfires. The resulting smoke and ash can decrease solar energy necessary to fuel photosynthesis, with unknown impacts on rates of primary production. This project examines the impact of wildfire on ecosystem function and metabolism: the quantification of processed energy as primary production and community respiration. The Sacramento Deep Water Shipping Channel (DWSC), an off-channel, man-made habitat serves as a case study for this impact. Shown to be net heterotrophic, both light and nutrients play a role in controlling metabolic rates. We are modeling metabolic rates using high frequency measurements of dissolved oxygen (DO) and temperature. We predict wildfire-induced decreases in solar radiation will depress rates of production and DO concentrations, increasing the magnitude of heterotrophy at the ecosystem scale. Preliminary analyses suggest DO is lower and water temperature cooler on smoky days, in comparison to non-smoky. Findings will allow environmental researchers to ensure ecosystem balance for freshwater species during wildfire events.

Short Term Memory Performance in Parents and Parenting-naive titi monkeys (*Plecturocebus cupreus*)

Anushka Vispute
Sponsor: Karen Bales, Ph.D.
Psychology

In response to the demands of raising an offspring, rodent mothers have been shown to gain improved cognitive and stress-mediation capabilities (Lambert and Kinsley 2012); however, this phenomenon has not been tested in nonhuman primates and contradicts what many human mothers experience. We examined differences in short-term memory (STM) between parents and parenting-naive coppery titi monkeys (*Plecturocebus cupreus*) using methods from a large cross-site cognitive project in primates (ManyPrimates et al., 2022). We hypothesized, in line with the rodent literature, parents would perform better than naive individuals in the STM task. During the task, the experimenter placed a reward under one of three cups while the subject watched. The cups were then flipped individually and the subject could retrieve the reward by touching the correct cup. There was a delay retention interval of 0 secs, 15 secs, or 30 secs and relative success rate was examined. Our preliminary results showed that naive individuals, N=3, had a mean (+ standard error) overall success rate of 44.2 + 8.0%, while parents, N=8, had a mean success rate of 35.7 + 3.0%. As we collect additional data, we also plan to explore sex differences in this biparental primate species.

L-type Calcium Channel S1928 Phosphorylation and K+ Remodeling During Diabetes

Hannah Voorhees
Sponsor: Madeline Nieves-Cintron, Ph.D.
MED: Pharmacology

Diabetes-induced hyperglycemia has detrimental effects on the small-resistance arteries of the vasculature. The layer of vascular smooth muscle (VSM) lining small-resistance arteries mediates the constriction and dilation directing blood flow to meet varying metabolic demands of tissues. VSM contractility is mediated by Ca^{2+} influx via L-type calcium channels (LTCCs) and K^+ efflux through associated potassium channels. LTCC activation and subsequent Ca^{2+} influx activate contractile proteins leading to arterial constriction. Meanwhile, K^+ activation promotes membrane hyperpolarization, thereby reducing LTCC activity and opposing vasoconstriction. Prior studies show that hyperglycemia can suppress the activity of K^+ channels in VSM through mechanisms involving increased LTCC activity. Our group demonstrated that hyperglycemia increases LTCC phosphorylation at S1928 in the carboxy-terminal, causing LTCC hyperactivity and increased arterial contractility. These changes are prevented in mice where S1928 is mutated to alanine. However, whether the inhibition of S1928 phosphorylation prevents suppression of K^+ channel activity in diabetic conditions is unknown. In this study, we examine if preventing S1928 phosphorylation protects K^+ channels from hyperglycemia-induced remodeling using electrophysiology, molecular biology, and diabetic animal models. Our results provide mechanistic insights into the VSM ion channel remodeling that may contribute to the development of vascular complications in the diabetic population.

In Vivo Neurotoxicity of PCB-11 in Neonatal Mice

Richa Vyas
Sponsor: Pamela Lein, Ph.D.
VM: Molecular Bio Sciences

Polychlorinated biphenyls (PCBs) remain a significant risk to the developing human brain. Virtually nothing is known about the developmental neurotoxicity (DNT) potential of lower chlorinated (LC)-PCBS. This is a troubling gap since there is wide-spread human exposure to LC-PCBs. Previous in vitro studies demonstrated that LC-PCB 11 promoted dendritic and axonal growth in primary mouse hippocampal and cortical neurons. In this study, in vivo effects of developmental exposure to PCB 11 on critical neurodevelopmental endpoints were assessed. C57BL/6 mice were exposed to vehicle (peanut oil) or PCB 11 at 0.1 or 1.0 mg/kg bw/d in the maternal diet throughout gestation and lactation. Cortical and hippocampal brain tissues from P4 and P21 mouse pups were harvested to quantify caspase-3 activity, TUNEL staining, neurogenesis, and dendritic arborization. Results suggest that exposure to LC-PCB 11 significantly altered dendritic arborization in cortical but not hippocampal neurons. No significant PCB 11 effects were observed for caspase-3 activity or TUNEL staining in either brain region. These findings indicate that in vivo developmental exposure to LC-PCB 11 modulates development of the mouse brain, suggesting PCB 11 may be an environmental risk factor for neurodevelopmental disorders.

Quantification of HIV and Drug through Microdialysis?

Rima Vyas
Sponsor: Whitney Duim, Ph.D.
Chemistry

Despite highly effective antiretroviral therapy (ART), HIV persists indefinitely through establishing and maintaining viral reservoirs in tissues. Current methods to quantify the virus and drug levels in tissue are invasive, use indirect measures of quantitation, and/or have limited ability to monitor viral or drug levels over time due to repeat sampling. Microdialysis is an ideally suited method to investigate basic and clinical-translational research questions in HIV cure. In vitro, a microdialysis method will be used to determine the optimal conditions for RNA extraction and will be applied ex vivo to HIV-infected tonsillar tissues. This work will serve as a basis for microdialysis use in curative HIV trials and an *ex vivo* model for therapeutic design. In addition to mechanistic and clinical-translational tissue-specific investigations (e.g. drug penetration, tissue viral dynamics, drug-effect assessment), microdialysis measures may be linked to clinical ATI outcomes (i.e. time to viral rebound, post-treatment control). Large pore microdialysis may also serve to monitor tissue-level bnAb levels, a promising therapeutic modality where little is known regarding tissue-level distribution. Overall, this work could pave the way for a more comprehensive understanding of viral reservoir dynamics and drug kinetics in tissues.

Spiropyrans as a Molecular Tool for Detecting DNA

Caitlyn Wagner
Sponsor: Angelique Louie, Ph.D.
Biomedical Engineering

Spiropyrans (SP) are organic compounds with photochromic properties that allow them to be useful in a variety of scientific fields: from sensing biological molecules to designing smart nanomaterials. There are two isoforms of this molecule: “closed-form” SP and “open-form” merocyanine (MC). They are inter-switchable as interaction with UV light opens SP, converting it into the MC form. In this study, SP was utilized in conjunction with a trimethylammonium butyl functional group to synthesize (SPIN) through a five-step reaction process. A silica flash column as well as extraction and washing were used for purification. For analytical characterization and structural confirmation of the compound, ^{1}H NMR and mass spectrometry were used. The MC form of this particular SP, obtained through UV exposure at 365 nm, has an affinity to interact with double-stranded DNA and RNA via intercalation, which alters the spectral properties of the compound and allows for visual detection. UV-vis spectrophotometer results showed a distinct shift in the absorbance peak of MC at 505 nm with DNA present. The spectral results from this experiment can be used to further investigate the biosensing properties of SPs and to potentially develop a diagnostic microfluidic chip for degenerative diseases expressed in DNA.

Understanding the Effects of Soil on Quaternary Ammonium Compounds Efficacy Against Soil Borne Pests

Lulu Wallace
Sponsor: Cassandra Swett, Ph.D.
Anr Plant Pathology

Agricultural equipment can transfer soilborne pathogens from field to field. Quaternary ammonium compounds (QACs) are a type of sanitizer that can reduce the number of pathogens on equipment. It is not always realistic for farming equipment to be completely free of debris like soil at the time of sanitization which can cause QAC deactivation. There is a lack of research on the effect of soil on the QACs’ ability to kill pathogens like *Fusarium oxysporum* f.sp. *lycopersici* (Fol) that causes Fusarium wilt. The project looks at four different concentrations of soil (0%, 10%, 30%, 50%) for their effects on the ability of a QAC called didecyl dimethyl ammonium chloride (DDAC) to kill Fusarium spores. We found that low soil loads (10%, 30%) resulted in similar reduction in the Fol spore survival (90% reduction) compared to the control. While high soil loads (50% soil) were hindering the QAC’s efficacy (50% reduction). Another part of the project evaluates the effect of soil on DDAC sanitation of whole microbial communities. This research is important because there needs to be an effective way to prevent shared equipment from contaminating fields with new pests, reducing the production of food security in California.

