

2021 - 2022

SENIOR RESEARCH BOOKLET

Index of Participants

College of Agricultural and Environmental Sciences

Marika Adamson

Glimpses of the Wild: A Collection of Short Stories
Exploring the Relationship between Nature and Self

Jessica Beskind

The Effect of Anthropogenic Noise on Provisioning
Behavior in Adult Tree Swallows

Hannah Blackwell

Validating a Panting Score to Assess Heat Stress in
Sheep

Janae Bonnell

There is No Nourishment in a Nuclear Feast: A
Qualitative Media Analysis of Spokane Tribal
Community Experiences with the Midnite Uranium
Mine

Sara Clarkson

Exploring the Impact of Dogs on Cat-Human
Interactions

Joyce Do

Does Social Integration Influence the Association
Between Functional Limitations and Depressive
Symptoms in Older Adults?

Kimberly Evans

Where Did They Come From and How Did They
Grow?: Reconstructing Salmon Growth Trajectories
Through Biochronologies

Kailey Flynn

Unbanked Transit Passengers and the California
Integrated Travel Project

Rory Greenhalgh

An Investigation into the Roles of Sulfated Peptides
in Rice

Marina Grimmert

Developing Creativity Skills Through Gameplay

Megan Harmon

Quantifying the Healing Process of Ear Tag Wounds
in Dairy Calves

Madeline Heeg

Specialization Course Survey and Kitten Fostering
Course

Natalie Huerta

The Impact of Sustainable Labels on Consumer
Purchasing Decisions

Bradley Jenner

A Novel Algorithm for Gene Expression
Quantification in TAGseq Analyses

Yue Jin

Leveraging Artificial-Intelligence-based Computer
Vision for Dietary Intake Assessment and Glycan
Analysis: Food Dataset Curation and Visually-Similar
Foods Classification Using Convolutional Neural
Networks

Minju Jung

Comparison of Cellular Immune Responses to Avian
Influenza Virus in Two Genetically Distinct, Inbred
Chicken Lines

Ava Kemper

The Art of Recycling

Sarai Knowles

A Model For the Seasonal Population Dynamics of
Asian Citrus Psyllids in Citrus-Growing Regions of
California

Taelynn Knutson

An Examination of the Ethics and Efficacy of
Philanthropy as a Method of Mitigating the
Progression and Impacts of Climate Change

Matthew Kramer

Changes in Diet and Supplement Use in Canine
Cancer Patients

Kyle Krueger

Following the Money Toward Environmental Justice:
The Transparency, Outcomes, and Community
Alignment of AB 617 Spending in California

Kirby Lee

Development and Feasibility Testing of an Inclusive
Guide for Communicating Nutrition Science

Isabella Loomis Howard

Does Visual Priming of Pleasant or Unpleasant
Animal-Based Images Influence College Student
Opinion of Animal-Product Consumption?

Emily Manroe

Impacts of the COVID-19 Pandemic on Elementary-
School Children's Social and Emotional Learning
(SEL): Understanding the Changes and Effective
Strategies to Address Social and Emotional Needs

Sarah Mark

Canine Distemper Virus Replication in Macaque
Tissue Explants

Noah McNaughton

Functional Morphometrics of Butterflyfish Feeding
Mechanisms

Anna Neubauer Vickers

Decriminalizing Sex Work in New York: An Analysis
of two proposed state policies

Nicole Ng

Laying Hen Pullets' Movements Between Single-Tiered Aviary Structures Change with Age

Bessie Nicolaides

A Review of the Effects of Prescribed Animal Grazing on Invasive Plant Species in Coastal Grassland Habitat

Rachel Ogan

How Daylight Savings Time Affects Anticipatory Behavior in Captive Black Rhinoceros

Ryan Packer

Revealing a Possible Plant Defense Effector from the Salivary Gland of *Frankliniella occidentalis*

Nicholas Petersen

Urban Biodiversity and Land Use in California

Jennifer Price

Effects of Wildfire Ash upon *Aedes aegypti* Breeding Site Preference and Rate of Larval Development

Mairead Ryan

Specialization Survey Course and Kitten Fostering Course

Huda Saleh

Investigation of Cryptocurrencies: What Are They, Advantages and Disadvantages, and Considerations to Replace or be Secondary National Currencies

Samantha Seefeldt

Development of a Nutrition and Life Skills Education Module for UC Davis Students

Francesca Shackleford

Effects of Rock Dust Amendments on Soil Infiltration Behavior

Claire Short

Emboldened and Golden: How Boldness Variation in Goldfish Shoals Affects Foraging Behavior

Samantha Stephan

The Art of Recycling

Amida Verhey

The Coyote Factor: How Interference Competition Influences Urban Space Use of Gray Foxes (*Urocyon cinereoargenteus*)

Angela Weber

The Sugar Flip - Sugar Reduction While Maintaining the Perception of Sweetness

Abigail Weir

Effects of Hydrogen Sulfide-Intoxication on Energy Expenditure and Microbiome Metabolome

Lauren Yen

Physiological Arousal and Self-Regulation in Pre-school Age Children in a Delay of Gratification Task

Sabrina Young

The Effect of Thiamine Levels and Rearing Temperature on Thermal Tolerance of Chinook Salmon

Chaoxun Yuan

Sheepscares

College of Biological Sciences**Jonathan Berg**

Enhancing Immunotherapy Efficacy on GBM by Inducing PD-L1 Expression

Austin Chan

SARS-CoV-2 Infection and Cytokine Responses in the Olfactory Epithelium

Poorvi Datta

Assessing the Impacts of Lecture Recordings and Captioning on Students with Disabilities in Higher Education

Carmen David

Invasive Leaf Litter Effects on *Plantago lanceolata* Germination and Seedling Recruitment

Viraj Deshpande

Decoding Glaucoma: Assessing the Efficacy of Machine-Learning Image Analysis in Quantifying Morphological Differences in Glaucomatous Axons of the Optic Nerve Head

Aditi Goyal

R You There? Detecting R Loop Hybridization using Machine Learning

Madison Hall

Effect of Dapk1 Silencing on the Metastatic Capabilities of Pancreatic Ductal Adenocarcinoma Cells

Pradhan Hariharan

Molecular Analysis of Novel RBP4 Mutation in Congenital Eye Disease

Steven Hobbs

From DNA Extraction to Sequencing: A Multi-Year Undergraduate Project to Introduce Community College Students to Bioinformatic Technologies

Peter Jespersen

Visual Working Memory Performance in Aphantasia

Anastasia Krajnovic

Regulation and Function of Sodium Pump (NKA) Dimerization

Leann Le

Effects of CaMKII Post-Translational Modifications on Autonomous Activation and Calcium Cycling

Henry Low

Using Computational Methods to Investigate BAI2, a Synaptic aGPCR Linked to Cancer: Tumor Expression Analysis & Developing a Novel Automated Tool for Evaluating Colocalization in Microscopy Images

Harjeet Mann

Expanding the Awareness of Adverse Childhood Experiences and Toxic Stress in the Sikh Community

Sukhdev Mann

Literature Review and Coding System for Elaaj Clinic Analysis

Nathifa Nasim

sEH Inhibition to Reduce Alzheimer's Disease-like Brain Inflammation

Derick Nguyen

Efficacy of Wastewater-based Epidemiology in Tracking Covid-19

Alejandro Perez

The Use of SHERLOCK for the Detection of Delta Smelt Environmental DNA

Maya Sahtout

The Role of HSD17B1 on Estrogen Synthesis in Zebrafish

Simran Saini

Investigating Potential Conserved Roles for RXR-gamma in the Developing *Xenopus tropicalis* Retina and Brain

Katherine Sayaseng

Role of the Fasciclin II C-Terminus in the Development of the Neuromuscular Junction of *Drosophila melanogaster*

David Shih

Delivery of Cryopreserved Probiotic *Lactiplantibacillus plantarum* and *Limosilactobacillus reuteri* to the Murine Digestive Tract to Prevent Dermal Inflammation

Nathaniel Schoppa**Tzu-Ni Sin**

Translating Ocular CRISPR-Cas9 Genome Editing across Species as a Potential Therapy for Retinal Diseases

Felicia Song

Simultaneous Comparison of Intraoperative Brain Function Monitoring: SedLine and BIS on Depth of Sedation

Tammie Tam

The Effect of Host Cell Rigidity on Whether *Entamoeba histolytica* "Nibbles" Versus "Swallows" Cells

Mable Thai

Sand DNA - A Genetic Library Sandbox

Jan Wignall

Probing Protein Interactors of hCTPS1 and hCTPS2 with Immunoprecipitation Mass Spectrometry

Brianna Yetter

Effect of Anthropogenic Factors on the Temporal Distribution of Greater Sage-grouse (*Centrocercus urophasianus*)

Estelle Yoo

The Investigation of the MARCKS/KRAS Signaling Axis in Conferring an Immunosuppressive Environment in Lung Cancer

Kacey Zimmerman

Somatic Compatibility of *Fusarium falciforme* Isolates from Different Hosts

College of Engineering**Faiza Alvi**

Aircraft Performance and Design Demonstrator Utilizing Canard Configuration

Gabriella Bond

NeuroVA: the Neurological Virtual Assessment for Face Asymmetry

Jefferson Chhen

Aggie Snap and Play

Victoria Flores

Design of a Drone-Glider Hybrid with Extendable/Retractable Wings

Miranda Godinez

Auto-Swabbing Device for Sampling Microbial Life in Rainforest Soil

Jeremy Inducil

Stormwater Treatment and Groundwater Recharge Facility

Sergio Jimenez

Drinking Water Treatment Facility for the City of Davis, CA

Parneet Kaur

CathAlert

Valentina Lai

Clear Lake Data Visualization App

Arielle Lazovsky

S.A.S: Stethoscope Auscultation System

Max Molchanov

Artificial Slow Motion Video

Joseph Morrison

Spinal Protective Implant for Neonatal Enhancements in Spina Bifida

Maya Mysore

Spinal Protective Implant for Neonatal Enhancements in Spina Bifida

Alexander Orlando

Passive Energy Housing for California's Migrant Workers

Anika Patel

NeuroBiography Browser

Kevin Peng

MFAC: Mutant Fish Attribution and Classification

Anthony Radtkey

Comparative Analysis for Flood-Managed Aquifer Recharge in the Merced Irrigation District

Soumil Shekdar

Deep Learning for Psychotic Episode Prediction

Ruby Telfer

Flood-MAR: A Groundwater Sustainability Strategy for the Merced Irrigation District

Raihana Yarzada

Aggie Snap and Play

Denise Zhong

Diagnostic Device For Critical Congenital Heart Disease

College of Letters and Science

Tiara Abraham

Faith, Hope, and Love - A Senior Honors Recital

Celine Busnelli

The Thirst For A Dam Raise: The Legal, Environmental, and Cultural Implications of Raising The Shasta Dam

Grace Chitouras

Ethics of Vaccines and Refusals for Firefighters in a Pandemic

Gia James da Vinci

Defining Dominance in Domestic Dogs: A Scoping Review

Jacob Derin

A Welfare Axiology Using Higher-Order Betterness Relations

Ellie Feder

Blood and Body: Agency as Enacted Through Child Sacrifice and Sexuality in Toni Morrison's Beloved

Lia Freed-Doerr

Encoding Variability and Event Segmentation Across Narrative Contexts

Owen Gao

An Exploration and Catalogue of 4-Dimensional Polytopes and Oriented Matroids

Diana Garcia Perez

Supporting Previously Incarcerated Youth During their Reentry: A Project to Support the Northern California Aftercare Program

Jackson Gaydon

We Journeyed Together: An Online Tabletop Roleplaying Game

Brian Graves

Ochre Powder and Hafting Adhesives in Prehistoric South Africa

Sallie Hollingshead

Women in Sports and Media Representation of Them

Thea Hudson

A Text-based Game: Exploring Critical Theory Texts Through Game

Dorothy Hung

Bridging User Experience and Learning Design: A Platform Introducing Visual Thinking Strategies

Dariush Imani

Clustering Techniques and Background Analysis in the Hadronic High Mass Pair Search

Dhanya Indraganti

Of Advice and Community: Marie-Claire Magazine During the Second World War

Raj Jagannath

Rise of the Zoo Empire: Real-Time Multiplayer Strategy Game for Android

Markus Kaeppli

The Apparatus of the Body Snatchers

Vivian Kellner

Investigation of Conserved Residues in Adenine Glycosylase MutY and their Importance in DNA Damage Repair Activity

Riley Kibbee

Developing a Methodology for Stacked Target Nuclear Cross-Sectional Measurements using a 76" Isochronous Cyclotron

Jill Kraus

Sexual Trauma, Reproductive Control, and the History of Slavery in Octavia Butler's Dawn

Miriam Lewis

Senior Recital Process and Reflection

Ashley Lo

Sustaining Open Economies: The Effects of Social Spending and Labor Market Policies on Immigration Attitudes

Alyse Lodigiani

Visual Working Memory in Schizophrenia and Other Mental Illnesses: Evidence from Electrophysiology

Stacy Lopez

Creative Alternatives to Zero-tolerance Policies in Schools through the Art

Nancy Marshall

Reawaken: Screen Printing With Natural Dyes for Contemporary Fashion Production

Rebecca Martin

Femininity, Womanhood, and the Fringe Female in Carol Duffy's *The World's Wife*

Aislinn Matagulay

The Effect of State and Non-State Actors on Environmental Conflict Resolution in East Africa

Minerva Melendrez

Understanding Latinx Political Heterogeneity Through the Lens of Linked Fate

Krishnapriya Nair

Comm-unity: An Online Communication Platform for Children with ASD

Juliana Oliveira

What Factors Determine Transfer Students' of Color Choices to Attend a Four-Year University?