Synthesis and Thermoelectric Properties of Bi_2Te_3 Nanoplates with a Single Nanopore

Yu Cheng Wang
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

Thermoelectric materials show great potential for sustainable energy applications due their ability to convert heat into electrical energy. Recent developments show that the thermoelectric properties of these materials can be improved through nanostructuring. In particular, Bi_2Te_3 nanoplates have attracted much attention due to their high thermoelectric performance near room temperature. In this work, we report on the synthesis and spark plasma sintering of Bi_2Te_3 nanoplates with a single nanopore. The nanoplates were synthesized using $Bi(NO_3)_3$ and Na_2TeO_3, with polyvinylpyrrolidone as a surfactant. A single nanopore is formed at the center of the nanoplates with the addition of water and longer reaction times ($\simeq$ 6.5 hours). This suggests that the morphology of the nanoplates are highly sensitive to reaction conditions. Spark plasma sintering of the synthesized nanoplates produced a dense (ρ>97%) bulk-like nanoporous pellet. Due to increased phonon scattering from the nanopores, the thermal diffusivity of the pellet was measured to be lower than the bulk Bi_2Te_3, but higher than pore-less Bi_2Te_3 nanoplates. This result highlights the bottom up synthetic approach to improving thermoelectric properties through nanostructuring. In addition, this work establishes nanoporous Bi_2Te_3 nanoplates as a promising thermoelectric material in the low temperature range.

Understanding How Folate Deficiency Affects Epigenetic State In Sperm

Xifan Wang
Sponsor: Satoshi Namekawa, Ph.D.
Microbiology & Molec Genetics

Over 6% of newborns are born with congenital diseases. In spermatogenesis, some genetic mutations affecting the development of sperm can lead to congenital diseases in offspring. Beyond the genome, sperm's epigenome can affect gene expression and ultimately impact health outcomes by impairing accessible chromatin and DNA methylation state. Although maternal folate intake before pregnancy could prevent congenital disorders, the role of paternal folate (a substrate required for methyl groups) intake is not well-studied. We use folate-deficient mice to understand how a paternal folate-deficient diet affects the epigenome in mature sperm. My project focuses on using bioinformatics to understand how a folate-deficient diet affects H3K4me3 in mature sperm. I will identify the differentially methylated regions (DMR) using previously published data and use our lab's ATAC-sequencing data to see the level of open chromatin throughout spermatogenesis. By examining regions proximal and distal to promoters, we will better understand how the epigenome is maintained throughout spermatogenesis. Overall, this will give an idea to understand what stage in spermatogenesis is most critical in sensing the folate state. The main goal is to understand when the chromatin state is established in spermatogenesis.

"It Won't Be Long"

Kairey Wang
Sponsor: Julie Wyman, M.F.A.
Cinema & Digital Media

"It Won't Be Long" explores the potential in storytelling through an intimate interpretation of dance in film. Dance in cinema initially evolved from capturing live performances on film, where big movements and exaggerated emotions were necessary to convey meaning to audience members in the farthest seats. Films are capable of dramatizing performance even further by allowing the audience to get physically closer to the dancers during a performance, such as in the final dance of Baz Luhrmann's *Strictly Ballroom*. Set to "Before The Day Is Over" by Joji, "It Won't Be Long" applies this dramatization of dance to the quotidian, featuring a solo dancer who experiences grief over losing a relationship in their life during a series of phone calls. The confined spaces, rooms in a home, that the film occurs in and the medium and close-up shots, in addition to full body and wide shots, add to the intimacy of the film. Inspired by Ian Eastwood's "E.T.A." and Duncan MacDowell's "Painted," this film expresses loss through hip hop and contemporary inspired movements that match with narrative scenes to fully integrate dance into the story, combining elements of dance film and dramatic film.

Microfluidic Laboratory Course Development

Ernest Wang
Sponsor: Erkin Seker, Ph.D.
Elect & Comp Engr

The field of microfluidics, where micro-liter volumes of fluids are manipulated in micron-size channels, has seen recent developments that enable new capabilities for research and analytical systems. As the technology develops, so does the need to expose the next-generation of scientists/engineers to the field. Therefore, our goal is to further both microfluidics interest and development by constructing an undergraduate/graduate-level lab course that introduces the fundamentals of microfluidics. In designing the laboratory course, procedures to measure fluid flow-rate and pressure within the microchannels is essential. Thus, the lab course is intended to begin with these measurements. The flow-rate is measured by recording the linear flow velocity through a known tube diameter. The footage is then analyzed using ImageJ, yielding a linear flow velocity, which is converted to volumetric flow-rate using geometric-relationships. The method to measure flow-rate was tested and confirmed using highly accurate syringe pumps. To measure the pressure, two electronic flow-through sensors will be used: attached both upstream and downstream of the device. The sensors allow us to resolve the pressure drop across the device. These two core measurement techniques serve as the foundation for a host of other experiments, including microfluidic valves, mixers, and electronic circuit analogies.

Differences in the Use of Online Food Shopping across Different Age Groups during the Covid-19 Epidemic and Implications for the Demand of Fresh Produce

Fei Wang
Sponsor: Kristin Kiesel, Ph.D.
Ag & Resource Economics

Covid-19 severely affected our everyday lives and disrupted both food service and retail food supply channels these years. As a result, online grocery shopping gained new popularity. By exploring data from the Bloomberg terminal, USDA, U.S. Bureau of Labor Statistics, etc., about twelve companies worldwide (mainly in the United States and Canada) during the pandemic, we study how the availability and use of new online grocery services at different times affected companies' overall business performances, including prices and sales volume, and food purchases and consumption patterns of different consumer groups segmented by age. Specifically, we want to explore further how different age groups differed in their use of online grocery services at the beginning and throughout the pandemic, what type of foods are available and purchased online compared to brick and mortar stores and at what prices, and discuss likely implications for the demand of fresh produce and specialty crops grown in California.

Arousal and Neural Correlates of Emotional Face Processing in Preschool

Adrien Ward
Sponsor: Lindsay Bowman, Ph.D.
Psychology

Preschool is a crucial time to develop the socioemotional skills necessary to grow into an emotionally competent adult. One such skill is the ability to perceive and accurately identify other's emotions. Increasing evidence highlights the role of physiological arousal in our response to our social environment, yet there is little research examining the connection between arousal and emotion in development. With the present study, we examined the relationship between autonomic activity and the neural correlates of emotional face processing in early childhood. Preschool (3- and 5-year-old) participants were presented with a series of emotional faces (e.g., happy, angry, fearful, and neutral), while collecting Event-Related Potential (ERP) and heart rate variability (HRV; variability in inter-beat intervals). We will extract mean ERP N170 amplitude as an index of children's emotional face perception while HRV will index children's physiological arousal. Data collection is nearly complete. We predict that a mature neural system for emotion perception (as demonstrated by a smaller N170 amplitude) will be associated with higher HRV, reflecting a relationship between emotional face processing and greater control over the body's physiological responses. Implications for this relationship will be discussed in terms of supporting development of competent social interactions and prosocial behaviors.

Movement and Microbes: How Dispersal Distances and Microbial Communities Interact to Affect Seed Germination

Lauren Ward
Sponsor: Jennifer Gremer, Ph.D.
Evolution & Ecology

Extensive research on plant-microbe interactions has revealed that microbes are necessary for plant health and growth. However, little is known about the effect of plant-microbial interactions on seed germination. Seed germination is a pivotal life stage transition as it is an irreversible process that allows plants to establish the next generation. Microbial relationships that form during this vulnerable life stage may critically affect a plant's ability to establish itself. The microbial community a seed is exposed to will depend on how far it can disperse. Seeds from 15 native and invasive California grassland forbs that vary in dispersal distance were germinated under local grassland soil microbial communities versus foreign desert microbial communities. Despite no overall microbial effects, various individual species did exhibit a change in germination percentages depending on microbial community exposure. These results give insight into how individual species respond to different microbial communities from grassland and desert soils. As a result of climate change, shifting plant ranges will be exposed to new soil microbiota that will influence plant community composition. This study provides insight into important plant-microbe interactions during the earliest stage of plant life.

University Student Energy Costs and Cooling Practices in the Context of Extreme Heat

Hadlie Ward
Sponsor: Eric Chu, Ph.D.
Human Ecology

Increasing extreme heat and energy costs affects low-income households, who are more likely to experience high energy burdens and rent energy-inefficient homes. Many university students experience basic needs insecurities, suggesting that rising costs could also impact students. To study student energy burdens, I administered a survey of UC Davis students who rent housing off-campus. The survey included questions about housing, expenses, and cooling practices during the preceding summer. While energy burdens are commonly calculated as the percentage of income spent on utilities, this study uses the percent of shelter costs spent on electricity, due to student income instability. Energy costs per square foot were calculated to show the energy efficiency of housing. Based on the sample (n=328), preliminary results suggest that, on average, respondents did not have high individual energy burdens during the summer of 2022, but paid higher energy costs per square foot than California's average. Additionally, most respondents indicated that energy costs were higher during the summer. Results will be analyzed further to identify potential trends related to race, gender, sexuality, and international student status. This research can be used to address energy inefficiency in student housing and study energy burdens in households vulnerable to extreme heat.