Madeleine Payne

Sleep, Stress, and Greenspace Access Among Children

Viktor Perti

First-Generation Perspectives on Transactional Stress-Coping and Measures of Academic Achievement

Emma Phillips

Assessing the Effectiveness of Communication in Face-to-Face vs. Computer-Mediated Therapy

Judy Shamshikh

Digital Privacy Laws in the United States: The Variation in Protection Across States and the Federal Government

Karen Shlesinger

The Effects of Trait Anxiety on Cortical Excitability and Music Listening-Induced Modulation

Priyal Thakra

The Impact of Microcredit in Sub-Saharan Africa

Denisse Vega Zarate

The Best Thing You Can Do with Your Life is Study: Parental Involvement in Mexican Immigrant Families from the Perspective of Academically Successful Students

Anjini Venugopal

Naturalness and Lifespan of Bugs in Code: Investigating the Effects of Predictability on the Life-cycle of Simple Coding Errors

Adam Vogel

Determining the Effectiveness of Residential Property Assessed Clean Energy Programs in Promoting Residential Solar Panel Adoption

Claire Volkmann

Illustrations of Alice in Wonderland: Theories and Ways of Reading Pictures and Conversations

Hannah Wang

Governing for Free: Rule Process Effects on Reddit Moderator Motivations

Luke Wangsness

Medicaid and Mobility: Investigating the Welfare Magnet Hypothesis Using US State Medicaid Program Expansions

Katherine Weltzien

Exploring Individual Differences in Attribute Framing and Reframing Effects

Rain Yekikian

Creative Writing Portfolio

Leon Zhuang

Visaudio: User-Driven Audio Visualization Database

College of Agricultural and Environmental Sciences



| Marika Adamson |

Major: Wildlife, Fish &
Conservation Biology and English
Mentor: Dr. Andy Jones
Research Type: UHP Project

Glimpses of the Wild: A Collection of Short Stories Exploring the Relationship between Nature and Self

The performer will present an hour-long vocal recital, featuring songs in English, Italian, German, French, and Spanish and from different style periods. The repertoire has been carefully selected to represent the theme 'Faith, Hope, and Love'. Program and program notes will be provided for audience members to better understand the historical, musical, and lyrical contexts of each song. The recital will be presented on May 22nd at 3pm in Ann E. Pitzer Center.

| Jessica Beskind |

Major: Wildlife, Fish & Conservation Biology
Minor: Sociology
Mentor: Dr. Gail Patricelli
Research Type: UHP Thesis

The Effect of Anthropogenic Noise on Provisioning Behavior in Adult Tree Swallows

Anthropogenic noise, specifically traffic noise pollution, is prominent in urban areas. This noise can alter bird behaviors that contribute to reproductive success, such as communication, vigilance, and provisioning. In this study, we examined how anthropogenic noise impacts the provisioning behavior of tree swallows (*Tachycineta bicolor*) and how this behavior may differ between males and females. We exposed nest boxes to playbacks of artificial noise during the breeding season and transcribed the number and length of provisioning visits for males and females from video recordings. We hypothesized that provisioning rates decrease in noisy areas, with greater effects on female birds. Our hypothesis is supported by research that shows birds increase vigilance when exposed to anthropogenic noise, decreasing available time for provisioning. Noise also hampers communication between parents and nestlings, which may hinder parents' ability to hear hunger signals from nestlings. Additionally, during settlement, female tree swallows choose nest boxes in quieter locations more often than males, which indicates that they may be more sensitive to noise than their male counterparts. Implications of noise sensitivity in tree swallows may include a significant decrease in provisioning of birds as a result of urban development, thus decreasing fitness and impacting the overall population.

| Hannah Blackwell |

Major: Animal Science
Mentor: Dr. Kristina Horback
Research Type: UHP Thesis

Validating a Panting Score to Assess Heat Stress in Sheep

Due to increasing incidences of extreme weather events, the welfare of sheep in adapting to the changing climate, such as elevated temperatures, is of concern. In the past, researchers proposed a '0-4' scoring system to assess panting amongst individual sheep with the implication that this system is indicative of the animal's underlying physiological state. Though these panting scores have been used repeatedly by previous researchers, the amount of error introduced by the human raters applying subjective scores and the accuracy of the system is unknown. This study seeks to further verify this panting score system through testing the following criteria: 1.) assessment of inter-rater reliability or agreement between human raters; 2.) collection of concurrent behavioral (via video recording) and physiological measures such as heart rate and body temperature; and 3.) comparison of real-time scores against those deciphered using video recordings. This study used 50 yearling sheep over three weeks. Groups of 3-5 sheep were equipped with a Polar Heart Rate monitor and given 2 panting scores by 3 independent live observers. Video recordings were also taken so that standing, walking, vocalization, and video panting score could be recorded. Results are pending.

| Janae Bonnell |

Major: Environmental Toxicology
Minor: Public Health
Mentor: Dr. Clare Cannon
Research Type: UHP Thesis

There is No Nourishment in a Nuclear Feast: A Qualitative Media Analysis of Spokane Tribal Community Experiences with the Midnite Uranium Mine

The environmental justice movement was founded on the belief that all individuals have the right to live in a safe and healthy environment. Historically, tribal lands have disproportionately been the site of extractive industries, including uranium mining. This study centers the experiences of members of the Spokane Tribe of Indians in Washington to better understand how tribal communities are impacted by these industries. Through the use of qualitative coding strategies, experience-centered news articles published by both tribal and non-tribal news sources have been analyzed. Article content and interview quotes highlighted adverse health impacts amongst community members, loss of cultural activities due to contamination, and relationships between the Tribe and other stakeholders. This was revealed in themes focusing on power imbalances between various mine stakeholders, the multi-scalar and intergenerational impacts of uranium mining, and patchwork accountability for the mine itself. This work reveals the lived experiences and human costs of extractive industries operating in Indigenous communities experiencing marginalization, particularly one as under-researched as the Spokane Tribe.

| Sara Clarkson |

Major: Animal Science
and Psychology

Mentor: Dr. Emma Grigg

Research Type: UHP Project

Exploring the Impact of Dogs on Cat-Human Interactions

Despite the growing numbers of dogs and cats cohabiting, very little research has focused on the two species in one household and the effects of interspecific interactions on the human-animal bond. This project will assess whether the presence of a dog in the home has an impact on the way in which cats interact with humans. Based on existing knowledge of the differences between human-dog and human-cat interactions, we predict that cats who have lived with a dog for at least one year will initiate longer and higher numbers of interactions with humans than cats in cat-only households. To investigate this difference, we designed and tested a 53-item survey with questions excerpted from published studies on cat/dog behavior and human-pet interactions. Survey respondents will be recruited using the crowdsourcing platform Mechanical Turk (Amazon Web Services), with the goal of reaching a sample size of 600 U.S. households. With this study, we aim to identify any differences in cat behavior between cats who lived in households with dogs and cats who have not. We hope to shed light on an increasingly important but understudied facet of human-feline research: the impact of dogs on the human-cat relationship.

| Joyce Do |

Major: Human Development and Psychology

Minor: Education

Mentor: Dr. Meng Huo

Research Type: UHP Thesis

Does Social Integration Influence the Association Between Functional Limitations and Depressive Symptoms in Older Adults?

Functional limitations are increasingly common as people age. The Disablement Process Model posits that these limitations can impact an older adult's ability to live independently and lead to diminished mental health. Prior research has linked functional limitations to depressive symptoms in older adults, but we still know little about social factors that may influence this link. The current study aimed to address this gap in the literature by focusing on social integration, which refers to the diversity of social relationships and may buffer older adult from adverse consequences of physical declines in later life. This study utilized data from the Daily Experiences and Well-being Study (DEWS), which surveyed adults over 65 years old in the greater Austin area. The participants (N = 333) self-reported functional limitations, depressive symptoms, and social integration. We considered overall social integration, and also the diversity of older adults' close as well as peripheral social networks. Findings showed that older adults who reported having more functional limitations reported having more depressive symptoms. Overall social integration did not moderate the association between functional limitations and depressive symptoms. However, having a more diverse peripheral network significantly attenuate the association between self-reported functional limitations and depressive symptoms. Findings advance our understanding of how social resources like having a diverse network can help protect older adults' mental health when they experience age-related physical declines and have the potential to inform and refine health-promotion interventions.

| Kimberly Evans |

Major: Environmental Science & Management

Minor: Sociology

Mentor: Dr. Marissa Baskett

Research Type: Honors Thesis in Major

Where Did They Come From and How Did They Grow?: Reconstructing Salmon Growth Trajectories Through Biochronologies

Chinook Salmon are a keystone species of the Pacific Northwest that are threatened by habitat loss and climate change. As juveniles, they utilize a variety of freshwater habitats before migrating to the ocean. Understanding which habitats provide growth opportunities is crucial for their conservation; however, tracking fish across habitats is difficult because field observations only provide a snapshot into their life. Otoliths (ear stones) are calcium carbonate structures that fish use for hearing and balance, but researchers can use them to reconstruct life history. Every day a new layer of otolith material is deposited, and its width provides an estimate of the fish's growth. We tested different models to convert otolith measurements to fish growth rates using caged salmon in California's Central Valley. After validating our method, we applied our otolith model to wild-caught fish that had unknown growth histories. We found that growth rates varied among different habitats and that wild fish made use of floodplain habitats in a year of high water availability. This tool allows researchers to reconstruct the mosaic of growth opportunities available to Chinook Salmon in the Central Valley. The results of this study provide critical information for salmon conservation to promote resilient populations.

| Kailey Flynn |

Major: Environmental Policy

Analysis & Planning and Economics

Mentor: Dr. Susan Handy & Dr. Susan Pike

Research Type: UHP Thesis

Inhibition of Glycolysis to Promote Tendon Formation

Proper tendon healing can be the difference between an active horse and a debilitated horse. Advancements in repair strategies are required to improve tendon healing in injured horses. Recently, 2-deoxy-d-glucose was determined to be a potent stimulant for the tenogenesis of human stem cells in culture. In this study, we are examining the effect of 2-deoxy-d-glucose on tenogenic properties of stem/progenitor cells derived from the tendon proper and peritenon of the equine super digital flexor tendon. We hypothesize that 2-deoxy-d-glucose will lead to an inhibition of glycolysis which will bolster tendon formation in the progenitor cells. In order to test this, we have provided cells with 0, 10, 100, and 1000 μ M of 2-deoxy-d-glucose over a 48-hour period in monolayer culture. We are using real-time quantitative polymerase chain reaction to assay gene expression in response to the glycolysis inhibitor. Concentrations of the glycolysis inhibitor that optimally promote tenogenesis will be further investigated in a three-dimensional tendon construct model before consideration of its application as an equine tendon repair therapeutic.

| Rory Greenhalgh |

Major: Biotechnology

Mentor: Dr. Pamela Ronald

Research Type: UHP Thesis

An Investigation into the Roles of Sulfated Peptides in Rice

Sulfated peptide hormones are present in broad swaths of plant taxa, having been found in monocots, eudicots, and mosses. Peptide hormones are sulfated by the enzyme tyrosyl sulfotransferase (TPST). A sulfated phytohormone of particular interest is plant peptide containing sulfated tyrosine 1 (PSY1), which is involved in root development through cellular expansion in the model organism Arabidopsis. Currently little is known about how PSY1 peptides influence development in the crop *Oryza sativa* (rice). The Ronald Lab has generated rice plants that constitutively express the rice ortholog of PSY1, OsPSY1 (Ubi:OsPSY1). The primary roots of the Ubi:OsPSY1 plants were evaluated and compared to wild-type primary roots. It was found that Ubi:OsPSY1 plants have longer primary roots that grow faster than the controls, and that these roots have more cells in their meristematic and elongation zones. These plants also have longer mature xylem root cells than the control. This phenotype could be influenced by sucrose availability, which would suggest that OsPSY1 activates root growth through a pathway that is likely energy intensive. A transformation to generate rice plants with a deletion in the gene encoding TPST was performed, and these plants will be of great value for future experimentation into sulfated peptides.

| Marina Grimmert |

Major: Human Development

Minor: Education and Art Studio

Mentor: Dr. Lee Martin

Research Type: UHP Project

Developing Creativity Skills Through Gameplay

This project investigates creativity and aims to develop a game that effectively facilitates the development of creativity and specific creativity-related skills such as problem solving, conceptual combination, adaptability to change, and flexibility. I studied literature and research on creativity and brainstormed ideas for games that might encourage a player to use a specific creative skill. I created a prototype which I repeatedly tested and adapted until I had the final version of the game. The game I created consisted of object based "element" cards, and imaginative "situation cards" that were open to interpretation. The main premise of the game is that players abstractly/conceptually combine two element cards to create an invention which solves a problem that they interpret from the situation card. There are areas for further exploration, but overall I was successful in creating a fun game which helped players to use and potentially improve creativity skills.

| Megan Harmon |

Major: Animal Science

Minor: Global Disease Biology

Mentor: Dr. Cassandra Tucker

Research Type: UHP Project

Quantifying the Healing Process of Ear Tag Wounds in Dairy Calves

Application of ear tags in cattle is a common practice for identification purposes. While it is known that ear tag application causes ear damage, little is known about the duration of wound healing, nor if the wounds stem from initial application infection or subsequent irritation at the application site. Therefore, the purpose of this project is to quantitatively describe ear tag wound healing progression in dairy calves. For each dairy calf (n=37), weekly ear tag wound photos were taken over 12 weeks and analyzed using a novel wound scoring system. We developed this system to score the presence or absence of 7 different tissue types: undamaged, exudate, impressions, impression crust, piercing crust, tissue growth, and desquamation. We expect that if infection is influenced by initial application of ear tags, tissue types related to damage will be seen in early weeks of age, while damage in later weeks of age would reflect irritation associated with ear tag design or environmental factors. Ultimately, these results will provide insights into better management practices to improve dairy cattle welfare.

| Madeline Heeg |

Major: Animal Science

Mentor: Dr. Carly Moody

Research Type: UHP Project

Specialization Course Survey and Kitten Fostering Course

Over the course of our undergraduate educations, we have observed a growing interest in companion animals and an increasing desire for hands-on classes. Our senior capstone research project will investigate the need and desire for additional companion animal classes offered by the animal science department at UC Davis and design a potential kitten fostering course. We are conducting a survey via Qualtrics of Animal Science students at UC Davis to assess student opinions about the availability and complexity of specialization courses offered by the animal science department. The survey will also assess interest levels in additional companion animal courses and what students would like to gain from a hands-on kitten fostering course. We will promote the survey via newsletters, social media posts, and class announcements to maximize survey participation. Due to the high number of animal science students specializing in companion animals and a lack of companion animal courses offered, we anticipate a high level of interest in additional hands-on companion animal courses, including the kitten fostering course. Based on the high proportion of animal science students who desire to pursue veterinary medicine, we predict there will be a special interest in veterinary-medicine related topics in the kitten fostering course. Based on the results of the survey, we will work with the animal science department and local animal shelters and rescues to design a kitten fostering course. It will include a syllabus, the cost to run the course, and materials that could be used for the curriculum.

| Bradley Jenner |

Major: Biotechnology

Mentor: Dr. Daniel Runcie

Research Type: Thesis in Major

A Novel Algorithm for Gene Expression Quantification in TAGseq Analyses

AGseq is a powerful tool for profiling the transcriptome of an organism. Unfortunately, current analysis methods for TAGseq often inaccurately quantify expression for genes with poorly annotated untranslated regions. Our algorithm, impact, attempts to alleviate this issue by quantifying gene expression using read clusters that have a higher probability of overlapping with gene annotations. We demonstrate that this method is effective at increasing the number of reads captured in poorly annotated genomes while preserving gene expression profiles and recreating the results of differential expression analyses. This method also creates future opportunities for transcript level expression, which was previously not possible in 3' RNA sequencing methods.

| Natalie Huerta |

Major: Managerial Economics

Minor: Public Health Sciences

Mentor: Dr. Kristin Kiesel

Research Type: Honors Thesis in Major

The Impact of Sustainable Labels on Consumer Purchasing Decisions

Recently, the concept of sustainability has grown in popularity across all sectors. We want to analyze how information about sustainable production processes influences consumer demand for fruits and vegetables in the food industry. Specifically, we are looking at consumers' preferences for different formats of information provision by analyzing their willingness to pay for a variety of sustainability labels currently being used in the marketplace, ranging from unregulated product claims to regulated and certified labels. We will analyze survey responses collected in collaboration with a prominent berry seller on consumers' perception and willingness to pay for different food labels associated with strawberries. These labels include "USDA Organic," "Certified Naturally Grown," and "Zero Pesticides." The data will allow us to analyze how consumers might respond to potentially competing sustainability claims, and whether their willingness to pay changes once they are provided with exact label definitions.

| Yue Jin |

Major: Clinical Nutrition and Psychology

Mentor: Dr. Danielle Lemay

Research Type: UHP Project

Leveraging Artificial-Intelligence-based Computer Vision for Dietary Intake Assessment and Glycan Analysis: Food Dataset Curation and Visually-Similar Foods Classification Using Convolutional Neural Networks

The assessment of dietary intake is crucial for nutritional studies. However, the current methods for collecting dietary intake information are burdensome to participants and susceptible to biases and errors. An artificial intelligence (computer vision) system can help in this process by providing real-time analysis of dietary intake data. A fundamental element of creating such a system is acquiring a large image dataset that covers a wide range of food, but this is resource-intensive. To minimize the resources required, it is highly advantageous to obtain images from publicly accessible networks. This work introduces a dataset of food images sourced from multiple publicly available resources. Development of the dataset, including methods for semi-automating data sourcing and organization, and the workflow for image quality control with respect to computer vision objectives will be discussed. For example, the ability of computer vision models to distinguish between images of similar types of food may be explored using computer vision. Taken together, this workflow in quality controlling images used for training AI algorithms will be helpful for reducing the costs related to curating image datasets for use in a variety of computer vision applications.

| Minju Jung |

Major: Animal Science

Mentor: Dr. Huaijun Zhou

Research Type: UHP Thesis

Comparison of Cellular Immune Responses to Avian Influenza Virus in Two Genetically Distinct, Inbred Chicken Lines

Avian influenza virus (AIV) has been of concern to animal and human health. It is a negative-strand RNA virus of the family Orthomyxoviridae (Capua and Marangon, 2006). Its effects not only have negative impacts on the poultry industry but also raise deeper concerns about public health. In order to develop effective strategies to prevent AIV, it is key to understand the molecular mechanisms of the chickens' immune response to AIV infections. The objective of this study is to compare the mucosal cellular response to low pathogenicity avian influenza virus (LPAIV) between the Fayoumi line and the Leghorn line. Chickens were inoculated at 21 days of age with LPAIV through nasal and tracheal routes. Tracheal swabs were collected, clinical signs were recorded, and tracheal and hardierian glands were harvested post-infection. The harvested tissues were used to access gene expression profiles using RNA-seq and RNA scope Hplex assay. Flow cytometric analysis was used to detect macrophages, B cell, and T cell populations to understand immune response (Wang et al. 2022)."

| Ava Kemper |

Major: Environmental Science & Management

Mentor: Dr. Dawn Sumner

Research Type: UHP Project

The Art of Recycling

At first glance, recycling appears to be an environmentally sound option for those who want to protect the planet. Unfortunately, knowledge gaps exist between the proper recycling actions required by solid waste collections companies and everyday consumers. Our project was designed to effectively communicate recycling research findings through interactive sculpture since studies show physical engagement with art demonstrations increases cognizance, retention, and interest. To assess the Davis community's recycling awareness, a survey was conducted to determine what information was lacking and what would be most essential to convey to the public. A field trip to Recology Davis and discussion with a zero-waste specialist helped us identify location-specific issues and illuminated the most commonly mis-recycled items. Our survey results indicate all-around confusion about recycling, especially concerning acceptable types of plastic and levels of food contamination. Consequently, the most commonly mis-recycled items in Davis include refrigerated juice/milk cartons, shelf-stable cartons (tetra packs), plastic bags, greasy pizza boxes, and mailers. This information influenced the materials we chose to construct our sculpture. Using our sculpture, we hope to test the efficacy of art in addressing communication barriers and recycling obstacles here at the Undergraduate Research Conference.

| Sarai Knowles |

Major: Global Disease Biology

Mentor: Dr. Neil McRoberts

Research Type: Honors Thesis in Major

Model For the Seasonal Population Dynamics of Asian Citrus Psyllids in Citrus-Growing Regions of California

Huanglongbing (HLB) is a disease of citrus caused by a phloem-inhabiting bacterial pathogen. HLB is spread by an invasive insect vector, the Asian citrus psyllid (ACP). The presence of HLB-infected psyllids in California currently poses a serious threat to California's agricultural economy. However, researchers are still working to understand whether ACP finds the climate suitable enough to spread throughout California. To understand ACP's capacity to maintain a population in California's climate, a model will be developed for the seasonal changes in ACP populations in California, comprising Leslie matrices with transition probabilities dependent on climate variables. Since there are different climatic regions of California where ACP has invaded, the model will be developed using a patch/metapopulation approach. It is possible there are insufficient data to generate a precise projection of ACP population dynamics in California. In lieu of precision, we can however rely on the model to reveal data gaps that must be filled to better understand psyllid population dynamics. As more data are collected, it is hoped that the model will be capable of accurately showing trends in ACP populations over time. This will be crucial to quantifying the threat posed by HLB to the California citrus industry.

| Taelynn Knutson |

Major: Environmental Policy Analysis & Planning

Mentor: Dr. Naomi Janowitz

Research Type: UHP Project

An Examination of the Ethics and Efficacy of Philanthropy as a Method of Mitigating the Progression and Impacts of Climate Change

This paper examines the role of philanthropy as an avenue of fighting climate change. More specifically, it investigates the ethical issues associated with philanthropy and what makes it effective and impactful. It also discusses criteria individuals should look for when selecting an organization to support. Several charity rating systems are available. Charity Navigator is a website that rates 501(c) 3 public charities on their financial health and their accountability and transparency using a variety of metrics. Secondary factors in the Charity Navigator system are the actual impacts of the organization and its effectiveness. Another website, Candid uses a seal system to show a charity's level of transparency. Neither of these rating systems track the actual impact of the organization. This project combines the scores and rating systems of Charity Navigator and Candid with an "Impact Estimate" to account for the actual effect of charity in its overall score. The "Impact Estimate" measures the impact made by charity intervention. A student fundraiser for Rainforest Action Network in Spring of 2022 serves as a case study that models the best practices and ethical considerations found in this research.

| Matthew Kramer |

Major: Animal Biology

Mentor: Dr. Michael Kent

Research Type: Honors Thesis in Major

Changes in Diet and Supplement Use in Canine Cancer Patients

A balanced and complete diet is important in the management of cancer patients. Previous studies have shown that owners of dogs diagnosed with cancer may make diet alterations, including to raw or home-prepared diets that are unbalanced or otherwise potentially harmful. To examine owner-initiated changes in diet, treats, and supplements of dogs recently diagnosed with cancer, a web-based survey was conducted of owners who visit the UC Davis Veterinary Medicine Oncology Services. Additionally, information on resources owners use to make these decisions was collected. Between January 2021 and December 2021, complete survey data was collected from 96 owners, and partial data from 9 owners, for a response rate of 30.1% (105/349). Data analysis was done in R. A change in diet or supplements was reported by 56.0% of owners, with 50.5% of changes involving diet. The most commonly reported reason for diet alteration was loss of appetite (32.1%). While 58.1% of owners used veterinarians as an informational resource, only 27.2% of home-prepared recipes were provided by veterinarians, while 50.0% were at least partially self-formulated. This data may indicate a need for further discussion of home-prepared diets among owners of dogs with cancer.

| Kyle Krueger |

Major: Environmental Science & Management

Minor: Philosophy

Mentor: Dr. Jonathan London

Research Type: Honors Thesis in Major

Following the Money Toward Environmental Justice: The Transparency, Outcomes, and Community Alignment of AB 617 Spending in California

Assembly Bill 617 (AB 617), signed into law in 2017, requires that Air Districts (ADs) reduce air pollution exposure in disadvantaged communities. To do so, ADs must collaborate with communities to develop Community Emission Reduction Plans (CERPs). Little research currently exists regarding CERP implementation. My study helps to fill this research gap, using document review and interviews to compare and evaluate the characteristics of CERP implementation across three AB 617 communities (South Central Fresno; West Oakland; and Wilmington/ Carson/ West Long Beach (WCWLB)). Evaluated characteristics include the transparency of CERP implementation (particularly spending) and the details of CERP-related budgeting. Evaluated characteristics also include the novelty of implemented CERP solutions in comparison to existing programs, the prioritization of CERP solutions by air districts, and the alignment of CERP implementation with community priorities. My initial findings indicate that publicly available CERP spending information is high-level and difficult to connect with specific CERP strategies. The results of this study will have important implications for how CARB and Air Districts should convey data on CERP implementation to the public. Common implementation themes across the selected AB 617 communities can serve as a starting point for improving AB 617 as a policy.

| Kirby Lee |

Major: Clinical Nutrition

Mentor: Dr. Debbie Fetter

Research Type: UHP Project

Development and Feasibility Testing of an Inclusive Guide for Communicating Nutrition Science

Microaggressions can foster inequalities, impair relationships, create emotional turmoil, and decrease the mental and physical health of an individual. In a therapeutic relationship, microaggressions can lead to a weaker working alliance, which may attenuate clinical outcomes. Inclusive communication in nutrition science is essential to make nutrition information accessible to diverse audiences and strengthen the impact of education, counseling, and interventions on health and well-being. This involves being cognizant of factors, such as race/ethnicity, culture, food practices, life stage, physical ability, socioeconomic status, and eating disorder history to avoid perpetuating stigma, stereotypes, and microaggressions. Yet, there is a lack of resources available on inclusive communication from the lens of nutrition science. The purpose of this project was to develop and assess the feasibility of a guide for inclusive nutrition science communication to provide undergraduate students with the tools to effectively work with diverse populations. The guide was developed based on topics and communication skills identified through the research and by key stakeholders, which included faculty in the nutrition department, nutrition-related internship directors, and other stakeholders through a needs assessment survey. To assess the guide's utility, evaluations were conducted by stakeholders and undergraduate nutrition students through a feedback survey. The survey findings will then be utilized for further improvements and revisions for the guide. Ultimately, this project aims to be a valuable resource to help undergraduate nutrition students apply their nutrition knowledge and work more effectively with diverse populations.

| Isabella Loomis Howard |

Major: Animal Science

Mentor: Dr. Kristina Horback

Research Type: UHP Project

Does Visual Priming of Pleasant or Unpleasant Animal-Based Images Influence College Student Opinion of Animal-Product Consumption?

"Young adults (aged 18-24) are among the social groups most likely to practice veganism or vegetarianism, with trends showing that modern young adults are most likely to go vegan and stay vegan. Due to this social context, their opinions and possible influences on others are of interest to animal activist groups and stakeholders in animal agriculture. This study examined the influence of visual priming on self-reporting of animal product consumption. Visual priming has the potential to subconsciously influence human opinion and has been used by advertisers and vegan activist groups alike when trying to sway opinion. Thirty-one UC Davis undergraduate students were presented images that were intended to evoke a neutral, positive, or negative emotional state in the viewer based on the qualitative features of the animal in the photograph. Subjects completed the same Likert scale survey after viewing these images (i.e., three surveys per person). Survey statements targeted the level of agreement with statements regarding the consumption of animal-based products (e.g., meat, milk and eggs) and use of agricultural animals in general. Results indicate that both positive and negative imagery of animals have the potential to reduce students' interest in consuming meat, but not milk or eggs. Negative imagery, however, was seen to impact a greater number of responses and cause students to feel a greater level of concern for animal welfare and less interest in eating any animal products, meat or non-meat. Negative imagery was effective in changing student opinion of their consumption in several contexts. Further research that follows students for a longer period of time after exposure to negative imagery would be helpful in determining if this change in opinion translates to lifestyle change.

| Sarah Mark |

Major: Animal Biology

Minor: Global Disease Biology

Mentor: Dr. Kevin Keel

Research Type: Honors Thesis in Major

Canine Distemper Virus Replication in Macaque Tissue Explants

Canine distemper virus (CDV) is a close relative of the measles virus, and although it is generally considered a disease of dogs, it has proven to be capable of readily crossing the species barrier. Outbreaks of CDV in primates have been reported multiple times in Asia, having significant impacts on research colonies of rhesus macaques (*Macaca mulatta*) with high morbidity and mortality rates. I sought to test the ability of North American strains of CDV to infect macaques through infections of macaque-tissue explants. Tissue samples (one lung lobe, ten cm of intestine, and five lymph nodes) were removed from a juvenile 6-month-old macaque at the UC Davis Primate Research Center, which was euthanized for unrelated medical complications. Explants were divided and inoculated with a wild-circulating North American strain of CDV provided by the Keel Lab. Replicates were retrieved at one hour, one day, three days, and five days post-inoculation. Formalin-fixed tissue was embedded in paraffin and then analyzed with immunohistochemistry for CDV. Quantitative PCR showed an increase in CDV between one hour and one day post-inoculation, implying viral replication in the macaque tissue. These results suggest that North American CDV does have the ability to replicate within macaque tissue explants.

| Emily Manroe |

Major: Human Development and Psychology

Minor: Education

Mentor: Dr. Rebecca Ambrose

Research Type: UHP Thesis

Impacts of the COVID-19 Pandemic on Elementary-School Children's Social and Emotional Learning (SEL): Understanding the Changes and Effective Strategies to Address Social and Emotional Needs

Elementary school classrooms have long been recognized as crucial contexts that guide children's social and emotional development. The COVID-19 pandemic created a unique and novel situation where, due to quarantining measures, much of the normative social and emotional classroom interactions were altered, limited, and/or erased. This study aims to understand how distance learning (and other subsequent effects of the pandemic) impacted elementary school students' social and emotional competencies. Specifically, this study focuses on both teachers' interpretations of children's social and emotional skills/needs over time as well as how prepared teachers feel to meet their students' needs. This investigation is designed as a case study of four classrooms in a Californian elementary school. Teachers responded to online surveys at the beginning, middle, and end of the 2021 Fall semester; these surveys included rating questions to understand how teachers perceived their students' social and emotional (SE) skills over time, as well as free-response questions that allowed teachers to describe their strategies, successes, and areas of improvement. The results illustrate a high level of abnormal SE competency prevalences across grades throughout the semester, as well as high variability within each grade. Teachers' reflections indicate their confidence that their strategies were mostly effective in fostering their students' SE skills, but communicate pervasive feelings of unpreparedness to address all of their students' SE needs. This study will hopefully add to a growing body of research around the ongoing impacts of physical separation and forced-online instruction on children's social and emotional development.

| Noah McNaughton |

Major: Animal Biology

Mentor: Dr. Peter Wainwright

Research Type: Honors Thesis in Major

Functional Morphometrics of Butterflyfish Feeding Mechanisms

Form follows function, and biomechanics have a lot of parallels to how we manufacture mechanical systems. Through video analysis of feeding strikes in butterflyfish, we determined that the kinematic movements of *Chaetodon ulitensis* differ in respect to prey type. This has implications for the evolution of generalized feeding patterns and why that might be evolutionarily advantageous.

| Anna Neubauer Vickers |

Major: Community and Regional Development

Mentor: Dr. Marjorie Visser

Research Type: UHP Thesis

Decriminalizing Sex Work in New York: An Analysis of two proposed state policies

| Nicole Ng |

Major: Animal Science

Mentor: Dr. Maja Makagon

Research Type: UHP Thesis

Laying Hen Pullets' Movements Between Single-Tiered Aviary Structures Change with Age