Defining the Critical Sequence Required for Force-Sensitivity of LMO Proteins

Samuel Watson
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Mechanical forces applied to cells lead to changes in signal transduction pathways that influence cell differentiation and proliferation. Previous work in our lab has shown that the protein LMO1 localizes to mechanically stressed keratin fibers, therefore taking part in mechano-transduction. The LMO family of proteins, which includes LMO1-4, is implicated in the onset and progression of different cancers, but their exact roles remain unclear. Applying an external force to stretch cells transfected with LMO2-4 showed that LMO3 and LMO4 were force-sensitive, but LMO2 was weakly force-sensitive, if at all. A sequence alignment on the LMO proteins revealed highly conserved LIM domains, with only 14 amino acids unique to LMO2 but conserved in the other LMO proteins. To test if these differences are behind the weak response, I created two LMO2 mutants: LMO2Y135F and LMO2Y73T. Additional experiments revealed that LMO2Y135F did not improve force-sensitivity, but LMO2Y73T did show an increased response. My current plans are to mutate the same residue in the other LMO proteins and observe the effects on force-sensitivity. This analysis on specific amino acids will lead to molecular insights about force-sensitivity and may provide clues into the role of LMO proteins in cancer.

Visual Representation of Middle Easterners Varies Based on Target: Religion and Gender

Wei Wei
Sponsor: Andrew Todd, Ph.D.
Psychology

People's stereotypes of Middle Easterners have intensified since 9/11, and the impacts of Islamophobia are being examined more carefully. This study explores how religion and gender affect participants' perceptions of Middle Easterners. In the first image-generation phase, images were generated of Middle Eastern faces of different genders (man/woman) and religions (Muslim/Christian). Participants (N=378) were asked to select the one that best matched the description among the two images that appeared on the screen. In the subsequent individual image ratings phase, participants rate the degree of dominance (N=257) and trustworthiness (N=254) they perceive in the face images without being directly informed of race, religion, or gender they are supposed to represent. The results showed that in terms of gender, Middle Eastern men were more dominant and less trustworthy than women. In terms of religion, Middle Eastern Muslims were more dominant than Middle Eastern Christians, but no difference was seen in trustworthiness. In conclusion, gender and religion influence people's mental representation and impression of Middle Easterners, respectively, but they do not interact.

Attentional guidance and match decisions rely on separable template information during conjunction search

Diana Wei
Sponsor: Joy Geng, Ph.D.
Psychology

The attentional template has been largely assumed to contain a single, static, and veridical representation of what we are looking for. We engage in a "look-identify" cycle during the visual search by holding a veridical copy of the target in memory and then guiding our attention to template-matching objects. In 4 experiments, we demonstrated that when looking for a color-orientation conjunction target, there are two qualitatively different templates used to guide attention and make target decisions. We found that guidance relies on color information exclusively unless orientation is pushed to be the "easiest" information to use, while match decisions include both color and orientation information. These results suggest that the use of template information within a conjunction search depends on the efficiency in discriminating the target features from distractors. The attentional template is a highly dynamic and flexible representation of the target that we customize to maximize visual search efficiency.

Relationship between Intestine Morphology and Growth Performance in a F34 Advanced Intercross Chicken Population

Yijun Wei
Sponsor: Huaijun Zhou, Ph.D.
Animal Science

Growth rate is one of the most economically important traits in poultry. Nutrients absorption can significantly affect growth performance, and the process of nutrient digestion and absorption mainly occurs in the small intestine, especially in the jejunum and ileum sections. Yet, the underlying genetic control of intestinal development related to growth performance remain poorly understood. Hence, we hypothesize that intestinal development has a positive correlation with the growth rate due to genetic variation. A unique F34 chicken advanced intercross population (a total of 376 birds) with diverse growth rate distribution was used to dissect genetic contribution in intestinal development. Jejunum and ileum of 20 birds from the lowest and highest growth rate groups (10 birds each) were collected on day 19 and day 33, respectively, for histology analysis. The results show the growth rate was significantly correlated ($p<0.05$) with the villi height and total villi surface area in jejunum. In ileum, the growth rate had significant ($p<0.05$) positive correlation with villi height, villi width, and villi surface area and was negatively correlated with villi count, crypt count and crypt depth. Our future study will focus on genotyping these birds and identifying genetic variants associated with small intestine morphology.

The Price of Control: Foreign Aid, Dependency, and Neo-colonialism

Genna Weinstein
Sponsor: Shingirai Taodzera, Ph.D.
African American African Stds

This paper will examine the power dynamics of foreign aid to sub-Saharan Africa, focusing on the relationship between the United States as a donor country and Kenya as a foreign aid recipient. By untangling how foreign aid helps and hinders economic and social development, this paper will argue that despite its noble intentions and some positive outcomes, modern-day international aid from the United States to Kenya represents a form of neo-colonialism. This has been manifested through Kenya's dependence on U.S. aid to fund its health sector and its succumbing to political interference. The paper employs two specific issues to illustrate these facts: U.S. aid to Kenya's HIV/AIDS relief programs and its influence on Kenya's policy-making processes. The U.S.-Kenya aid relationship impacts Kenya as a nation through neocolonialist control. As foreign aid continues to flow from the U.S. to Kenya, analyzing its impact on Kenya's development is increasingly relevant.

Impact of heat waves on *E. coli* O157:H7 persistence in lettuce

Tracy Weitz
Sponsor: Maeli Melotto, Ph.D.
Plant Sciences

Contamination of fresh produce by human pathogens is amongst the most common sources of foodborne illness outbreaks. Human pathogens, such as *Escherichia coli* serotype O157:H7, can persist in the internal spaces of leaves where they may survive until human consumption of fresh produce. Although human pathogens do not cause disease in plants, their presence causes the plants to undergo an immune response that reduces the persistence of the pathogen within the plant. The environment in which plant-microbe interactions occur impacts the dynamics of the plant-microbe interaction. Understanding the effect of elevated temperatures, such as heat waves, on the persistence of human pathogens within produce is important in the context of the future of food safety under climate change. We screened 25 genotypes of lettuce for positive, negative, or neutral growth of *E. coli* O157:H7 within the leaf 10 days after inoculation with the bacterium. Each genotype of lettuce underwent temperature treatment of 18°C for normal temperature conditions and 38°C for elevated temperature conditions. We found *E. coli* O157:H7 persisted at lower levels in elevated temperature conditions compared to normal temperature conditions, suggesting that hot weather may not allow for prolonged contamination of lettuce with human pathogens.

Neocolonial Legacies Persist through the White Man's Burden

Sheyenne White
Sponsor: Beenash Jafri, M.D.,Ph.D.
Gendersexuality Womensstudies

In opposition to Western ideologies of development and modernity, the West continues to disparage religion as premodern, irrational, violent and therefore, antithetical to democratic and egalitarian politics. Such an orientalist fabrication serves to maintain and reinforce the problematic binary frame between the colonizer and the colonized — with the latter being characterized as primitive, savage, and uncivilized. While historical and ongoing efforts to curb the spread of religion has proven to be an unavailing pursuit, the question of gender has proved to be fruitful. Time and time again, global superpowers and former colonial powers have capitalized on issues of gender inequality in order to legitimize ongoing Western intervention and military invasion within the Middle East. After all, the U.S and other global superpowers only benefit from the perpetuation of conflict in the Middle East. Understanding that the Middle East is rich in natural resources and possesses 60% of the world's oil reserves, the region has always been a center of attraction. Dependencies on oil and energy flows incentivize neocolonial powers to create and/or sustain political instability so that the region's underground wealth remains exploitable and their geopolitical interests remain protected.

Thermal Characterization and Modeling of a CubeSat in Low Earth Orbit

Zachary White
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

The Space and Satellite Systems (SSS) club's REALOP mission is to create a 2U CubeSat which is designed to deploy out of the ISS. As a sub-department of SSS, Structures Thermal Analysis' (STA) goal is to simulate the thermal environment of a transient orbit around the Earth to verify CubeSat nominal temperatures. To create the simulations, STA utilizes Thermal Desktop to build a thermal model of the CubeSat. These simulations will help determine which components aboard the CubeSat need to be adjusted or reinforced thermally. The software CES Edupack is used to gather optical and thermophysical properties required to fully detail the CubeSat model. STA is in the process of modeling the entire structure with internal components to understand the temperature changes the CubeSat will undergo as it is exposed to the extreme space environment. This will showcase the effects of radiation on the external faces of the structural frame, as well as internal heat transfer between the inner components/faces of the frame. The overall goal of the STA team is to ensure the CubeSat stays thermally safe throughout its operational lifespan.

Behavioral changes and tau pathology in response to Traumatic Brain Injury in *Drosophila melanogaster*

Kailea Wiese
Sponsor: Kassandra Ori-Mckenney, Ph.D.
Molecular & Cellular Bio

Traumatic brain injury (TBI) is a disruption of normal brain function that results from mild to severe impacts to the head, and can affect memory, and behaviors such as anxiety, aggression, and depression. TBI is the leading risk factor for late onset neurodegenerative diseases such as Alzheimer's Disease (AD). TBI and AD are associated with the presence of hyperphosphorylated tau in the brain and cerebrospinal fluid. Tau is a microtubule associated protein that controls microtubule based processes. Upon hyperphosphorylation, tau forms neurofibrillary tangles (NFTs)— thought to contribute to neurodegeneration. Events that cause tau hyperphosphorylation and NFT formation post-injury, and how these contribute to neurodegeneration are not well established. We subject flies expressing 2N4R human tau pan-neuronally to TBI to study the contribution of tau phosphorylation and oligomerization to neurodegeneration and behavioral decline. In the 24 hours post-TBI on males, pan-neuronal expression of tau increased inter-male aggression. We screened specific drivers for neuronal types involved in mating and aggressive behaviors, and have identified dopaminergic and serotonergic circuits as contributors to increased aggression. We are using immunohistochemical and biochemical techniques on fly brains post-injury to determine if there are any differences in tau localization, phosphorylation, or neurodegeneration.

Initiation of Early Afterdepolarizations by Complex Spatial Dynamics in Cardiac Tissue

Noah Wiesner
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Mathematics

Early Afterdepolarizations (EADs) are complex depolarizing phenomena arising in the plateau phase of a cardiac action potential (AP) that can cause lethal arrhythmias. In this study we, we show that tissue geometry that induces a source sink mismatch between loaded and unloaded cells is critical for the formation of EADs. We use a physiologically detailed model of a rabbit AP to simulate a strip of cardiac tissue with one source branch and three sink branch which we vary in sizes. When the AP is generated at one end of the source branch it propagates until arriving at the source-sink branches where it exhibits three characteristic phenomena. The AP propagates normally when the source branch exceeds the size of the sink branches. Conduction failure occurs when the sink branches are larger than the source branch. EADs form in the cells before the sink branch in the critical case, when the source branch is roughly the same size as the sink branches. Our findings underscore that tissue geometry is critical not only for the action potential wave propagation but also for the formations of EADs.

Identification, quantification, and comparison of plasticizers in the feces, liver, and adipose tissue of marine mammals

Lena Wigger
Sponsor: Jenessa Gjeltema, D.V.M.
VM: Medicine & Epidemiology

Given the globally ubiquitous presence of plastic in the marine environment, it is increasingly important to understand the effects that this contaminant of emerging concern has on top predators like marine mammals. Several studies have detected plasticizers in marine mammal tissues, including blubber, and have proposed using plasticizer levels as a marker of plastic exposure. This study will evaluate the potential use of surrogate markers of microplastic exposure, like plasticizers, in several different species of marine mammals. Frozen samples of feces, liver, and blubber collected from free-ranging northern elephant seals (*Mirounga angustirostris*), and California sea lions (*Zalophus californianus*) that recently stranded and were euthanized or died were obtained. Plasticizers will be extracted and their concentrations measured using gas chromatography-mass spectrometry. Levels of plasticizers in different tissues and species will be compared to determine the best sample types for estimating plastic exposure and which species are potentially at higher risk of microplastics exposure. This pilot study will provide important preliminary information about sample type and species prioritization for future prospective research evaluating the health effects of microplastics in marine mammals.

Application of Robotics to CubeSat Development and Testing

Zoe Wilf
Sponsor: Stephen Robinson, Ph.D.
Mechanical & Aerospace Engr

CubeSats, miniature satellites used for various scientific and commercial applications, undergo vigorous testing in many areas, but one with a gap in knowledge and promising potential is the application of robotics to the development and testing of CubeSats. To fill this gap, an experiment is performed at the Human, Robotics, Vehicles Integration and Performance (HRVIP) laboratory where a CubeSat is attached to a UR5e robot, an industrial robot arm, and the built-in capabilities of the UR5e are used to measure the mass moment of inertia (MOI) of the CubeSat. The CubeSat is mounted to the end of the UR5e using a custom designed mount, manufactured with in-house laser cutting and 3D printing capabilities. The UR5e measures the MOI and center of mass (COM) of the CubeSat, which will be compared to estimated values of MOI and COM from computer aided modeling designs that are used in the development of CubeSat attitude controllers. This experiment further develops the relationship between robotics and CubeSat development, allowing mass properties (MOI and COM) to be measured with greater accuracy, thereby increasing the capabilities of in-house CubeSat testing at the HRVIP laboratory.

Determining the Anti-Fibrotic Potential of Isoliquitrigenin in Corneal Fibroblasts *in vitro*

Liana Williams
Sponsor: Brian Leonard, D.V.M.,Ph.D.
VM: Surg/Rad Science

Corneal fibrosis from trauma, infection and photorefractive surgery can lead to severe visual impairment and blindness worldwide. Isoliquiritigenin, an herbal compound, has been shown to decrease corneal fibrosis *in vitro* in Tenon's capsule fibroblasts. This study sought to investigate the anti-fibrotic potential of isoliquiritigenin in corneal fibroblasts *in vitro*. Cultured rabbit corneal fibroblasts (RCFs) were treated with isoliquiritigenin, in the presence or absence of TGF-β1 (10 ng/mL), for 24 and 48 hours, and RNA and protein were isolated, respectively. Total RNA was reverse transcribed and qPCR was performed to detect alpha-smooth muscle actin (α-SMA) mRNA expression. Additionally, total protein was extracted and western blotting was performed to detect α-SMA protein levels. Samples were normalized to GAPDH and compared with vehicle control. Treatment with isoliquiritigenin 50 μM, in the presence of TGF-β1, prevented the upregulation of α-SMA mRNA and protein expression in a dose-dependent manner. However, the lowest dose tested (5 μM) did not prevent this upregulation. Isoliquiritigenin demonstrated anti-fibrotic effects on RCFs stimulated with TGF-β1. Future studies will be focused on determining the therapeutic effect of isoliquiritigenin in animal models with the potential to be used in humans to prevent corneal fibrosis.

Life Under the Ice: Antarctic Microbial Mat Morphology and Spatial Ecology

Caden Williams
Sponsor: Dawn Sumner, Ph.D.
Earth And Planetary Sciences

Microbial communities have existed on Earth for the majority of the planet's history, yet we cannot fully explain their formation and ecology. In the perennially-frozen saline lakes of Antarctica's dry valleys, benthic microbial communities are the dominant life forms. These low disturbance environments provide an ideal opportunity to study the connection between life and the physical environment. The communities, mostly cyanobacteria, form "mats" of combined biological material and sediment that build up over time. A key structure present in the mat's topography are pinnacles, which form in part due to cyanobacteria tending to grow towards the direction of light to increase photosynthesis rates. We construct 3D models of microbial mats to statistically analyze the distribution of pinnacles. The distribution reflects patterns associated with community organization and their respective environments. We observe clustered, regularly spaced, and randomly distributed spatial patterning at different sites, suggesting that both competition and mutualism are influential. By investigating modern mat formation and the connection between morphology and environment, we also aim to better understand early life on Earth.

Clam Harvesting Seasonality and Fish Bone Isotopes at a Disturbed Midden Site in San Francisco, CA

Moonlily Winokur
Sponsor: Jelmer Eerkens, Ph.D.
Anthropology

During construction activities in 2020 on South Van Ness between Market and Mission Streets workers encountered a small layer of disturbed/redeposited material from a pre-contact period ancestral Ohlone archaeological site. The material includes large amounts of shell, along with some bones of animals, and a small number of stone tools. Most of the shellfish represent San Francisco Bay species. A sample of bentnose clam shells (Macoma nasuta), the dominant shell within the midden (84% by weight), was selected for stable isotope analysis to reconstruct season of harvest. Results show emphasis of clamming in early summer and winter, and a near-absence of clamming in Fall. This could represent a mobile residential pattern where people moved to interior locations during the Fall when acorns and other plant foods ripened. As well, a sample of fish bones was identified to family/genus/species, with a small number analyzed for stable isotopes, including bat ray, shark, smelt, and surfperch. Results indicate these fish were living primarily in marine waters but were consuming at a similar trophic level. We also present radiocarbon results, which indicate the site was occupied between 1500 and 300 years ago.

Endomembrane Dissection of Plant Cytokinesis Using Proteomic Analysis of Isolated RABA2A Vesicles In *Arabidopsis thaliana*

Skyler Wong
Sponsor: Georgia Drakakaki, Ph.D.
Plant Sciences

During cytokinesis in terrestrial plants, the emerging daughter cells are separated by the formation of the cell plate, which is built with cell plate precursors starting from the center outwards and ultimately joining with the parental cell wall. These cell plate precursors are delivered by *trans*-Golgi Network (TGN) vesicles. RABA2A is a subunit of the GTPase protein involved in the delivery of TGN vesicles to the forming cell plate. In this study we isolated RABA2A vesicles from *Arabidopsis thaliana* seedlings expressing *YFP-RABA2A* grown in liquid culture. To enrich for RABA2A vesicles, fractionation of plant lysate was conducted utilizing a discontinuous sucrose gradient. Resultant fractions were probed by anti-YFP antibodies to determine relative presence of RABA2A within them via Western Blotting. Immunoblots of organelle marker proteins were performed to validate the subcellular representation of each fraction obtained. Immunoprecipitation (IP) of YFP-RABA2A vesicles was performed in fractions associated with cell plate enrichment and interphase TGN vesicle enrichment to isolate YFP-RABA2A tagged vesicles. The IP extracts were then subjected to proteomic analysis to identify cargo proteins associated with YFP-RABA2A within each of the two fractions. Cargo proteins have been identified, and their role in cytokinesis and interphase will be further investigated.