In backyard and commercial chicken production, housing design should align with the physical abilities and behavioral preferences of pullets. We studied how pullet age affects the use of a single-tiered aviary (STA). Dekalb White pullets were housed in four groups of 55-56, with group size reduced to 45 at 8 weeks of age (WOA). For 10 focal pullets/aviary, we reviewed 2 hours of video at 6 and 16 WOA (4 hours total). We recorded all instances of transitions between STA components, noting the location of origin and landing (perches, tier, ramp, and pen floor). Ramp landings decreased while perch and tier landings increased with age (6 WOA: 1091 landings, 16.6% ramp, 17.9% tier, 33.1% perch; 16 WOA: 1469 landings, 8.4% ramp, 20.6% tier, 37.5% perch). As pullets aged, the ramp was used less often to access perches and tiers of the aviary from the floor (6 WOA: 343 transitions from floor, 58.9% to perches/tier, 40.2% to ramp; 16 WOA: 482 transitions from floor, 79.9% to perches/tier, 18.5% to ramp). These results emphasize the importance of introducing STA structures at appropriate ages to accommodate age-dependent preferences and abilities.

| Bessie Nicolaides |

Major: Environmental Science & Management

Mentor: Dr. Andrew M. Latimer

Research Type: UHP Project

A Review of the Effects of Prescribed Animal Grazing on Invasive Plant Species in Coastal Grassland Habitat

With climate change affecting landscapes across the globe, all possible methods of mitigating the negative effects should be considered. The spread and increase in invasive plant species is a potential threat, especially in sensitive grassland and prairie communities in California. A potential method to decrease these non-native flora is utilizing grazing animals to target them. In a scientific literature review, I will be assessing the current state of research regarding goat grazing and other animal-based methods of combating invasive plant species in California. This analysis will include various biomes and habitat types in California with a focus on grasslands and coastal prairies. The main goal is to determine the effectiveness of animal grazing against invasive plant species, the viability of each animal method used, and how it may positively or negatively alter the landscape over time. Data and information on this topic will be drawn from multiple peer-reviewed scientific journals, sorted by relevance and chronological submission.

| Rachel Ogan |

Major: Animal Biology

Mentor: Dr. Jason Watters

Research Type: Honors Thesis in Major

How Daylight Savings Time Affects Anticipatory Behavior in Captive Black Rhinoceros

Daylight savings time consists of two days each year in which humans turn their clocks backward or forward one hour, shifting the time that humans are active. To captive animals, this clock shift represents a subtle change in their daily routine. This study sought to determine if a discrete routine change in the form of daylight savings time resulted in a change in anticipatory behavior for a captive black rhinoceros (*Diceros bicornis michaeli*) at the San Francisco Zoo and Gardens. I collected preliminary data of the rhino's behaviors using an ethogram on the ZooMonitor app, describing anticipatory behavior as stereotypic pacing near his feeding site. I then collected data on November 7th when the clock shifted back one hour. I expected that there would be an increase in anticipatory behavior on November 7th, when there was a discrete routine shift, compared to the daily routines in the months before and after this day. This study aims to contribute to the knowledge within the zoo and rehabilitation communities of how subtle shifts in routine may affect a captive animal's overall welfare. These findings may subsequently aid them in better preparing the animals under their care for these changes.

| Ryan Packer |

Major: Entomology

Mentor: Dr. Diane Ullman

Research Type: UHP Thesis

Revealing a Possible Plant Defense Effector from the Salivary Gland of *Frankliniella occidentalis*

Western flower thrips (WFT), *Frankliniella occidentalis*, are small insects that transmit Tomato spotted wilt orthotospovirus to plants. The Ullman laboratory research aims to understand the complex interaction between virus, vector, and host. The virus must infect the thrips' salivary gland for virions to be injected into plants. To understand the interaction between the virus and thrips, a salivary gland transcriptome and proteome from infected and non-infected WFT was created. These 'omics' tools identified genes enriched in the salivary glands, and genes expressed differentially when thrips are infected. Moreover, a secretome was created for WFT, identifying proteins secreted in the saliva. Two genes of interest were selected for genetic transformation into two *Solanum lycopersicum* 'MoneyMaker' lines that were used for thrips oviposition bioassay. The bioassay measures the rate of oviposition to represent the fitness on three tomato lines, wildtype, SG053, and SG114. We expect the inserts to suppress or stimulate the plants' defenses resulting in a higher or lower egg count, respectively. The first two repetitions show a statistically significant difference between the SG053 and control. However, the third repetition showed the SG053 was the same as the control. Expression of the inserted genes could temporally change, resulting in high variation in oviposition rate.

| Nicholas Petersen |

Major: Community & Regional Development

Minor: Environmental Policy Analysis & Planning

Mentor: Dr. Laci Gerhart-Barley

Research Type: Honors Thesis in Major

Urban Biodiversity and Land Use in California

Land use, the alteration of the landscape by human activity, impacts biodiversity on a monumental scale. A core component of sustainable development is the integration of wildlife into urban areas, as human settlement patterns occupy large swaths of once natural lands. This research project aims to understand how specific land uses impact urban biodiversity, through the Geographic Information Systems (GIS) analysis of urban biodiversity and land use datasets of five major Californian cities — Los Angeles, San Diego, San Jose, San Francisco, and Sacramento. The urban biodiversity datasets are of the City Nature Challenge, an annual urban biodiversity citizen science competition, and the land use datasets are municipal zoning data. Preliminary results suggest key insights between land use and urban biodiversity, with implications for urban areas globally. Significance of this research includes applications in rethinking how urban planners plan for existing cities and future sustainable development, towards a more ecologically-inclusive model.

| Jennifer Price |

Major: Animal Biology

Minor: Medical-Veterinary Entomology and Public Health

Mentor: Dr. Geoffrey Attardo

Research Type: Honors Thesis in Major

Effects of Wildfire Ash upon *Aedes aegypti* Breeding Site Preference and Rate of Larval Development

Aedes aegypti is a tropical mosquito species that vectors multiple arboviruses, including yellow fever, Zika, Chikungunya, and dengue. *A. aegypti* has been detected in California within the last decade, coinciding with the intensification of wildfire activity in the Western United States. I sought to evaluate whether ash alters juvenile development in *A. aegypti* and whether it acts as an oviposition attractant. With assistance from the UC Davis Fire Department and CALFIRE, I collected wildfire ash from two field sites in Northern California (Frenchtown and Woodland). I prepared 0%, 0.25%, 0.5%, and 0.75% ash solutions in which I reared 4 replicates of L1 larvae and recorded their time to pupation and eclosion. Across all treatments with Frenchtown ash, all of the larvae pupated on day five instead of day six ($p = 2 \times 10^{-16}$). Additionally, I placed 4 replicates of gravid females in breeding cages with the four solutions and quantified the number of eggs laid in each container. Egg counts were positively associated with unfiltered Frenchtown ash concentration ($p = 1.5 \times 10^{-5}$). Since these effects were only seen in unfiltered Frenchtown ash, we are now pursuing experimental replication with single-species ash and Solid Phase Micro-Extraction to identify volatile attractants.

| Mairead Ryan |

Major: Animal Science

Mentor: Dr. Carly Moody

Research Type: UHP Project

Specialization Course Survey and Kitten Fostering Course

Over the course of our undergraduate educations, we have observed a growing interest in companion animals and an increasing desire for hands-on classes. Our senior capstone research project will investigate the need and desire for additional companion animal classes offered by the animal science department at UC Davis and design a potential kitten fostering course. We are conducting a survey via Qualtrics of Animal Science students at UC Davis to assess student opinions about the availability and complexity of specialization courses offered by the animal science department. The survey will also assess interest levels in additional companion animal courses and what students would like to gain from a hands-on kitten fostering course. We will promote the survey via newsletters, social media posts, and class announcements to maximize survey participation. Due to the high number of animal science students specializing in companion animals and a lack of companion animal courses offered, we anticipate a high level of interest in additional hands-on companion animal courses, including the kitten fostering course. Based on the high proportion of animal science students who desire to pursue veterinary medicine, we predict there will be a special interest in veterinary-medicine related topics in the kitten fostering course. Based on the results of the survey, we will work with the animal science department and local animal shelters and rescues to design a kitten fostering course. It will include a syllabus, the cost to run the course, and materials that could be used for the curriculum.

| Huda Saleh |

Major: Managerial Economics

Minor: Arabic

Mentor: Dr. Aaron Smith

Research Type: Honors Thesis in Major

Investigation of Cryptocurrencies: What Are They, Advantages and Disadvantages, and Considerations to Replace or be Secondary National Currencies

There is a lot of misinformation about cryptocurrencies that it can be difficult at times to understand the value and faults of cryptocurrencies and whether they are actually worth the hype. My paper aims to summarize some of the primary costs and benefits of using cryptocurrencies in 2022 and determine whether or not cryptocurrencies such as Bitcoin, or Stablecoins like USD Coin and Tether could potentially be better stores of value relative to national currencies. From my findings, I discovered that some of the most common benefits of cryptocurrencies are that they can be used for payments, lower-cost remittances, investing, and earning profits as a digital creator through NFTs. The common concerns, however, are that they lack regulation (ex. consumer protection laws), use high amounts of electricity to operate, and aren't very accessible to the most vulnerable. This paper also delves into the characteristics of an ideal currency and compares fiat money to Stablecoins and what I call "decentralized digital currencies", which are essentially cryptocurrencies with one of the main functions being as a form of payment. I find that these cryptocurrencies meet most of the requirements except that they aren't as widely accepted by institutions as fiat money is, and that decentralized digital currencies aren't good stores of value because of the fact that they are highly volatile. When comparing the volatility of cryptocurrencies to national currencies, I determine that in most cases, national currencies are a better form of currency, however, for a few countries (ie. Democratic Republic of the Congo, South Sudan, Venezuela, and Zimbabwe) I found that their inflation rates were generally more volatile than the common cryptocurrencies, and could potentially benefit from the use of cryptocurrencies as a form of payment, once the common concerns are better addressed. Additionally, of the two types of cryptocurrencies I was considering, I would recommend stablecoins, particularly fiat-collateralized cryptocurrencies, as a better potential form of currency because they are far less volatile than the decentralized digital currencies that I researched.

| Samantha Seefeldt |

Major: Clinical Nutrition

Mentor: Dr. Debbie Fetter

Research Type: Honors Thesis in Major

Development of a Nutrition and Life Skills Education Module for UC Davis Students

Material to ameliorate food insecurity in the college population is not accessible and widely available. Resources for food insecurity are available such as food and basic goods, but education on how to obtain such resources and skills to use them effectively is lacking. To address this knowledge gap involved with the prevailing issue of food insecurity on the University of California, Davis (UC Davis) Campus, an education module was created to be given to food-insecure students. This education module in the form of videos addresses topics such as obtaining, budgeting, shopping, preparing, and consuming food. The video design of the module was created based on ease of accessibility for college students. The creation of 8 different videos around 10 minutes in length per has been completed. The module is in the process of being distributed to a pilot audience of previously homeless students. From the data collected through pre- and post-surveys, the goal is to assess the effectiveness of filling knowledge gaps and to edit the module further to address the gaps that were not met. Eventually, the module will hopefully be used in a first-year seminar course.

| Francesca Shackelford |

Major: Environmental Science & Management

Minor: Sociology

Mentor: Dr. Majdi Abou Najm

Research Type: Honors Thesis in Major

Effects of Rock Dust Amendments on Soil Infiltration Behavior

The ability to quantify soil infiltration is crucial for the success of land management practices. This is an especially important topic in California's Central Valley, a region facing ongoing severe drought due to groundwater overdraft. I investigated an efficient and inexpensive soil infiltration test method by constructing five automated infiltrometers. Each machine features a 2.3-liter transparent cylindrical reservoir which allows for 130 mm of total infiltration, as well as an Arduino microcontroller board and differential pressure transducer which allow them to provide water at a constant head and record resulting infiltration rates. Using these infiltrometers, I intend to measure the saturated hydraulic conductivity (Ks) at sites in the Central Valley near Davis, CA to understand their infiltration dynamics. These automated infiltrometers can be recreated by many other researchers to gain insights into soil behaviors that would be otherwise difficult to quantify, having important applications in various fields of study like managed aquifer recharge (MAR), cover cropping, grazing, fire management, and sea water intrusion.

| Claire Short |

Major: Wildlife, Fish, and Conservation Biology

Mentor: Dr. Andrew Shih

Research Type: UHP Project

Emboldened and Golden: How Boldness Variation in Goldfish Shoals Affects Foraging Behavior

Previous studies have found that boldness is often a stable personality trait in fish and have explored how boldness variation in fish shoals affects their collective behavior. Some studies have found that the proportion of bold versus shy individuals impacts the group's foraging success, but there are inconsistent findings among different studies, most of which focus on a simple environment with a single food patch. Our study investigates how variation in boldness levels in pairs of goldfish (*Carassius auratus*) influences their foraging behavior in an environment with patchily distributed food. We first conducted boldness assays, which indicated that boldness is a stable personality trait in goldfish that varies within a population. We then categorized each fish as either bold or shy based on the results of the boldness assays and assigned the fish to bold/bold pairs, shy/shy pairs, and bold/shy pairs. We placed each pair of fish in a simple maze with two food patches and analyzed latency to eat, leader-follower dynamics, food allocation within each pair, and exploring behavior. We found that shy fish ate sooner and reached the far food patch sooner when paired with bold versus shy fish, but bold fish seemed to be unaffected by their partner's boldness ranking. We also found that boldness ranking had no effect on the amount of food consumed and that shy fish usually followed bold fish within bold/shy pairs. Our results suggest that shoaling with bold conspecifics may help shy goldfish discover food patches and begin foraging sooner, and that bold fish may not outcompete them at food patches. This study investigates the role of boldness variation in foraging behavior in a more complex environment than previous studies, providing further insight into the role of personality in group dynamics.

| Samantha Stephan |

Major: Environmental Science & Management

Mentor: Dr. Dawn Sumner

Research Type: UHP Project

The Art of Recycling

At first glance, recycling appears to be an environmentally sound option for those who want to protect the planet. Unfortunately, knowledge gaps exist between the proper recycling actions required by solid waste collections companies and everyday consumers. Our project was designed to effectively communicate recycling research findings through interactive sculpture since studies show physical engagement with art demonstrations increases cognizance, retention, and interest. To assess the Davis community's recycling awareness, a survey was conducted to determine what information was lacking and what would be most essential to convey to the public. A field trip to Recology Davis and discussion with a zero-waste specialist helped us identify location-specific issues and illuminated the most commonly mis-recycled items. Our survey results indicate all-around confusion about recycling, especially concerning acceptable types of plastic and levels of food contamination. Consequently, the most commonly mis-recycled items in Davis include refrigerated juice/milk cartons, shelf-stable cartons (tetra packs), plastic bags, greasy pizza boxes, and mailers. This information influenced the materials we chose to construct our sculpture. Using our sculpture, we hope to test the efficacy of art in addressing communication barriers and recycling obstacles here at the Undergraduate Research Conference.

| Amida Verhey |

Major: Environmental Science & Management

Minor: Wildlife, Fish, & Conservation Biology

Mentor: Dr. Justine Smith

Research Type: Honors Thesis in Major

The Coyote Factor: How Interference Competition Influences Urban Space Use of Gray Foxes (*Urocyon cinereoargenteus*)

As urban areas continue to expand, understanding the consequences of human disturbance on wildlife behavior is increasingly important. Moreover, interactions between species in urban environments may further complicate the ways wildlife respond to human spaces. In the Santa Monica Mountains, a recreational area near Los Angeles, coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*) compete for resources. As a result of this competition, we expect gray foxes, the subordinate species, to avoid coyotes by using areas and resources that do not overlap with coyotes, which may influence the distribution of foxes near development. To explore the effect of coyote presence on urban area use of gray foxes, I will fit occupancy models with three years (2013-2015) of camera trap records. Gray fox occupancy will be modeled as a function of coyote detections, and comparisons of occupancy between species will be used to investigate relationships of space use. I expect gray fox occurrence to be highest near urban areas where coyotes are not present because of potential anthropogenic resource subsidies and protection from predators. Additionally, I predict that gray fox occurrence will be lowest near development where coyotes are present, because foxes avoid coyotes seeking the benefits of human spaces. Finally, areas furthest from development will have high fox occurrence regardless of coyote presence. These results will further our understanding of competition's impact on gray fox distribution in urban landscapes.

| Angela Weber |

Major: Food Science

Minor: Technology Management

Mentor: Dr. Jean-Xavier Guinard

Research Type: UHP Thesis

The Sugar Flip - Sugar Reduction While Maintaining the Perception of Sweetness

Sugar consumption has become a steadily increasing trend in recent decades among American adults, with desserts being a significant source of added sugars in the diet. The “Sugar Flip” aims to apply sensory flavor enhancements other than sugar as low-calorie drivers of sweetness. We hypothesized that “sweetness” is a multisensory modality affected by appearance, aroma, taste, and texture, then applied this principle to achieve a 25% sugar reduction in cookies without compromising sweetness perception or consumer acceptance, with the use of flavor-enhancing culinary strategies. Sugar enhancers were added to chocolate chip cookies (browned butter, nuts, vanilla) and snickerdoodle cookies (cinnamon, coconut, citrus), then their consumer liking, preference, and perception of sweetness were tested among college-aged participants at a university dining commons. Participants evaluated three versions of a standard cookie (full sugar, reduced sugar, and reduced sugar with enhanced flavor) for overall liking, liking of appearance, flavor, texture/mouthfeel on a 9-point hedonic scale, sweetness, and other sensory attributes by Just-About-Right scales, preference ranking, and sensory attributes by check-all-that-apply. While participants (n= 122) preferred the original recipe of chocolate chip cookie out of all three variations, the reduced sugar enhanced sweetness variation was perceived as significantly sweeter. Participants significantly preferred the 25% reduced sugar version of the lemon cookie but felt the enhanced and original variations were higher in perceived sweetness, showing potential for greater proportions of sugar reduction in future sugar flip applications. In conclusion, these results can be used to assess the efficacy of various sweetness enhancement strategies across visual, chemosensory (flavor), and tactile dimensions in sugar reduced foods.

| Abigail Weir |

Major: Environmental Toxicology

Mentor: Dr. Wilson Rumbelha

Research Type: UHP Thesis

Effects of Hydrogen Sulfide-Intoxication on Energy Expenditure and Microbiome Metabolome

Hydrogen sulfide (H₂S) gas is an environmental hazard with known neurotoxic properties. It is of concern to the Department of Homeland Security as a potential terrorist chemical agent. Currently, there is no FDA-approved antidote for acute H₂S poisoning. Prior studies have shown that acutely exposed mice lose weight, but the mechanism(s) involved have not been investigated. In this pilot study, we investigated whether H₂S-associated weight loss is due to reduced energy intake or expenditure compared to breathing air control mice. 10 mice were exposed to 1000 ppm H₂S (LD₅₀) and 5 mice were exposed to medical-grade breathing air once for 60 min. Surviving mice were subjected to indirect calorimetry and gross body composition analysis for 7 days following exposure. Body heat, respiratory exchange rate, food intake, energy expenditure, lean mass, fat mass, water mass, and activity data were recorded. Results showed that in the first 3 days H₂S-exposed mice burned fat. There was a statistically significant difference in body fat between H₂S-treated and control mice. Results also showed that H₂S significantly suppressed vertical movement (rearing) compared to controls. We conclude that weight loss is due to impaired feed intake arising from H₂S-induced loss of rearing causing mice to burn fat.

| Lauren Yen |

Major: Human Development

Minor: Psychology

Mentor: Dr. Daniel Choe

Research Type: UHP Thesis

Physiological Arousal and Self-Regulation in Pre-school Age Children in a Delay of Gratification Task

"Self-regulation is the ability to modulate one's reactions and responses during periods of stress, and can be measured in part using a delay of gratification task (Kahle, Utendale et al, 2018). Respiratory sinus arrhythmia (RSA) is a physiological indicator of reactivity in the parasympathetic nervous system, with high RSA at rest correlating with better self-regulation and control of emotions (Beauchaine & Thayer, 2015; Porges, 2007). Pre-ejection period (PEP) is a physiological marker of the sympathetic nervous system, with higher PEP values indicating a lower stress response (Kahle & Miller, 2018). Emotionality encompasses both positive and negative affect, and children who display more extreme emotional responses are less likely to succeed at the task. However, little research has examined how emotionality, RSA, PEP, and behavioral strategies (e.g., behavioral distraction, attention distraction) contribute to delay of gratification, which is associated with positive developmental outcomes such as socioemotional competence, mental health, academic achievement, and career success (Lizhu & Jiangyang, 2007); Wedding & Furey, 2015). Using these data, we expect high levels of RSA and use of behavioral strategies to predict task success, and both low PEP and high emotionality to predict task failure. Seventy preschool-aged children (M = 50.8 months, SD = 4.77, 48.6% girls) performed a gift delay task in which children were left alone for three minutes and told not to touch a gift placed in front of them. Task success was defined by whether they touched the gift. A subset of children wore seven electrodes to collect psychophysiological data, which were processed and then averaged across 30-sec epochs using MindWare's Heart Rate Variability and Impedance Cardiography softwares. Recorded observations were scored using Noldus The Observer XT, and these behavioral strategy scores, previously coded at 10-sec intervals, were then combined and averaged across 30-sec epochs to be consistent with the physiological data. Preliminary data show no relationships between emotionality, RSA, PEP, and these behavioral strategies, except when focusing on girls. For girls, behavioral distraction was negatively correlated with gift touching, indicating task success ($r = -.46$, $p = .046$, $n = 19$). Our next steps are to behaviorally score the remaining 28 videos and to conduct more advanced analyses (e.g., test main effects and interactions in hierarchical regression).

| Sabrina Young |

Major: Animal Biology

Minor: Music

Mentor: Dr. Nann Fangue

Research Type: UHP Thesis

The Effect of Thiamine Levels and Rearing Temperature on Thermal Tolerance of Chinook Salmon

Climate change is a multifactorial event with unknown consequences for wild fish populations. To determine the effects of thiamine deficiency and increasing water temperatures on developing Chinook salmon, thiamine treated and untreated fry were raised at control (11°C) and warm (14°C) water temperatures. To assess their thermal tolerance (CTMax), tank temperatures were gradually increased until the fish experienced a loss of equilibrium. Groups reared at warmer temperatures displayed significantly higher thermal tolerance than their control counterparts but both thiamine treated and untreated groups produced the same mean CTMax. Based on these results, conservation efforts should focus reducing the impacts of climate change on water temperatures since thiamine deficiency had no effect on thermal tolerance, but further research should investigate how the lack of this vitamin influences other aspects of development in Chinook salmon.

| Chaoxun Yuan |

Major: Landscape Architecture

Mentor: Haven Kiers

Research Type: UHP Project

Sheepscales

Although much literature exists on the benefits of sheep grazing, the research primarily evaluates prescribed grazing from an ecological perspective; economic and social considerations are only mentioned as an extension to the environmental focus. These studies typically take place in rural settings and focus on issues such as fire management, grazing impacts on carbon storage and greenhouse gas emissions, or the restoration of grassland habitat. Few studies of statistical significance have focused on the benefits of grazing in urban spaces or the social influence of sheep grazing on communities. This gap in research provides me with an opportunity to 1) incorporate sheep grazing into the paradigm of urban design, and 2) take a holistic approach in researching the environmental, economic, and social benefits of urban grazing, with a primary focus on human mental health. Beyond the campus lawnscapes, opportunities to introduce urban grazing to promote human health and wellbeing are numerous, such as office campuses, lawns surrounding hospitals and elderly care facilities, and urban parks and greenways. Many of these urban grazing applications already exist—but few researchers are exploring the health effects of urban grazing on the people who stop to observe the sheep. While I am still far from publishing in scientific journals, I am optimistic in my ability to contribute to the field through the creation of a publication, for my senior thesis, outlining the procedures and guidelines for implementing sheepscales programs at universities around the country. This small step can serve to encourage the adoption of sheep grazing as a low cost/high impact design intervention to improve social health and promote sustainability.

College of Biological Sciences



| Jonathan Berg |

Major: Neurobiology, Physiology & Behavior

Minor: Music

Mentor: Dr. Jian Jian Li

Research Type: UHP Thesis

Enhancing Immunotherapy Efficacy on GBM by Inducing PD-L1 Expression

Many human cancers including the most malignant brain tumor glioblastomas (GBM) are able to escape immune detection by expressing PD-L1 that binds to PD-1 receptor on T cells, making the tumor cells invisible to T cell mediated immune attacks. In clinic, increasing evidence demonstrates enhanced cancer control by immunotherapy targeting the interaction of PD-1/PD-L1. However, if tumor cells express low or no PD-L1, the efficacy of such PD-1/PD-L1 targeted immunotherapy is severely limited. Although radiotherapy and lactate are shown to enhance PD-L1 expression respectively via the JAK/STAT and HIF1 α pathways, more effective modality for PD-L1 induction is urgently required. This project aims to test a potential synergism between cellular metabolism and radiation as a way of increasing PD-L1 expression to improve the viability of immunotherapy treatment of GBM. Monocarboxylate transporter 4 (MCT4) is a proton-associated monocarboxylate transporter, functioning in transporting many monocarboxylates such as lactate across the cell membrane. We will determine if blocking MCT4 can raise cellular lactate concentration thus enhancing PD-L1 expression on GBM cells. In addition, we will test if blocking MCT4 together with radiation can further upregulate PD-L1. If successful, the data from this project will be informative to guide a preclinical trial using MCT4 inhibitor or combined MCT4 inhibitor with radiation in GBM treatment using PD-1/PD-L1 targeted immunotherapy.

| Poorvi Datta |

Major: Biological Sciences

Mentor: Dr. Laci Gerhart-Barley

Research Type: UHP Thesis

Assessing the Impacts of Lecture Recordings and Captioning on Students with Disabilities in Higher Education

The retention of students with disabilities (SWD) in higher education is a pressing equity concern. It can be addressed by increasing accessibility for SWD in classrooms, while still maintaining the principles outlined in Universal Design for Learning (UDL). UDL states that classrooms should be designed in a manner that accommodates all learners without specialized adaptation. The inclusion of lecture recordings and closed captioning as a supplement to class materials is a proposed mode of interpreting UDL. This literature review examines the impacts of lecture recordings and closed captioning on SWD. When provided, SWD use recordings and actively express a preference for their inclusion as a supplemental resource. Recordings reduce barriers related to attendance for students with mobility/chronic health/mental health disabilities, and allow students with dyslexia/learning disabilities to revise material. Closed captioning also facilitates comprehension for SWD, and is essential for Deaf/Hard-of-Hearing students. However, auto-captioning, as opposed to accurate, human-edited captioning, has limitations in terms of accuracy. The literature is clear: SWD prefer, use, and need lecture recordings with captioning for a multitude of purposes. By including these two resources, instructors also accommodate undisclosed SWD and reduce the burden on SWD overall.

| Austin Chan |

Major: Neurobiology, Physiology and Behavior

Minor: Psychology

Mentor: Dr. Qizhi Gong

Research Type: Honors Thesis in Major

SARS-CoV-2 Infection and Cytokine Responses in the Olfactory Epithelium

Infection by SARS-CoV-2 leads to COVID with many symptoms including anosmia. Olfaction occurs by detecting environmental odorants in the nasal cavity by olfactory sensory neurons (OSNs). Studies suggest that the SARS-CoV-2 does not infect OSNs, but instead infects other cells within the olfactory mucosa such as the sustentacular (SUS) cells. To investigate the mechanisms of COVID-associated olfactory loss, our lab uses a transgenic-mouse model (K18-hACE2) in order to examine the impact of SARS-CoV-2 on the mouse olfactory epithelium (OE). We infected K18-hACE2 mice through nasal inoculation of SARS-CoV-2 and conducted immunohistochemistry to study spatial viral infection, cell-type-specific infections, and temporal responses all within the nasal cavity. SARS-CoV-2 nuclear protein (NP) staining was used as an indicator of viral presence and we observed sparse NP immunoreactivity in OE turbinates. However, in the respiratory epithelium (RE), NP-positive cells were numerous and robust in staining. Through RNAscope in situ hybridization, we observed specific SARS-CoV-2 infections of sustentacular cells, accompanied by a wide-spread CXCL10 and IL-6 upregulation. We additionally observed upregulation of multiple cytokines including type I interferons by whole tissue RNA-sequencing, which were validated through qRT-PCR.

| Carmen David |

Major: Evolution, Ecology & Biodiversity

Minor: Plant Biology and Education

Mentor: Dr. Jennifer Gremer

Research Type: Honors Thesis in Major

Invasive Leaf Litter Effects on *Plantago lanceolata* Germination and Seedling Recruitment

Leaf litter can be a mechanism of indirect interspecific competition allowing plants to modify their environment to gain a competitive advantage, acting as a physical barrier in addition to changing light quality and quantity. Since 2016, *Plantago lanceolata*, a short-lived perennial, has been monitored in the Putah Creek Riparian Reserve. This population is under heavy litter cover from *Eucalyptus* and exotic annual grasses. This project investigates how *P. lanceolata* germination and seedling recruitment are affected by *Eucalyptus* and annual grass litter as a physical and light barrier. *P. lanceolata* seeds were sown under litter of these two species in addition to an artificial litter and shade treatment, scored for germination, and then grown out to measure shoot length and dry biomass. Based on personal field observations, I predict the grass litter will have a greater negative effect on the seedlings, serving as a tougher barrier for seedlings to break through in addition to having a greater effect on the light quality than the *Eucalyptus* litter. This project will be important to understanding interspecific dynamics between these three exotic species mediated via litter, providing greater insight into the persistence of exotics in Putah Creek.

| Viraj Deshpande |

Major: Neurobiology, Physiology & Behavior

Mentor: Dr. Nicholas Marsh-Armstrong

Research Type: Honors Thesis in Major

Decoding Glaucoma: Assessing the Efficacy of Machine-Learning Image Analysis in Quantifying Morphological Differences in Glaucomatous Axons of the Optic Nerve Head

Glaucoma is a disease in which optic nerve deterioration leads to progressive vision loss. The earliest stages occur in axons of the peripheral bundles of the optic nerve head (ONH); visualization of this region is achieved using Serial Block-Face Scanning Electron Microscopy (SBEM). This study will assess the efficacy of utilizing AIVIA, a machine-learning image analysis software, in producing 3D models of individual axons from SBEM blocks to quantify the morphological differences between normal and affected axons. I will extract one subvolume each from two scans of the ONH; one from a rhesus macaque with glaucoma and one without. I will then apply both subvolumes to AIVIA to generate two blocks of all perceived axons within each subvolume. I will then manually adjust ten axons within each generated set, extract metrics including axon eccentricity, tortuosity, and G-ratio for each individual axon, and compare these between axons with and without glaucoma. Finally, I will compare the two computer-generated models to assess whether the same quantitative differences are represented over a significantly larger sample size. If successful, using this software will increase the available quantitative data regarding glaucoma-induced axonal morphology, pushing forward potentials for targeted therapy and early diagnosis in the ONH.