Comparing the Regeneration Frequencies of Grape *GRF-GIFs* in *Lactuca Serriola* (Armenian 999)

Dylan Wong
Sponsor: Richard Michelmore, Ph.D.
MED: Medical Microbiology & Imm

GRF-GIF is a hybridized, chimeric protein associated with increased regeneration in many plant species. Our previous research compared the effects of introducing *GRF-GIFs* from different plant species as transgenes on *in vitro* regeneration of lettuce. We found that a grape *GRF-GIF,* with a region resistant to miRNA (grape *rGRF-GIF*) binding and therefore degradation, had the highest rate of regeneration. However, we were unsure if the miRNA resistant region or grape *GRF-GIF*'s superiority was the cause of success. Our current study directly compared the wild-type Grape *GRF-GIF* (wtGrape *GRF-GIF*) to the rGrape *GRF-GIF* to see how significant the degradation resistant region had on the overall regeneration. To track *GRF-GIF* positive transformants, we included a RUBY reporter gene in the same T-DNA, which results in transformed plants producing the red pigment, betalain. The rGrape *GRF-GIF* had the highest regeneration rate; however, levels of RUBY expression varied among all groups. We suspect that the 35S promoter induced silencing, culminating in only patches of red RUBY expression. Future research will use a more stable promoter to express RUBY to more accurately demonstrate the transgene's integration, and test different *GRF-GIFs* to determine if greater enhancements of regeneration can be acquired.

Sustainable Antimicrobial Coatings on Hydrophobic Food-Contact Surfaces for Reduction of Foodborne Bacterial Contaminations

Jody Wong
Sponsor: Gang Sun, Ph.D.
Biological & Ag Engineering

Reducing bacterial contamination on food-contacting surfaces is critical in preventing foodborne illness. Biofilm formation on surfaces of produce processing machines and containers, especially on plastic materials, is a common issue contributing to bacterial transmissions in fresh produce. One of the solutions is to develop antimicrobial and antifouling coatings on food-contacting surfaces, though many studies reported the limitation of the coatings in stability and durability. Polyethylene (PE), a common material widely used in food-producing industries, has high hydrophobicity, representing the most challenging situation in the application of antimicrobial-coatings. To address such issues, this research explores a sustainable, biodegradable, and rechargeable antimicrobial food ingredient-based coating with protein-based N-halamine structures for hydrophobic surfaces. The coating systems made with gelatin (Gel), soy protein hydrolysate (SPH), and tannic acid (TA) were deposited as homogenous layers to low-density polyethylene (LDPE) films, which were previously plasma treated to increase interactions with the coating materials. The coated materials (Gel/SPH/TA@PE) were later charged with diluted chlorination solution to convert amino and certain peptide bonds in proteins to biocidal N-halamines to achieve the antimicrobial function. The Gel/SPH/TA coatings demonstrated good stability in low-temperature hydro-rich environments on PE, providing efficient active chlorine to defeat potential microbial contaminations.

This Game Is Dying: Using Board Games to Address Climate Change

Ciel Wood
Sponsor: James Housefield, Ph.D.
Department Of Design

In typical conversations surrounding climate change, we often focus on small changes individual consumers can make: drive less, recycle more. However, studies have shown that those with the largest environmental footprint are corporations and the ultra-wealthy, and that the most effective ways to address climate change are through regulation of these entities. Given these circumstances, how might one design an intervention that invites audiences to interrogate the complex relationships between wealth, power, and environmental impact, while emphasizing the importance of democratic participation? Through intensive research, multiple designed iterations, and prototyping, I developed *This Game Is Dying*, a board game meant to spark conversations about these pressing concerns. After several rounds of playtesting and refinement, *This Game Is Dying* was able to successfully demonstrate the links between economic, social, and environmental factors, as well as illustrate the variety of potential futures in store, determined by the regulations we implement now. *This Game Is Dying* proves that even complex issues like these can be made into digestible, educational games that facilitate critical discussion, encouraging further action to fight climate change in ways more effective than simply recycling. Next steps include producing and distributing the game to educational institutions across the country.

Examining the Interaction Between Hierarchical vs. Non-Hierarchical Polyamorous Relationship Styles and Measures of Compersion

Hailey Wooten
Sponsor: Paul Eastwick, Ph.D.
Psychology

Limited research has explored polyamorous relationships in relationship science due to monogamous, heteronormative societal relationship norms. Few studies have focused on how differences in relationship structure (hierarchical v. non-hierarchical polyamory) could predict relationship measures. Prior research has shown differences in attachment anxiety and avoidance, and relationship satisfaction between those who practice hierarchical v. non-hierarchical polyamory (Flicker et al., 2021). Related research has also examined similarities and differences in relationship perceptions among those in various types of polyamorous relationships (Balzarini et al., 2019). In order to facilitate more knowledge on how differing polyamorous relationship structures influence romantic relationships, this study investigates the relationship between hierarchical v. non-hierarchical polyamorous relationships and compersion (i.e., satisfaction felt by an individual from their partner(s) intimately engaging with other potential partners). This project helps further knowledge on the polyamorous community, and lessen the disparity in scientific research towards non-monogamous groups. This study also explores the novel measure of compersion, which could help inform future research on both monogamous and consensually non-monogamous relationships.

Analyzing the Reliability of DELLY in the Rhesus Macaque Genome

Jalena Wouters
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VM: Deans Office

Whole genome association studies (WGAS) are utilized to identify causal disease mutations. These studies use whole genome sequencing (WGS) data, first characterizing a phenotype of interest and later calling and identifying associated variants. DELLY is a software program that calls large structural variants (LSVs) in a genome and is used in WGAS as a starting point for investigation. The reliability of DELLY is well demonstrated in human genomes, but its reliability across translational animal models has yet to be reported. The objective of this study is to evaluate DELLY's reliability in non-human primates (rhesus macaques). We hypothesize DELLY LSV identification and genotyping results in a high error rate (>15%) when calling LSVs in non-human primate WGS data. Within each mutation impact level ('HIGH', 'MOD', and 'LOW'), 25 variants of each type (deletion, translocation, insertion, inversion, and duplication) were randomly selected. To assess reliability, variants were hand-genotyped using the Integrative Genomics Viewer (IGV) program. DELLY incorrectly genotyped 48.2%, 47.1%, and 41.7% of variants in the 'HIGH', 'MOD', and 'LOW' impact groups, respectively. The results of this study support our hypothesis, suggesting that researchers should not solely rely on DELLY for large structural variant detection in rhesus macaques.

Genetic screening of *Solanum lycopersicum* hairy root mutants to investigate the molecular basis of exodermis differentiation.

Aaron Wright
Sponsor: Siobhan Brady, Ph.D.
Plant Biology

Lignin is a phenolic polymer often utilized by vascular plant roots as an apoplastic barrier to promote regulation between the environment and the root. The *Solanum lycopersicum* (tomato) root contains a lignified cell type called the exodermis not found in the model plant *Arabidopsis thaliana*. In the tomato exodermis, the polar lignin cap serves as an apoplastic barrier and is a marker of its differentiation. In this experiment, we conducted a reverse genetic screen of *S. lycopersicum* to identify regulators of exodermis differentiation. Using CRISPR-Cas9, we targeted exodermis-enriched transcription factors for mutagenesis under the hypothesis that these transcription factors are involved in exodermis differentiation. Genotyping using Sanger sequencing was performed to identify the mutant lines. Genetically modified lines were then screened for mutant phenotypes of exodermis polar lignin deposition to determine if our candidate genes are involved in exodermis differentiation. In doing so, this research will provide insight into fundamental developmental processes and could provide an avenue for the development of stress-resistant crops.

From Simplicity to Complexity: Binary Synthesis of $Yb_{21}Mn_4Sb_{18}$

Kaixin Wu
Sponsor: Susan Kauzlarich, Ph.D.
Chemistry

Given that roughly 2/3 of energy generated is lost as heat, thermoelectric (TE) materials, a class of materials that can convert thermal energy into electrical energy, have become an increasingly attractive source of renewable energy in recent years. zT, a dimensionless measure of how "good" a TE material is, be calculated from the equation $zT=\alpha^2T/\rho\kappa$, where α, T, ρ, and κ are the Seebeck coefficient, temperature, resistivity, and components of the thermal conductivity, respectively. Ideal thermoelectric materials have a "phonon−glass, electron−crystal" (PGEC) propagating phonons like a glass, while transporting electrons like a crystal. $Yb_{21}Mn_4Sb_{18}$ is a high temperature material with a low resistivity, low thermal conductivity, and high Seebeck coefficient. This phase could be improved by substituting Bi for Sb, lowering the band gap by decreasing orbital overlap and bond strength. However, while $Yb_{21}Mn_4Sb_{18-x}Bi_x$ was synthesized from pure elements, the impurity phase $Yb_{11}Sb_{10}$ was produced during the process. This impurity can be potentially eliminated by employing binary starting materials, as they allow for better stoichiometric control and facilitate mixing. Here, $Yb_{21}Mn_4Sb_{18}$ was made from Yb_4Sb_3, MnSb, and YbH_2. The product was pressed to pellet for PXRD analysis, while the thermoelectric properties are currently being measured by Laser Flash Analyzer (LFA).