| Madison Hall |

Major: Biochemistry & Molecular Biology

Mentor: Dr. Chang-il Hwang

Research Type: Honors Thesis in Major

Effect of Dapk1 Silencing on the Metastatic Capabilities of Pancreatic Ductal Adenocarcinoma Cells

While previous studies have identified characteristic mutations that occur during the development of pancreatic ductal adenocarcinoma (PDAC) tumors, there do not appear to be recurrent mutations that lead to metastasis. This suggests that epigenetic changes may instead be responsible. To work towards identifying specific epigenetic changes that lead to metastasis, I aimed to determine the effect of methylation-based epigenetic silencing of Dapk1 on the metastatic capabilities of PDAC cells. First, I attempted to specifically methylate the Dapk1 promoter of murine pancreatic tumor cells using dCas9-Dnmt3a. After experiencing difficulties with this method, I attempted to knockout Dapk1 in murine pancreatic tumor cells using a CRISPR Cas9 approach. Initial genetic analysis indicates that the knockout was successful in two different populations of cells. If the knockout can be verified by measuring the level of the Dapk1 protein in the cells, these cell lines will be a valuable resource for investigating the effects of Dapk1 silencing on the metastatic capabilities of PDAC cells.

| Aditi Goyal |

Major: Genetics & Genomics and Statistics

Mentor: Dr. Ian Korf

Research Type: Honors Thesis in Major

R You There? Detecting R Loop Hybridization using Machine Learning

R loops occur when RNA strands bind to DNA, creating an RNA/DNA hybrid. These structures have been implicated in several biological mechanisms, including gene regulation and DNA replication. While we know that R loops occur frequently throughout the genome, we cannot predict where these loops will form. Current sequencing methods can provide some information about the location but are not informative for prediction. In this project, we hope to develop a neural network designed to predict if an R loop is present given a certain sequence of genomic DNA. This study is being conducted using sequence data from previous DRIP-seq (a sequencing method to identify R loop structures) courtesy of Dr. Fred Chedin and utilizes the PyTorch library in Python. We hope to have a network that can accurately predict where R loops will be present in a genome. This information can help us understand why R loops form, and provide further insight into how R loops contribute to various physiological mechanisms.

| Pradhan Hariharan |

Major: Genetics & Genomics

Minor: Public Health

Mentor: Dr. Tom Glaser

Research Type: Honors Thesis in Major

Molecular Analysis of Novel RBP4 Mutation in Congenital Eye Disease

Mammalian eye organogenesis requires retinol-binding-protein (RBP) to transport vitamin A (retinol) from maternal hepatic stores to the developing optic primordia via the bloodstream and placenta. RBP4 gene mutations that disrupt retinol transfer cause eye malformations. We have investigated microphthalmia (small eyes) and congenital blindness in a three-generation pedigree segregating a novel RBP4 amino acid substitution (G34V). Heterozygous carriers have low serum vitamin A levels, but only those who inherited the mutation from their mother are blind. These findings are consistent with previously reported dominant-negative RBP4 alleles, which exhibit maternal inheritance, alter the ligand pocket, and disrupt retinol transfer by binding to the STRA6 cell surface receptor with high affinity on both sides of the placenta. G34V affects a unique region of the RBP polypeptide. To test its pathogenic mechanism in vitro, we are examining the biochemical properties of G34V RBP expressed by transfected HeLa cells with an N-terminal epitope (HA) tag. The mutant protein appears to fold correctly and is secreted normally. We are working to characterize how the mutant RBP binds (1) retinol, (2) transthyretin, and (3) STRA6. Our findings will help determine the etiology of microphthalmia in these families and advance understanding of congenital blindness.

| Steven Hobbs |

Major: Biochemistry & Molecular Biology

Mentor: Dr. Mary 'Fran' Keller

Research Type: UHP Project

From DNA Extraction to Sequencing: A Multi-Year Undergraduate Project to Introduce Community College Students to Bioinformatic Technologies

With the rapid advancements in biotechnology and molecular biology, providing contemporary and authentic research experiences to undergraduate students has become increasingly important. However, many educational institutions struggle to provide such experiences for their students. Engagement in hands-on laboratory exercises is meant to develop students' proficiency with modern laboratory equipment and prepare them for future opportunities in biology research at four-year universities, in graduate programs, and in professional workplaces. In collaboration with the Folsom Lake College Biology Department, we have modernized the traditional zoology curriculum to include contemporary techniques from molecular biology. We designed, wrote, and implemented a series of laboratory experiments in which students learned the fundamentals of gene-cloning and sequencing. Students developed proficiency in pipetting, DNA extraction, polymerase chain reaction, gel electrophoresis, and genome sequencing. Overall, these laboratory experiments were effective in introducing the theory and application of gene-cloning and sequencing. The survey-based assessment demonstrated that students enhanced their understanding of molecular biology and developed skills that may make them more competitive in future research opportunities.

| Peter Jespersen |

Major: Neurobiology, Physiology & Behavior

Mentor: Dr. Steve Luck

Research Type: UHP Thesis

Visual Working Memory Performance in Aphantasia

Aphantasia is a mental condition characterized by the inability to create visual imagery in one's mind. The condition was first described in 1880, but the mechanism of its visual memory deficits remain poorly understood. This project examines whether the inability to experience visual imagery in aphantasia is the result of 1) disruptions in sensory processing in early visual cortical areas or 2) a lack of metacognitive access to the visual representations. We use the Vividness of Visual Imagery Questionnaire (VVIQ) to identify and recruit aphantasiac subjects. A series of tasks including a visual working memory task and a change localization task are used to assess subjects' memory performance in aphantasiacs and controls. We expect to find a decrease in precision of working memory representations over varying delay periods compared to control subjects. However, we predict that aphantasiac subjects perform better than controls during the change detection task.

| Anastasia Krajnovic |

Major: Neurobiology, Physiology & Behavior

Mentor: Dr. Julie Bossuyt

Research Type: Honors Thesis in Major

Regulation and Function of Sodium Pump (NKA) Dimerization

This paper is one part of a collaborative study among five other research groups investigating the regulatory mechanisms and downstream effects of the sodium potassium pump. The "sodium potassium pump" or sodium potassium ATPase (NKA) was one of the first transmembrane proteins discovered in almost all animal cells with distinct functions that are essential for maintaining cellular homeostasis. It consists of α , β and FXD subunits and contributes to the electrostatic potential between the cell membrane by transporting three sodium ions out of the cell for every two potassium ions brought in (Suhail M, 2010). There are many regulators of NKA that influence its affinity for these ions and mechanical pump actions as well as mutations that play a part in disrupting its major functions. This study will focus on mutations of the G301 residue found in ATP1A1 and ATP1A3 gene. Mutagenesis of one amino acid to a positively charged arginine in the G301R mutation is known to cause renal hypomagnesemia and familial hemiplegic migraine type 2 (Staehr, et al., 2020). In a previous part of this collaborative study a new mutation replacing arginine with a nonpolar alanine was created to compare the effects of these mutations on NKA function. This background will be used in this experiment which compares G301R and G301A mutated NKA to wildtype (WT) NKA to investigate the downstream effects of NKA dimerization. Human embryonic kidney 293 cells (HEK) will be treated with ouabain to initiate a signal transduction cascade leading to the phosphorylation of SRC and ERK kinases. Adequate phosphorylation will be identified via SDS page, western blotting, and fluorescent multiplex detection. If NKA dimerization does play a significant role in the initiation of signal transduction of SRC and ERK, then the WT samples will have normal activation of the signaling cascade while the G301R and G301A mutants will have perturbations (in protein expression or activating phosphorylations) likely due to their interference with the NKA dimerization.

| Leann Le |

Major: Neurobiology, Physiology, & Behavior

Mentor: Dr. Donald Bers

Research Type: UHP Thesis

Effects of CaMKII Post-Translational Modifications on Autonomous Activation and Calcium Cycling

Calcium/Calmodulin-dependent protein kinase II δ (CaMKII δ) regulates numerous functions in cardiomyocytes, including calcium cycling, transcription, and contraction. Autophosphorylation at T287 prolongs CaMKII δ activity in an open conformational state after Ca/CaM dissociates, which contributes to various cardiac pathologies. A mechanism by which CaMKII δ may become persistently activated is through post-translational modifications (PTMs) such as oxidation at MM281/282 and O-GlcNAcylation at S280. However, little is known about the combinatory effect of these PTMs on intracellular calcium release. Therefore, we investigated the synergistic effects of oxidative stress and high glucose-mediated PTMs on CaMKII δ , as it affects calcium handling. Using confocal linescan imaging approaches, we assessed calcium transient morphologies, SR calcium content, and frequency of calcium waves generated in paced intact mouse ventricular myocytes loaded with calcium-sensitive indicators. We then exposed the myocytes to oxidative stress (1 μ M H₂O₂), high glucose (50 mM Glucose), and both PTMs to compare the changes in intracellular calcium activity due to PTM exposure. We expect to find that a combination of the PTMs on CaMKII δ intensifies calcium mishandling relative to individual PTMs. These findings will yield greater insight on how CaMKII δ oxidation and O-GlcNAcylation contributes to cardiac arrhythmia development, and potential clinical strategies for its prevention.

| Henry Low |

Major: Neurobiology, Physiology, & Behavior

Mentor: Dr. Elva Diaz

Research Type: UHP Thesis

Using Computational Methods to Investigate BAI2, a Synaptic aGPCR Linked to Cancer: Tumor Expression Analysis & Developing a Novel Automated Tool for Evaluating Colocalization in Microscopy Images

Cancerous brain tumors represent a heterogeneous group of malignancies that cause thousands of deaths annually. Recently, it has been discovered that some brain tumors, namely certain forms of high-grade gliomas (HGG) and breast-to-brain-metastases (B2BM), possess an unusual proclivity for establishing pseudo-synaptic structures that facilitate electrochemical tumor proliferation signals. Hypothesizing that agents associated with regular synaptic development might be involved, I utilized computational methods to study a group of synaptic adhesion GPCRs known as the brain angiogenesis inhibitors (BAIs). Beginning by investigating expression of the BAIs across HGG and B2BM, I datamined RNA-seq repositories containing histological samples from xenograft models / patient biopsies and, using R, evaluated single-cell transcriptome distributions. I found that one particular protein, BAI2, is significantly enriched in both HGG and B2BM, compared to non-malignant oligodendrocytes. To follow up, I used Java/IJM scripting to develop a user-customizable, automated ImageJ plugin for assessing synaptic colocalization in multichannel fluorescence microscopy images. Designed to substantially streamline image analysis, this novel tool is currently being employed to analyze confocal images in neuronal co-culture assays involving BAI2 and other synaptic proteins. Ultimately, a better understanding of the synaptic biology of BAI2 may offer important insights into the malignant signaling properties of brain tumors.

| Harjeet Mann |

Major: Biological Sciences

Minor: Public Health

Mentor: Dr. Leigh Ann Simmons

Research Type: UHP Thesis

Expanding the Awareness of Adverse Childhood Experiences and Toxic Stress in the Sikh Community

Adverse Childhood Experiences (ACEs) were first studied in the late twentieth century by the Centers for Disease Control (CDC) and Kaiser Permanente to understand how trauma in childhood can manifest in adulthood negatively through individual health outcomes. ACEs were traditionally defined around the categories of childhood abuse and household dysfunction, so factors which originated in family and home. However, it is just as important to understand the role of traumatic stress through community factors which affect children and the health outcomes in adulthood. This is especially important for minorities who face discrimination, racism, community violence, and bullying in America. Sikh Americans are greatly exposed to the expanded ACEs of bullying and discrimination in the classroom and community. During the summer of 2021, I first looked for literature about ACEs in the Sikhs and I broadened my search by using terms like “Sikhs” and “bullying” (or “racism” or “discrimination” or “mental health” or “health disparities”). I also conducted qualitative interviews with 2 Sikh psychiatrists to learn about Sikh health disparities originating with ACEs and toxic stress. Lastly, I used the internet to compile resources for Sikhs who face trauma. Through my literature review, I recognized 6 main themes pertaining to peer victimization, substance abuse, intimate partner violence, limited data on Sikhs, and the need for culturally appropriate resources. Sikh students in America are disproportionately bullied with rates ranging from 50-83%. Four main themes were identified in the interviews conducted with Sikh psychiatrists on the topics of parental understanding, culturally appropriate resources, mental health, and alcohol consumption. Currently for my senior thesis, I am collecting data through a questionnaire and one-on-one interviews with Sikh college students to understand the ACEs they experienced growing up in America during their K-12 schooling. Thus far, 72.2% of the college students who participated in the survey said that they experienced bullying as a child. Upon completing the data collection, I will be analyzing the data and sharing the prevalence of ACEs in Sikhs. I hope to continue working on this project to expand awareness about the ACEs Sikhs face and how to help create and provide resources.

| Sukhdev Mann |

Major: Biological Sciences

Minor: Public Health

Mentor: Dr. Gurtej Singh Cheema

Research Type: UHP Thesis

Literature Review and Coding System for Elaaj Clinic Analysis

"Elaaj Clinic is a culturally/religious specific clinic that has been created to serve the health needs of the Punjabi Sikh community of Northern California. This clinic operates in a Sikh Temple, Gurudwara, and almost the entire Elaaj Clinic Staff comes from this community as well. The purpose of this study is to evaluate the effectiveness of Elaaj Clinic and to understand how components of Elaaj Clinic can be applied to primary care models so the health outcomes of minority populations can be improved as patient interactions with their primary care physician (PCP) increases. The model being used in this study has been adapted by a study published in Project Muse. This study utilized the Cultural Competence Model (CCM), which is made of 5 constructs: cultural awareness, knowledge, skills, encounters or interactions, and desire. For this study of Elaaj Clinic, an adaptation of the CCM model will be implemented. The components of the model will be: cultural humility (regarding clinic staff), cultural competency (regarding clinic staff), culturally related academic research, physician/patient interactions (aspect of culture), and the use of narrative medicine. Using this model, 12 patients will be interviewed with no specific age range or sex and the patients must be from the Punjabi Sikh community. They will be asked questions regarding these 5 aspects in the interview and the transcripts of the interviews will be created in both Punjabi and English. Conclusions can be made as to how PCP settings should be designed in providers such as Kaiser Permanente to promote patient interactions with their doctors so the health outcomes of the Punjabi Sikh Community of Northern California can be improved.

| Nathifa Nasim |

Major: Neurobiology, Physiology & Behavior

Minor: English

Mentor: Dr. Lee-Way Jin

Research Type: Honors Thesis in Major

sEH Inhibition to Reduce Alzheimer's Disease-like Brain Inflammation

Neurodegenerative diseases such as Alzheimer's have been shown to be linked with the "M1" or proinflammatory state of microglia, which can trigger a positive feedback loop of exacerbated neuroinflammation. The aim of our project is to explore the connection between inflammation and Alzheimer's disease via the soluble epoxide hydrolase (sEH) enzyme. sEH metabolizes anti-inflammatory epoxy fatty acids (EETs) into their dihydroxy counterparts (DHETs) which are linked to inflammation. The project will investigate whether pharmacological sEH inhibition via 1770 treatment can decrease neuroinflammation. The experiments will be performed using APP-PS1 mice, transgenic mice used as an Alzheimer's disease model, treated with the pharmacological sEH inhibitor 1770 via IP injection (into the body cavity) for one week. The ability of sEH inhibition to reduce inflammation in the brain will be determined by the levels of inflammatory markers released by activated M1 microglia, measured through qPCR and Western Blots. By reducing microglial activation, the inhibitor has potential as a treatment for Alzheimer's disease-like neuroinflammation.