Improving Surveillance for Patients with Aortic Aneurysms

Emily Xu
Sponsor: Misty Humphries, M.D.
MED: Surgery

More than 200,000 abdominal aortic aneurysms (AAA) are diagnosed each year in the US, a condition that becomes life-threatening if not identified and treated appropriately. Currently, the majority of primary healthcare providers adhere to the US Preventive Services Task Force (USPSTF) screening guidelines when evaluating patients for AAA, though up to 40% of patients miss these recommended screenings. We sought to use Natural Language Processing (NLP), a form of machine learning, to review patient imaging to improve identification of AAA. Across a large tertiary care system, 3859 patients with aneurysms (aortic dilation >3 cm) and ectasia (dilation between 2.5-3 cm) were identified by NLP. After exclusions, we evaluated demographic data for 1924 (55%) of these patients. Minorities represented 38% of aneurysms among patients under 65 years. Additionally, the average age at diagnosis in Hispanic patients was 50 compared to 59 in non-Hispanic patients. White and black patients were more likely to be captured by screening guidelines than Asian and Other patient groups, and Asian patients were significantly more likely to be diagnosed after 75. Incorporating NLP enhances screening practices and successful detection of aneurysms especially within minority populations more likely to be excluded by USPSTF screening guidelines.

Molecular Basis of Improved Motor Performance of Chat Deficient Mice Treated with AAV-mediated Gene Therapy

Sophia Xu
Sponsor: Ricardo Maselli, M.D.
MED: Neurology

Congenital myasthenic syndromes (CMS) are a heterogeneous group of diseases characterized by weakness and muscle fatigue. One variant of CMS results from deficiency of choline acetyltransferase (ChAT). ChAT synthesizes acetylcholine (ACh) from choline and acetyl-CoA at cholinergic synapses, including the neuromuscular junction. Deficiency of ChAT causes weakness and life-threatening episodes of apnea. Using a mutant *Chatflox/flox/Cre-ERT2/T2* mouse model, in which deficiency of Chat is conditionally induced by tamoxifen (Tx) injection we hypothesized that reestablishing the ability of neurons to generate acetylcholine could mitigate the negative effect caused by silencing the Chat gene by Tx. In a previous study we showed that mice injected with an adeno associated virus (AAV) carrying human *CHAT* showed improved motor performance when compared with non-injected Chat deficient mice. In this project we used immunohistochemistry and quantitative-PCR to investigate the molecular basis of these observed behavioral changes. Mutant mice showed severe depletion of Chat in spinal cord motor neurons, which recovered to more than 70% of wildtype mice in mutants injected with AAV-*CHAT.* Additionally, cell transduction occurred at the highest level in the brain and liver. Our findings support the use of AAV-mediated gene therapy for the CMS resulting from *CHAT* mutations.

Enzymatic Properties of GH43 Enzyme from *B. longum* subsp. *longum* YK1048 and its Role in the Fermentation of Byproducts of the Dairy Industry

Miu Yamamoto
Sponsor: David Mills, Ph.D.
Food Science & Technology

By-products from the isolation of whey proteins which include lipids, proteins, and glycoproteins, are attractive candidates to enhance of nutrition. Some dairies use these fractions for animal feed, however their functionality or nutritional effect was not clearly understood. Recently, *Bifidobacterium longum* subsp. *longum* YK1048 was isolated from the baby's fecal sample and could ferment whey protein phospholipid concentrate (WPPC) as a sole carbon source. Transcriptomic analysis of *B. longum* YK1048 showed the up-regulation of carbohydrate-active enzyme genes on WPPC including glycosyl hydrolase (GH) family 43 enzymes. To understand the role of these, one of the GH43 enzyme genes was cloned into the vector and heterologously expressed in *E. coli* BL21. The enzyme characterization of recombinant protein including hydrolysis activities was performed with xylooligosaccharides. Determination of the molecular mechanisms for the use of WPPC with bifidobacteria leads to the prediction of the structure of glycoprotein in WPPC. Furthermore, the fermentation of byproducts of the dairy industry with bifidobacteria can be a novel WPPC-based synbiotics for use in animals and humans.

Chlamydomonas reinhardtii as a Sustainable Platform for the Biomanufacturing of Human Insulin

Daniel Yang
Sponsor: Marc Facciotti, Ph.D.
Biomedical Engineering

As the price of therapeutic proteins continues to rise, access to potentially life-saving medications becomes increasingly difficult for many patients around the world. The most common chassis organisms used to produce these proteins, such as *E. coli* and *S. cerevisiae*, utilize inputs that come at a significant environmental and economic cost. Our goal is to use *Chlamydomonas reinhardtii* to produce a recombinant proinsulin protein for use in diabetes patients. *C. reinhardtii* is a single-celled eukaryotic microalgae that has been shown to be capable of therapeutic protein production. By only requiring light, trace minerals, buffer, and a nitrogen source, microalgae provides a low-cost solution for proinsulin production that is also ecologically sustainable. We report our progress towards the design and assembly of the plasmid vector we will use to genetically engineer *C. reinhardtii.* We will also discuss the optimization of existing microalgae transformation protocols. The Algae to Insulin team is a part of BioInnovation Group at UC Davis, which provides undergraduate students the opportunity to coordinate and innovate in biotechnology research.

Quantifying Stress-induced Autophagy Response

Joy Yang
Sponsor: Kenneth Kaplan, Ph.D.
Molecular & Cellular Bio

A number of studies have suggested that autophagy - the cellular process of targeting damaged organelles for destruction in the vacuole or lysosome - is protective for neurodegenerative disease (ND). The logical question resulting from this model is can a decrease in autophagy capacity can lead to disease onset or progression? We hypothesize that combining multiple stressors that trigger autophagy will reduce the overall response, thus making cells more susceptible to the toxicity caused by alpha-synuclein, a protein found in inclusions in Parkison's patients' brains. To test this hypothesis, we determined the kinetics of the autophagy response by measuring the fluorescence intensity of the autophagy protein, mCherry-Atg8. Our preliminary findings suggest that there are both high, medium and low responding cells under nutrient stress and that expression of a-synuclein causes a decrease in the high responders. We are now developing imaging techniques and computational pipelines that will allow us to measure the response in large numbers of individual cells over time. We predict that this approach will allow us to identify the characteristic changes to the autophagy pathway when nutrient stress is combined with the stress from over-expressing a-synuclein.

Diversity of the Emerging Fungal Pathogen *Fusarium falciforme* in Cucurbits Based on Somatic Compatibility

Anne-Marie Yang
Sponsor: Cassandra Swett, Ph.D.
Anr Plant Pathology

Fusarium falciforme is an emerging fungal pathogen that largely causes disease in tomatoes, but has also recently been found to cause disease in cucurbits. The goal of this project is to study the genetic diversity of *F. falciforme* across agricultural cropping systems with an emphasis on cucurbits through identifying self-recognizing clonal groups within three genetically distinct *F. falciforme* lineages: *F. falciforme sensu stricto*, *F. noneumartii*, and *F. martii*. Nitrogen non-utilizing mutants are used in genetic complementation reactions as a method to organize *F. falciforme* isolates into clonal somatic compatibility groups (SCGs). Based on previous research in tomato, it is hypothesized that clonality remains distinct between the three lineages, such that no two isolates from different lineages are clonal with one another. Based on previous research in pathogenicity, further investigation is needed to understand whether isolates from different cucurbit crops could potentially be clonal with one another and whether isolates from tomato and cucurbits are clonal. Understanding the genetic diversity of *F. falciforme* will contribute to improving diagnostic tools and field management practices to combat disease caused by *F. falciforme*.

Quality Analysis of Sun Damaged Walnuts

Shannon Yi
Sponsor: Selina Wang, Ph.D.
Anr Food Science & Technology

California's Central Valley is the largest walnut producer in the U.S. During the past harvest season, the climate was unusually warm, producing many dark walnuts due to sun damage. This raised concerns among local growers and industry if sun damage posed decreased quality, specifically higher risks of rancidity, that usually dictates shelf-life. Samples of walnut cultivars grown in California regions were sorted by kernel skin lightness (L*) value measured using a colorimeter. Darker kernels had L* values between 20-39, and standard light kernels had L* between 40-59. Sorted samples were analyzed for peroxide value (PV) and free fatty acid (FFA) content to determine and compare the progression of oxidation. Results indicated that dark kernels had a higher FFA value (0.30 ± 0.59 % oleic acid) than the light kernels (0.11 ± 0.15 % oleic acid). PV was 0.35 ± 0.13 meq/kg for dark kernels and 0.40 ± 0.20 meq/kg for light kernels. Additional analysis on secondary oxidation products will be performed to confirm results and further investigate the correlation between sun damage and walnut quality.

UX/UI Design Approach to Electronic Health Records

Laura Yien
Sponsor: James Housefield, Ph.D.
Department Of Design

When hospitals and healthcare providers replaced paper patient charts with electronic health record (EHR) software systems, healthcare workers hoped this new technology would improve their ability to care for patients. Instead, since the software was primarily designed by engineers instead of designers, many found themselves frustrated and wasting valuable time struggling to navigate these systems. This project addresses these problems by investigating how to improve the usability of EHR interfaces through user experience/user interface (UX/UI) design, an iterative human-centered design approach. I designed an interactive prototype of an EHR interface intended to be used by healthcare workers at a dialysis clinic in Sacramento. I began this project by interviewing physicians and nurses at the clinic about their experience and pain points with current EHR systems. I synthesized these findings, sketched solutions, and translated them onto Figma software. I developed a prototype while conducting usability testing and receiving feedback from staff at the dialysis clinic. My final products include a high-fidelity interactive prototype and a written documentation of my process. These findings aim to inform new iterations of EHR design to empower healthcare workers to efficiently navigate these systems, freeing them to focus on patient care.

Correlations of Breast Muscle Yields With Villi Height and Villi Height/Crypt Depth Ratios in a Unique Chicken Advanced Intercross Population

Carolyn Yih
Sponsor: Huaijun Zhou, Ph.D.
Animal Science

Chicken breast meat is the most economically important part due to its high nutritional value and low fat content compared to other livestock species. The small intestine plays a major role in nutrient digestion and absorption, where villi maximize the surface area to increase absorption, and crypts contain stem cells that differentiate into intestinal epithelial cells. We hypothesize that villi heights and villi height/crypt depth ratios are positively correlated with breast muscle yield. A unique F34 advanced intercross population derived by crossing a highly inbred chicken line with modern broiler was used to examine association between growth rate and villi histology. Jejunum and ileum from 20 birds of the highest and lowest growth rate groups (10 birds each) were collected from a total of 376 chickens at day 19 and day 33, respectively. Quantitative analysis on villi heights and villi height/crypt depth ratios of histology slides from two tissues suggested significant positive correlations ($P<0.05$) between pectoralis major and minor breast muscle yield and villi heights and villi height/crypt ratios. Further study on the identification of genetic variants associated with small intestine morphology is underway to elucidate underlying molecular mechanisms of growth in poultry.

The Synaptonemal Complex's Importance in Full-length Chromosome Alignment and DNA Break Repair

Ilara Yilmaz
Sponsor: Sean Burgess, Ph.D.
Molecular & Cellular Bio

The specialized cell division of meiosis is required to form haploid gametes from a diploid germ cell. One key factor in proper chromosomal segregation in meiosis is the formation of the synaptonemal complex (SC), a protein-packed structure between chromosome pairs. The SC is composed of an axis along each chromosome, transverse filaments connecting the axes and a central element stabilizing the transverse filaments. Work from mice shows a component of the central element, SYCE2, is important to extend the SC after it initiates at the sites of meiotically induced DNA double strand breaks (DSBs). DSBs are important for the exchange of genetic material, a process also assisted by the SC. To determine if full-length chromosome alignment is mediated by SC extension, we used CRISPR-Cas9 to create a syce2 knockout strain to prevent the SC from fully forming. Using immunofluorescence microscopy to probe chromosome-associated proteins, we rarely observed full-length chromosome alignment in syce2 mutants and DSBs are less efficiently repaired. Surprisingly, our preliminary data indicates that syce2 mutants still produce healthy offspring. These results inform our understanding of genetic factors affecting chromosome missegregation, miscarriages and infertility.

Vitamin A Deficiency: An Artistic Overview of Pathology and Cultural and Biomedical Interventions

Claire Young
Sponsor: Christine Stewart, Ph.D.
Nutrition

Vitamin A deficiency impacts the developing world through myriad factors, ranging from scarcity of adequate nutrition to a lack of dietary education. The cause and effects of the deficiency have been observed through study, but knowledge nested in academia is elusive to those without access to education and scientific resources. In this visual art project, I illustrate the physiological and psychological impacts of vitamin A deficiency through the eyes of communities distant from scientific information and guidance. While diversity of beliefs exist, there are some overlaps in cultural schemas relevant to diet and health, and these are the tools many cultures utilize to explain bodily phenomena and the healing properties of food and remedies. I aim to represent possible sources of schemas derived from intuition and observation through art, interpreting decisions made by health leaders for their community. My art will demonstrate the signs these communities witness, sentiments that guide them towards different treatments and cures, and the ultimate struggle to unite tradition and biomedical advice. To listen and understand novel perspectives is most important to reaching people in need, and I believe illuminating multiple perspectives through art will contribute to empathy in approaching those in need.

Molecular Basis of Improved Motor Performance of Chat Deficient Mice Treated with AAV-mediated Gene Therapy

Jaime Young
Sponsor: Ricardo Maselli, M.D.
MED: Neurology

Congenital myasthenic syndromes (CMS) are a heterogeneous group of diseases characterized by weakness and muscle fatigue. One variant of CMS results from deficiency of choline acetyltransferase (ChAT). ChAT synthesizes acetylcholine (ACh) from choline and acetyl-CoA at cholinergic synapses, including the neuromuscular junction. Deficiency of ChAT causes weakness and life-threatening episodes of apnea. Using a mutant $Chat^{flox/flox}/Cre\text{-}ER^{T2/T2}$ mouse model, in which deficiency of Chat is conditionally induced by tamoxifen (Tx) injection we hypothesized that reestablishing the ability of neurons to generate acetylcholine could mitigate the negative effect caused by silencing the Chat gene by Tx. In a previous study we showed that mice injected with an adeno associated virus (AAV) carrying human *CHAT* showed improved motor performance when compared with non-injected Chat deficient mice. In this project we used immunohistochemistry and quantitative-PCR to investigate the molecular basis of these observed behavioral changes. Mutant mice showed severe depletion of Chat in spinal cord motor neurons, which recovered to more than 70% of wildtype mice in mutants injected with AAV-*CHAT.* Additionally, cell transduction occurred at the highest level in the brain and liver. Our findings support the use of AAV-mediated gene therapy for the CMS resulting from *CHAT* mutations.

Investigating the Necessity of Transcription Factor Engrailed-1 (EN1) in Pancreatic Cancer Cell Survival and Progression

Omar Younis
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Microbiology & Molec Genetics

Pancreatic cancer (PDA) is the third leading cause of cancer-related death in the United States. To this day, PDA resists all current chemotherapeutic regimens; therefore, there is an urgent need to develop novel therapeutic strategies targeting PDA. We previously showed that engrailed homeobox 1 (EN1), a neuro-development transcription factor, is associated with aggressive PDA phenotype. We, therefore, hypothesize that EN1 is necessary for the survival of PDA cells. To assess EN1-dependency in PDA, I will inactivate EN1 utilizing CRISPR/Cas9 gene editing technology in human PDA cell lines. Guide RNA and GFP constructs will be lentivirally delivered. I expect to see the depletion of EN1-inactivated cells over time using GFP flow cytometry. In addition, I will conduct *in vitro* colony formation and anchorage-independent growth assays to determine the phenotypic outcomes when knocking out EN1 in PDA cells. Overall, my study will allow us to better understand the role of EN1 in PDA progression.

The Application of Machine Learning in Studying the Neural Mechanisms of Behavior

Hannah Zakharenkov
Sponsor: Brian Trainor, Ph.D.
Psychology

Calcium imaging by fiber photometry allows for the monitoring of brain activity with high temporal resolution. However, it can be challenging to synchronize behavior observations from a human observer with the high-resolution fiber photometry data. Machine learning is a valuable tool for addressing this challenge because of its high temporal resolution. In video analyses of social behavior in California mice, machine learning was used to track the activity of two mice interacting with one another. Deep Lab Cut (DLC) was used to create a machine learning model that accurately determined mouse body points. Using DLC scored coordinates, we determined the time spent in close contact and correlated it with fiber photometry data from the bed nucleus of the stria terminalis. The simple behavior analysis (simBA) program was used to train models for autonomously recognizing freezing, aggression, and nose-to-nose contact behaviors, providing detailed information on behavior start and end times. Preliminary data suggest that the activity in the BNST is elevated during bouts of social contact while activity is reduced during avoidance. Machine learning is a powerful tool capable of advancing our understanding of the relationship between neural circuits and behavior.

Using CRISPR/Cas9 Technology to Knock Out GFP in Intact Mouse Islets

Karen Zhai
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Neuro Physio & Behavior

The pancreas is the essential organ for maintaining blood glucose homeostasis in the body. This is accomplished through insulin release from the beta cells of pancreatic islets. Recently, genome-wide association studies have identified common mutations in the genes of islet cells that are correlated with disease, such as diabetes mellitus. One way to study their correlation and potential causation is to generate gene-specific knockout (KO) primary islets. Traditionally, this involves generating KO mice for each gene of interest, which is expensive and time-consuming. I propose to develop a method to rapidly generate gene-specific KO mouse islets by utilizing CRISPR/Cas9 technology. This will be accomplished by manufacturing adenoviral (AV) particles carrying the sequence for the Cas9 enzyme, the guide RNA (gRNA) for the gene of interest, and a nuclear Mkate2 signal. To test this approach, we will deliver a guide RNA targeting green fluorescent protein (GFP) in primary islets isolated *ex vivo* which contain a knockin GFP in their beta cells. Successful transduction of the virus will knock out the GFP transgene, removing the green fluorescence signal, and create a red nuclear fluorescence. This will provide a platform for efficiently testing the islet-specific phenotype of disease-associated candidate genes.