| Derick Nguyen |

Major: Biological Sciences
Mentor: Dr. Karen Shapiro
Research Type: UHP Thesis

Efficacy of Wastewater-based Epidemiology in Tracking Covid-19

Using traditional testing methods to monitor infections caused by SARS-COV-2 in a population is challenging because data gathered by these methods are not representative of a community's overall population. Current attempts to address this concern focus on the detection and quantification of SARS-COV-2 genetic markers in sewage wastewater to evaluate trends in community infection levels in a given population, a field of study known as wastewater-based epidemiology (WBE). This study attempts to correlate the concentrations of SARS-COV-2 RNA in wastewater to the individual testing cases detected by saliva PCR methods at the University of California, Davis. Graphical analysis of this data over time indicates that wastewater data and clinical data do indeed follow similar trends. This study suggests that WBE can be used to monitor disease transmission patterns in a community and provide a less biased depiction of positivity rates in a population.

| Alejandro Perez |

Major: Molecular and Medical Microbiology
Mentor: Dr. Andrea Schreier
Research Type: Thesis in Major

The Use of SHERLOCK for the Detection of Delta Smelt Environmental DNA

My research involving SHERLOCK (Specific High-sensitivity Enzymatic Reporter Unlocking) will allow for the evaluation of Clustered regularly interspaced short palindromic repeats (CRISPR) technology for the indirect detection of an endangered fish, the Delta Smelt (*Hypomesus transpacificus*), through the detection of environmental DNA (eDNA). eDNA methods, which detect DNA shed into the environment by organisms, can supplement standard aquatic monitoring surveys and can be beneficial when dealing with rare and endangered species for which "take" (doing harm, capturing, or killing of an endangered species) is a concern. In addition, standard monitoring methods are time-consuming and expensive, for which eDNA can provide an alternative source of monitoring data. My contribution to the research includes carrying out and analyzing SHERLOCK assays to detect Delta Smelt eDNA in water samples from the San Francisco Estuary. Eighty-eight samples were analyzed after carrying out SHERLOCK reactions. Our results suggest that a CRISPR-based approach can be used for eDNA detection of Delta Smelt through water samples. The application of SHERLOCK to other organisms could expand the aquatic species of management concern from the San Francisco Estuary for which SHERLOCK assays could be used.

| Maya Sahtout |

Major: Biological Sciences
Minor: Anthropology
Mentor: Dr. Bruce Draper
Research Type: UHP Thesis

The Role of HSD17B1 on Estrogen Synthesis in Zebrafish

17 β -Estradiol (E2) is the major female sex hormone in vertebrates, including zebrafish. In mammals, the production of E2 requires two cell types: theca and follicle cells. The primary role of theca cells is to produce the intermediate androstenedione, which is then converted to E2 in follicle cells by two additional enzymes, most notably the Cyp19a1 aromatase. Although many studies have investigated steroid hormone production in zebrafish, there are still significant gaps in our understanding of the E2 synthesis pathway. For example, while enzyme orthologs necessary for E2 production in mammals have been identified in zebrafish, the specific cell type(s) that produce E2 have not been determined. In addition, there are two pathways from androstenedione to E2, but the pathway used in zebrafish is not known. While both pathways require Cyp19a1, Pathway 1 also requires the enzyme Hsd17b3, and produces testosterone as an intermediate, while Pathway 2 requires Hsd17b1 and produces estrone as an intermediate. Based on gene expression data, I hypothesize that E2 is produced by Pathway 2 in the zebrafish ovary. I am testing this hypothesis by inducing loss-of-function mutations in hsd17b1. If correct, I expect hsd17b1 mutants to produce no E2 and all develop as males.

| Simran Saini |

Major: Neurobiology, Physiology & Behavior
Mentor: Dr. J David Furlow
Research Type: Honors Thesis in Major

Investigating Potential Conserved Roles for RXR-gamma in the Developing *Xenopus tropicalis* Retina and Brain

The retinoid x receptor gamma (RXR γ) belongs to the steroid/thyroid receptor superfamily involved in regulating numerous cellular processes, in particular within the nervous system, pituitary and special senses. In mammals, RXR γ expression is highly restricted, and may developmentally regulate expression of cone photoreceptors with its heterodimer partner, the thyroid hormone receptor (TR). In order to study RXR γ action in a nonmammalian model, our laboratory generated CRISPR-mediated homozygous mutants inactivating the RXR γ gene in the frog *Xenopus tropicalis*. We first followed homozygous mutant larvae through metamorphosis, a thyroid hormone (TH) regulated process. Surprisingly, RXR γ mutants went through metamorphosis faster than age-matched wild types. Since RXR γ may also play a role in negative feedback by TH at the pituitary, we are examining the expression of thyroid stimulating hormone beta in brain and pituitary of newly metamorphosed froglets. Further, we designed primers to investigate rod and cone opsin expression in the retina as potential targets for RXR γ in the developing frog eye. Ultimately, our analysis will determine the degree of conservation in TH negative feedback and TH regulated opsin expression via RXR γ , and further aid the development of the *Xenopus* system for screening novel pharmaceuticals and environment toxicants acting via TRs and/or RXRs.

| Katherine Sayaseng |

Major: Neurobiology, Physiology, & Behavior

Mentor: Dr. Karen Zito

Research Type: Honors Thesis in Major

Role of the Fasciclin II C-Terminus in the Development of the Neuromuscular Junction of *Drosophila melanogaster*

Synaptic development is a key step in the formation of neural circuits. FasciclinII (FasII) is a homophilic cell adhesion molecule that is located both presynaptically and postsynaptically and is required for the development of the neuromuscular junction (NMJ). FasII's C-terminus recruits postsynaptic proteins. We hypothesize that these interactions contribute to the development of the subsynaptic reticulum (SSR), a convoluted membranous structure that surrounds the NMJ. In earlier studies, FasII Δ 3 mutants were generated using CRISPR. FasII Δ 3 mutants have a deletion in the last three amino acids, such that the C-terminal interactions of FasII are disrupted. To assess the consequences of this FasII mutation on NMJ development, we used syndapin, a postsynaptic protein. Levels of syndapin correspond to the size of the SSR. Mutant FasII Δ 3 and control wandering third-instar larvae were dissected and immunostained, and levels of syndapin were measured using fluorescence microscopy. Results show that the synaptic localization ratio of syndapin compared to the muscle is lower for FasII Δ 3 mutants than for control larvae (n=17 larvae). This could suggest that the SSR of FasII Δ 3 mutants is less developed as a result of the disruption of FasII's C-terminus.

| David Shih |

Major: Microbiology

Mentor: Dr. Maria Marco

Research Type: UHP Thesis

Delivery of Cryopreserved Probiotic *Lactiplantibacillus plantarum* and *Limosilactobacillus reuteri* to the Murine Digestive Tract to Prevent Dermal Inflammation

Probiotics are living microorganisms that when applied in sufficient amounts confer a health benefit on the host. Human studies have shown that certain probiotics can reduce intestinal and systematic inflammation caused by consumption of obesogenic diets. In this study, we are comparing the potential of two probiotics strains, *Lactiplantibacillus plantarum* NCIMB8826R (LP) and *Limosilactobacillus reuteri* DSM17938 (LR) for their capacity to reduce dermal and intestinal inflammation in mice fed an obesogenic diet. To provide a stable source of viable cells, we have developed a cryogenic storage protocol for use in murine model studies. In this protocol, bacterial strains are preserved in Hogness Freezing Buffer. Both LP and LR suspensions yielded cell counts of 9×10^{10} – 1×10^{11} CFU/ml and 5×10^{10} CFU/ml, respectively, and remained about 90% viable when stored at -80 °C for at least 40 (LP) and 6 (LR) days. To determine the relationship between probiotic survival and health benefits, we are quantifying the cell numbers of *L. plantarum* and *L. reuteri* in mouse fecal pellets to confirm that the bacteria remain viable after passing through the digestive tract. The findings will be useful for substantiating the anti-inflammatory effects of ingesting these two strains to their probiotic action in vivo.

| Nathaniel Schoppa |

Major: Biochemistry & Molecular Biology

Mentor: Dr. Justin Siegel

Research Type: Thesis

| Tzu-Ni Sin |

Major: Biochemistry & Molecular Biology

Minor: Animal Science and Animal Biology

Mentor: Dr. Glenn Yiu

Research Type: Honors Thesis in Major

Translating Ocular CRISPR-Cas9 Genome Editing across Species as a Potential Therapy for Retinal Diseases

CRISPR-based genome editing has the potential to overcome the burden of frequent intraocular injections of anti-angiogenesis agents and provide a sustained therapy for patients with neovascular retinal conditions. Targeting exon 1 of the vascular endothelial growth factor-a (VEGFA) gene with guide RNAs (gRNAs) conserved across mice, rhesus macaques, and humans, we evaluated the use of CRISPR-Cas9 across cell lines and in laser-induced choroidal neovascular (CNV) mouse model. We compared different Cas9 orthologs, SpCas9 and SaCas9, and different numbers of gRNAs to assess the efficacy of gene editing through deep sequencing and VEGF-A protein suppression using ELISA. SpCas9 with dual gRNAs produced the highest gene ablation rate in vitro with minimal off-target mutations from GUIDE-seq, and also resulted in suppression of laser-induced CNV in mice. Single-cell RNA sequencing (scRNA-seq) of CNV-damaged mouse retina revealed that all retinal cell types except rod photoreceptors expressed VEGFA protein, a pathologic angiogenetic factor. Finally, I showed that this CRISPR-Cas9 system can edit human and rhesus macaque DNA in a cell-free environment and plan to adapt this system to rhesus macaque eyes in vivo. My studies support the translation of gene editing across different species, which holds potential for treating retinal angiogenesis in human clinical trials.

| Felicia Song |

Major: Neurobiology, Physiology & Behavior
and English

Mentor: Dr. Neal Wayne Fleming

Research Type: UHP Project

Simultaneous Comparison of Intraoperative Brain Function Monitoring: SedLine and BIS on Depth of Sedation

Monitoring depth of anesthesia is critical in preventing anesthetic related poor outcomes such as hemodynamic changes, psychologically traumatic repercussions, and post-operative cognitive dysfunction. Electroencephalographic recordings (EEG) present opportunities to monitor brain electrical activity during general anesthesia through simple surface electrodes placed on the scalp. The application of proprietary algorithms offers clinically functional guidance to complex data by extracting information from EEG through analysis of amplitude, frequency, and phase of waveforms. Specifically, intraoperative brain function monitors with processed electroencephalogram (EEG) indices such as the bispectral index (BIS) and patient state index (PSI), may improve characterization of the depth of sedation when compared to conventional physiologic monitors, such as heart rate and blood pressure. However, the clinical assessment of anesthetic depth may not always agree with available processed EEG indices. The study concurrently compares the performance of BIS and SedLine monitors through shared individual generic sensors connected to a custom-built passive interface box. The non-blinded, non-randomized study enrolled 100 adult patients presenting for elective procedures requiring general anesthesia. BIS and SedLine electrodes were placed preoperatively, and their respective indices tracked. The concordance between processed EEG indices and clinical assessments of anesthesia depth will be analyzed.

| Mable Thai |

Major: Microbiology

Minor: Public Health and Anthropology

Mentor: Dr. Jonathan Eisen

Research Type: Honors Thesis in Major

Sand DNA - A Genetic Library Sandbox

DNA separation through silica adsorption has been done based on the action of positively charged ions bridging the negatively charged silica and the negatively charged DNA backbone in saline environments. Looking at similar, naturally occurring environments, the purification of silica found in common beach sand was discovered to contain concentrations of DNA from the surrounding seawater, portraying the life present within and around those shores. Previous research has shown that shotgun sequencing these DNA concentrations yield novel genes from all different kingdoms of life, with over half of it uncovering new phylotypes in prokaryotes, eukaryotes, and viral. Using different extraction and elution techniques as done previously, this study aims to increase the yield of concentrated DNA to be identified and investigate possible more efficient methods of tapping into an inexpensive and accessible source of sequences. With improved sequencing techniques and technology, data collection and analysis is currently underway with the aim of expanding the genetic library of life.

| Tammie Tam |

Major: Microbiology

Minor: Quantitative Biology and Bioinformatics

Mentor: Dr. Katherine Ralston

Research Type: Honors Thesis in Major

The Effect of Host Cell Rigidity on Whether Entamoeba histolytica “Nibbles” Versus “Swallows” Cells

Entamoeba histolytica is a parasitic protozoan and the causative agent of amoebiasis. E. histolytica kills human cells through trophocytosis, a mechanism where distinct “nibbles” of human cells are ingested until membrane integrity is lost. E. histolytica prefers to perform phagocytosis on dead, rigid cells and trophocytosis on live, mechanosensitive cells. Previously, a study suggested that feeding fixed and hardened red blood cells to E. histolytica increases their affinity for performing phagocytosis over trophocytosis. Therefore, I hypothesize that increasing the rigidity of live human cells will induce E. histolytica to perform phagocytosis more often than trophocytosis. To test this, I will use lentiviral transduction and CRISPR interference to construct mutant human cell lines, each deficient in a different cytoskeletal gene that will make the cells more rigid. I will verify increased rigidity by measuring levels of phosphorylated myosin light chain 2 using Western blotting. Then, E. histolytica ingestion of these mutants will be assessed to measure the amount of phagocytosis versus trophocytosis performed. This research will lead to a better understanding of why E. histolytica “nibbles” some cells and “swallows” others, and may also apply more broadly to eukaryotic ingestion mechanisms in general.

| Jan Wignall |

Major: Biochemistry & Molecular Biology

Minor: History

Mentor: Dr. Enoch Baldwin

Research Type: UHP Thesis

Probing Protein Interactors of hCTPS1 and hCTPS2 with Immunoprecipitation Mass Spectrometry

CTP synthetases (CTPSs) are conserved enzymes that catalyze the final step in de-novo pyrimidine biosynthesis. Defects in human CTPSs can cause immunodeficiencies while selectively controlling their activity could be used to treat autoimmune disease. CTPSs have a complex regulatory network, with a more unusual aspect being reversible formation of micron scale polymeric filaments. These filaments alter enzyme kinetics and are vital for regulating CTP production. Fluorescently-tagged hCTPSs expressed in MCF10A human breast cells form two distinct structures: numerous small puncta and rarer large rods that are dynamically transported throughout the cytoplasm. The large rods colocalize with other enzymes such as the purine biosynthetic enzyme IMPDH2, but the partners for the punctate forms are unknown. We hypothesize that hCTPSs interact with proteins involved in their trafficking, regulation and localization. To identify interacting proteins, we will perform immunoprecipitation of YFP-labeled hCTPS1 and 2 followed by mass spectrometry, testing variables such as crosslinking and growth conditions. Determining CTPS interactors may reveal mechanisms and target sites of dynamic localization, and reveal novel regulatory networks controlling pyrimidine biosynthesis.