The Unintended Impact of the 2016 Presidential Election on International Student

Ziyi Zeng
Sponsor: Giovanni Peri, Ph.D.
Economics

International students have generated $44 billion in export revenue in 2019 and supplied highly educated laborers to the job market in the United States. However, after the 2016 presidential election, the number of international students dropped. Some international students share their concern that they do not feel welcomed after Trump was elected. This paper aims to investigate the relationship between the number of international students and the 2016 election result within the US. Fixed-effect regression and control variables are used in the econometric models. This paper finds that after the 2016 presidential election, counties with more republican voting tend to have less international students by using the Difference-in-Difference method. To illustrate, a 1 percent increase in Republican vote is estimated to decrease 0.018 percent of international students on average in a county, holding other factors constant. This result is significant and its detailed interpretation depends on the number of total students of the interested county.

Nutrient Effects on the Embryonic Process That Forms the Brain

Briani Zhang
Sponsor: Crystal Rogers, Ph.D.
VM: Anat Physio & Cell Biology

Vertebrate embryos undergo a process called neurulation to form the neural tube, which becomes the central nervous system. At the same developmental time point, neural crest cells form and separate from the neural tube. These stem-like neural crest cells give rise to a wide variety of tissues including facial bone and cartilage. Defects in neurulation and neural crest formation lead to a range of disorders characterized by malformation of the brain and spinal cord (e.g., anencephaly, spina bifida) or neural crest-derived structures (e.g., cleft palate, cleft lip). Past studies have shown that nutrients such as folate play a vital role in reducing the chance of neurulation defects. Consequently, the CDC advises women of reproductive age to consume folic acid daily well in advance of getting pregnant. However, less is known about how other nutrients affect neurulation. In my review, I analyze current literature on the relationship between nutrient intake and neurulation. These studies indicate that emerging nutrients may play an important role in preventing neurulation defects. My review will highlight the current understanding of which nutrients are implicated in the embryonic process of neurulation and point out avenues for further research.

Comparison of Proteases Used in Histone PTM Analysis of Mozambique Tilapia Gills

Selina Zhang
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Animal Science

Proteases have practical use in histone post-translational modification (PTM) analysis, particularly using liquid chromatography mass spectrometry methods. It is beneficial to know what protease will be the most effective at revealing the desired histone PTMs in a given study. Four proteases were identified to have promise in revealing unique histone PTMs. We used Trypsin platinum, ProAlanase, Thermolysin, and Pepsin to digest Mozambique tilapia (*Oreochromis mossambicus*) gill tissue samples. The *O. mossambicus* samples were obtained from fish that had experienced two different salinity treatments. One group of fish had experienced freshwater (0 ppt) conditions and the other group had experienced seawater (30 ppt) conditions. All gill samples were aliquoted and processed using each of the four proteases. A second goal of the experiment was to investigate the differences in the global histone PTM landscape between fish inhabiting freshwater versus saltwater conditions. By comparing these proteases' effectiveness in revealing desired histone PTMs we establish which is the most beneficial to use.

Variation of Seed Mass in *Festuca microstachys* and *Festuca perennis*

Dezhen Zhang
Sponsor: Jennifer Funk, Ph.D.
Plant Sciences

Variation in seed mass is common and widespread. A seed's mass can affect its ability to germinate, grow, and compete. For example, a heavy seed might have a stronger competitive ability than a lighter seed in some plants. In this research, I compare the seed mass of seeds collected at different times during the growing season of two species of *Festuca*, a genus in the grass family Poaceae, *Festuca microstachys,* and *Festuca perennis. F. Microstachys* is a prominent native annual species in California grasslands. *F. Perennis* is an annual grass native to Europe. I ask 1) Do the seeds produced by Femi and Fepe vary in weight over the growing season? 2) How much variation is there among individual plants in seed weight in Femi and Fepe? Studying grass species gives helpful information for grassland restoration. The research can provide helpful information on grassland restoration by collecting seeds for the best period to increase survival and competition with other species.

Defining the Minimum Force-Sensitive Sequence of Tensin 3

Karen Zhao
Sponsor: Soichiro Yamada, Ph.D.
Biomedical Engineering

Mechanical force plays an important role in cell proliferation and differentiation. Tensins are a family of proteins with significant roles in cell focal adhesion and possibly cancer cell migration. Previously, our lab showed that cten (tensin 4) accumulates along tensed keratin fibers. Recently, we found that tensin 3 also accumulates along force-bearing keratin fibers. However, the physiological role of this force sensitivity remains ambiguous. Understanding the physiological role of tensin 3 requires definition of the minimum force sensitive sequence and identification of its molecular relationship with keratin fibers. Using MDCK epithelial cells expressing GFP tagged tensin 3 truncations, we visualized and compared the force-dependent accumulation of different tensin 3 constructs. Tensin 3 amino acid 1-1171, which lacks the conserved C terminus, accumulated along keratin fibers even in force-free conditions, but the most robust force-dependent tensin 3 recruitment was seen within amino acid 453-1171, which also lacks an actin binding domain. These data suggest that the C terminus and actin binding domain inhibits force-induced tensin 3 recruitment along keratin fibers. Using the sequence responsible for tensin 3 recruitment to force-bearing keratin fibers could decipher the molecular interactions and help resolve tensin 3's role physiologically and in cancer cell migration.

Differences in the Use of Online Food Shopping across Different Age Groups during the Covid-19 Epidemic and Implications for the Demand for Fresh Produce

Han Zhao
Sponsor: Kristin Kiesel, Ph.D.
Ag & Resource Economics

Covid-19 severely affected our everyday lives and disrupted both food service and retail food supply channels these years. As a result, online grocery shopping gained new popularity. By exploring data from the Bloomberg terminal, USDA, U.S. Bureau of Labor Statistics, etc. about grocery companies worldwide (mainly in the United States and Canada) during the pandemic, we study how the availability and use of new online grocery services at different times affected companies' overall business performances, including prices, sales volume, as well as the food purchases and consumption patterns of the consumer. Specifically, we want to explore further how different age groups differed in their use of online grocery services at the beginning and throughout the pandemic, what type of foods are available and purchased online compared to brick and mortar stores and at what prices, and discuss likely implications for the demand of fresh produce and specialty crops grown in California.

Investigating the Causes of Congestion at the Port of Los Angeles during the COVID-19 Pandemic

Iris Zheng
Sponsor: Jeffrey Williams, Ph.D.
Ag & Resource Economics

The freight rate for containers from Shanghai to LA surged after the pandemic hit, yet the increased demand for medical supplies and Americans' shifted purchasing habits were not the sole reason behind it. The other possible reason was that the severe congestion at the Port of Los Angeles decreased the overall supply of containers in the round trip between Shanghai and LA. The constraints that lead to congestion at the Port of Los Angeles include reduced terminal space, an inefficient trucking system, skilled labor shortages, and outdated technology at the port. However, other factors that different between import peaks in 2018 and 2021 have exaggerated the congestion at the Port of Los Angeles during the pandemic. This paper develops a simulation model to investigate how congestion builds upon congestion. The model incorporates the scenarios of vessel redirection and decreased processing efficiency when the port is congested, and it indicates that the real processing capacity of a port is significantly lower than the theoretical one. The findings obtained from this paper could provide useful insights for risk resilience at ports and mitigation of such disruption in the future.

A Novel Function of MARCKS in Macrophage Activation and Pulmonary Fibrosis

Zilan Zheng
Sponsor: Ching-hsien Chen, Ph.D.
MED: Int Med Nephrology (sac)

Idiopathic pulmonary fibrosis (IPF) is a progressive lung disease with poor prognosis and no effective treatment characterized by the accumulation of fibroblasts leading to disrupted gas exchange, responsible for respiratory failure then death. Macrophages, a type of innate immune cells, have been implicated to play a significant role in driving fibrosis; therefore, targeting macrophage polarization influencing IPF progression have recently emerged as a promising therapeutic strategy. A single-cell transcriptomic study has recently discovered upregulation of a membrane-bound protein, Myristoylated Alanine Rich C-Kinase Substrate (MARCKS), in both monocytic cells and alveolar macrophages isolated from IPF patients. We generated macrophage-specific MARCKS-knockout mice and carried out a bleomycin-induced pulmonary fibrosis model using these mice to investigate the functional role of macrophages' MARCKS in mediating lung fibrosis. By using Masson's trichrome staining and immunohistochemical assays, histopathological analysis of lung tissues showed that bleomycin administration induced severe lung damage and collagen deposition concomitant with increased macrophage infiltration into fibrotic lungs in wild-type mice, whereas MARCKS-knockout mice displayed significantly lower degrees of fibrosis, macrophage infiltration, and hydroxyproline contents upon bleomycin exposure. These results suggest that MARCKS functions in lung macrophage-mediated fibrosis progression and it may serve as a therapeutic target for pulmonary fibrosis.