| Brianna Yetter |

Major: Evolution, Ecology & Biodiversity

Minor: Art Studio

Mentor: Dr. Gail Patricelli

Research Type: UHP Thesis

Effect of Anthropogenic Factors on the Temporal Distribution of Greater Sage-grouse (*Centrocercus urophasianus*)

Greater sage-grouse (*Centrocercus urophasianus*) display and mate on breeding grounds, called leks, where males perform elaborate displays in order to compete for mating opportunities. The sage-grouse typically congregate on the breeding grounds during the early morning, arriving before dawn and staying for up to several hours after sunrise. Maintaining lek site conditions is very important for sage-grouse conservation because poor breeding ground conditions can lead to lek abandonment. Anthropomorphic factors, such as gas and oil rigs, have been shown to greatly reduce lek attendance at nearby breeding grounds. We investigated how temporal patterns in Greater Sage-grouse presence and behavior at the breeding grounds during the breeding season vary with the occurrence of anthropogenic factors (cars, people, and planes). We created generalized mixed linear models to analyze data from previously processed camera trap footage scored via the citizen science platform Zooniverse. We found no significant difference in aggression between disturbed and undisturbed sites. However, we found that hunkering was less likely to occur and displaying was more likely to occur in disturbed sites than in undisturbed sites. This could be due to predator release occurring at the disturbed sites, and future research should involve taking predator surveys at the breeding grounds.

| Estelle Yoo |

Major: Biochemistry & Molecular Biology

Mentor: Dr. Ching-Hsien Chen

Research Type: UHP Thesis

The Investigation of the MARCKS/KRAS Signaling Axis in Conferring an Immunosuppressive Environment in Lung Cancer

The advent of immunotherapy with immune checkpoint blockade (ICB) has led to significant advances in lung cancer management; unfortunately, many issues remain to be resolved, especially regarding a low objective response rate. Through integrated large-scale omics data and biomarkers from published immune ICB trials, we identified the PIP2-binding protein, myristoylated alanine-rich C-kinase substrate (MARCKS) as a top-ranked therapeutic target in mediating immunotherapy resistance. Both our immunoprecipitation and Western blot data demonstrate that MARCKS interacts with the GTPase protein KRAS and modulates the MEK/ERK pathway, one of its downstream signaling cascades. We further discovered that MARCKS is associated with an increase in M2 macrophages, a protumor tumor infiltrating immune cell that is responsible for creating an immunosuppressive microenvironment. Data from The Cancer Genome Atlas (TCGA) confirmed a positive correlation between MARCKS and CD163 and MRC1 in lung cancer specimens. Moreover, lung cancer patients with high MARCKS and KRAS expression in tumors were found to have significantly shorter overall survival. Our data suggest an oncogenic role of the MARCKS/KRAS axis in mediating lung cancer progression. Therapeutic targeting of MARCKS may warm up an immunologically “cold” microenvironment, sensitizing tumors to immunotherapy.

| Kacey Zimmerman |

Major: Cell Biology

Minor: Evolution, Ecology & Biodiversity

Mentor: Dr. Cassandra Swett

Research Type: UHP Thesis

Somatic Compatibility of *Fusarium falciforme* Isolates from Different Hosts

Fusarium falciforme is a fungal pathogen that causes severe disease in tomatoes. Recent studies have shown that it is also a pathogen of non-tomato crops, including cucurbits, garlic, and hemp. This project seeks to better understand the genetic variation within *F. falciforme* from diverse hosts and geographical regions within California. *F. falciforme* can reproduce asexually; therefore, multiple isolates can be derived from a single clonal lineage. It is currently unknown whether there are multiple clonal lineages within *F. falciforme* isolates. A recent phylogenetic study found evidence of two genetically distinct groups within tomato, true *F. falciforme* and *F. noneumartii*. This distinction has been supported by preliminary results from this project. Additionally, previous pathology tests between *F. falciforme* isolates of the various crops provide the hypothesis of one clonal lineage for all cucurbits but different clonal lineages in garlic and hemp. Nitrogen non-utilizing (nit) mutants were generated to use in genetic complementation reactions between different isolates. This process determines somatic compatibility, a form of self-recognition such that somatically compatible isolates are more likely to belong to the same clonal lineage. Understanding genetic diversity within *F. falciforme* will be instrumental to improving management practices for this costly disease.

College of
Engineering



| Faiza Alvi |

Major: Aerospace Science & Engineering and
Mechanical Engineering

Minor: English

Mentor: Dr. Jean-Jacques Chattot

Research Type: Engineering Design Project

Aircraft Performance and Design Demonstrator Utilizing Canard Configuration

The aerodynamics team developed and analyzed the external structure of DUCC—Demonstrator Utilizing Canard Configuration—to ensure its effectiveness for all phases of flight. This includes the main wing, canard, fuselage, and winglets.

| Gabriella Bond |

Major: Biomedical Engineering

Mentor: Dr. Sheela Toprani

Research Type: Engineering Design Project

NeuroVA: the Neurological Virtual Assessment for Face Asymmetry

Given that access to neurologists is not expected to match demand anytime soon, it is necessary to develop solutions aimed at maximizing the abilities of doctors to reach a greater number of patients in a timely manner without sacrificing treatment quality. Visits for general evaluation of neurological diseases are time-consuming and severely limited by the number of physicians, their schedules, and associated costs for the patient. In addition, current neurological assessment methods rely on human senses, which cannot quantify neurological disorder changes. There is a need to provide new screening solutions in order to increase patient access to neurological care and in turn more efficiently track the progression of neurological disorders. NeuroVA addresses these challenges as a virtual diagnostic aid that effectively quantifies patient face motor function through a guided exam on a mobile application. This exam analyzes various facial expressions of the patient using a facemesh taken from the open source site MediaPipe. The landmarks from this are used with a geometric computational model that we have designed to determine locations of asymmetry and their severity. The analysis will be formatted into intuitive and clinically-relevant results for the neurologist to use alongside other data to come to a diagnosis or track the progression of an existing neurological condition.

| Jefferson Chhen |

Major: Electrical Engineering and

Computer Engineering

Mentor: Dr. Bevan Baas

Research Type: Engineering Design Project

Aggie Snap and Play

This two-quarter engineering design course involves the design, analysis, implementation, and testing of an application specific processor (ASP) using a modern, large-scale field programmable gate array (FPGA). The team was given a computationally intensive problem and was required to investigate algorithms for solving the problem that can be efficiently implemented on an FPGA. In a team of four, the team developed real time image processing algorithms, graphic user interface, and an arcade-style video game. Image processing algorithms include gaussian filters, brightness, and contrast. When these applications are developed into hardware, there is an increase in performance and efficiency when compared to their software counterparts.

| Victoria Flores |

Major: Mechanical Engineering

Mentor: Dr. Iman Soltani

Research Type: Engineering Design Project

Design of a Drone-Glider Hybrid with Extendable/Retractable Wings

"In recent years, drone technology has improved to the point where its applications are being investigated by large corporations for services like payload delivery, surveillance, or low altitude imaging. Fixed wing drones are strong candidates because they have a long flight range and can take advantage of wind energy by gliding, but they do not operate well in dense environments like urban cities or forests. Multicopters are ideal because they are more maneuverable and have a small body size which allows them to operate in dense environments. However, they have a limited battery life which reduces the flight range of the drone. The motivation of this project is to merge the best aspects of both drone configurations by designing a mechanism that is mounted to a multicopter drone and capable of extending wings that will allow the drone to glide utilizing the wind energy when the rotors are powered down or turned off.

| Miranda Godinez |

Major: Mechanical Engineering

Minor: Music

Mentor: Dr. Jonathon Schofield

Research Type: Engineering Design Project

Auto-Swabbing Device for Sampling Microbial Life in Rainforest Soil

As shown by the COVID-19 pandemic, unmonitored viruses of zoological origin threaten our society. Current monitoring techniques rely on human labor and can pose unnecessary risks to scientists and wild animals. To address this, our team is developing an automated swabbing device to collect RNA viral samples from rainforest soil. The device will be small for drone transport to sampling sites, and houses the electromechanical systems needed to dispense swabs, take samples, and store samples. It will be assessed based on its ability to take a soil sample without human intervention.

| Jeremy Inducil |

Major: Civil Engineering and Environmental

Engineering

Mentor: Dr. Frank Loge

Research Type: Engineering Design Project

Stormwater Treatment and Groundwater Recharge Facility

Crop production in a controlled environment setting in Mediterranean regions has become popular due to the increased negative impacts of climate change. However, the greenhouse energy costs, especially the costs for heating and cooling, depend heavily on the greenhouse's shape and orientation. Previous studies recommended various shapes and two different greenhouse orientations for greenhouse all over the world. A quasi-steady state thermal model known as GREENHEAT was developed to simulate conventional greenhouses' hourly heating requirements over a year. Currently, GREENHEAT model does not address the transient air turnover rate due to ventilation in the greenhouse, which could significantly affect energy-demand, especially under cooling mode. To account the effect of varying air exchange, the study will create a ventilation sub-model to simulate the required ventilation to control the temperature and relative humidity in the greenhouse. This study aims to analyze the effect of five different greenhouse shapes and orientation on energy costs in three climates representing major agricultural regions in California.

| Sergio Jimenez |

Major: Civil Engineering and
Environmental Engineering

Mentor: Dr. Colleen Bronner

Research Type: Engineering Design Project

Drinking Water Treatment Facility for the City of Davis, CA

The goal of this project is to design a water treatment facility for the city of Davis that will provide potable water to the community. The project focused on the design of the process units including their dimension size, flow schematic, pipes, and pumps. It did not include design of the intake system, distribution system, or construction plans. Design choices were steered by public acceptance and risk and uncertainty. The final design of the treatment facility met relevant regulatory standards for drinking water, limited greenhouse gas emissions, and minimized operational costs.

| Parneet Kaur |

Major: Biomedical Engineering

Mentor: Dr. Jennifer Choi

Research Type: Engineering Design Project

CathAlert

There is a need for an effective and reliable method to determine the proper placement of a catheter for medical professionals to use in ensuring adequate blood flow rates shortly after catheter implantation in hemodialysis patients. Therefore, creating a medical device that can be used to assist the doctor's placement of a hemodialysis catheter by providing flow and pressure rates prior to suturing and connecting with hemodialysis machines.

| Valentina Lai |

Major: Computer Science & Engineering

Mentor: Dr. Xin Liu & Alicia Cortes

Research Type: Engineering Design Project

Clear Lake Data Visualization App

Clear Lake, the largest lake in California and one of the oldest lakes in North America, is subject to eutrophication as a consequence of the high concentrations of nutrients. These nutrients stimulate high concentrations of algae and cyanobacteria and consequently present severe challenges to Lake County, the lake users, and stakeholders. UC Davis is engaged in a multi-year research study to understand the dominant processes in the Clear Lake watershed and in the lake itself that are negatively impacting the restoration of the lake water quality and the ecosystem health. UC Davis Tahoe Environmental Research Center (TERC) team is currently collecting a wide variety of data to form the basis of a long-term monitoring strategy to measure the status and trends in the future in Clear Lake. Because this data is important in showcasing the health of the lake to the public, our goal is to increase the visibility of the Clear Lake data by creating dynamic data visualizations and interactive user interfaces for local lake users and stakeholders. Through our application, users can query and filter specific data to better understand the trends of the lake through the connection of different parameters, such as turbidity, flow, and more. Our application also aids the client in cleaning and managing their large datasets to ensure the visualization reflects the true condition of the lake. Overall, we hope to increase the user journey and experience through this new site, which will encourage more lake holders and stakeholders to be part of the research and the findings of the TERC team.

| Max Molchanov |

Major: Computer Science & Engineering

Mentor: Dr. Xin Liu

Research Type: Engineering Design Project

Artificial Slow Motion Video

In recent years, being able to capture slow-motion video has been an important objective for a multitude of tasks across various industries. In particular, entertainment broadcasting requires slow-motion for seamless delivery of highlight clips and critical replay analysis. Traditional slow-motion video can be captured by using high-fps cameras. When the playback speed frame rate is slower than the capture rate, the video appears to slow down. However, this poses two problems. The amount a captured video can be slowed down is throttled by the fps capability of the camera that captured it, and high-fps cameras are non-trivially expensive. Our project aims to alleviate the extent of these two problems and offer a solution that is not dependent upon state of the art camera equipment. We employ recent deep learning techniques to create an arbitrary number of intermediate frames between the ones captured in the video, allowing us to slow down the video while simultaneously maintaining pixel continuity and accounting for occlusion reasoning. We utilize Nvidia's Optical Flow SDK to generate flow vectors (data representing pixel movement between two adjacent frames), and implement our version of a flow interpolation model refined by prior work. In doing so, we offer a proof of concept: Artificially Generated Slow Motion Video; a Windows application built with a functional front-end that offers full control for video manipulation and exporting. The application comes built with features allowing users to manipulate replays and port them to social media or news outlets.

| Arielle Lazovsky |

Major: Biomedical Engineering

Mentor: Dr. Jennifer Choi

Research Type: Engineering Design Project

S.A.S: Stethoscope Auscultation System

Our team aims to design an ergonomic, portable, and dependable auscultation device that amplifies and emits sounds detected by a standard stethoscope chest piece without sacrificing the quality obtained with standard acoustic stethoscopes. This device could be utilized in instructional settings for both veterinarians and physicians. Our device solution consists of a 3D printed case in an L-shape that holds our PCB board, traditional stethoscope head, and all external components to make our device function. This includes an on/off button as well as an LED indicator, volume adjustment wheel, and microUSB charging port. Our design also consists of a coupler that will be the connection from the speaker head to the microphone on the PCB for our device.

| Joseph Morrison |

Major: Biomedical Engineering

Mentor: Dr. Aijun Wang & Dr. Jennifer Choi

Research Type: Engineering Design Project

Spinal Protective Implant for Neonatal Enhancements in Spina Bifida

Spina bifida is a condition in which the fetal neural tube does not close completely during gestation. In the United States, 1,427 children are born with spina bifida each year, with 87% of those children having the most severe case—Myelomeningocele (MCC). In MCC, the lack of closure to the neural tube causes a missing vertebrae arch and other support structures that protect the meninges, and spinal cord. The meninges and spinal cord balloon out of the gap, and can break through the epidermal layer. When this happens, the amniotic fluid causes damage to the spinal cord, which can lead to paralysis, lack of control of bowels and bladder, hydrocephalus, and Chiari 2 Malformation. Our objective is to create an implantable device that will protect the neurons of the exposed spinal cord and provide mechanical support at the enlarged gap between vertebrae in patients with spina bifida. Our device will be designed to be implanted in utero and prevent damage to the spinal cord, mimicking the natural environment of a healthy spine with intended application in safer, more effective spina bifida treatments. To develop a device that mimics the missing vertebrae, our team aims to combine a suitable biomaterial, the appropriate cell type, and the needed growth factors in order to create a full tissue engineered vertebrae. Specifically, we aim to recapitulate the bone mechanical properties through additive manufacturing of a composite alginate-hydroxyapatite scaffold seeded with placental mesenchymal stem cells that are intended to differentiate into the appropriate bone tissue. In developing such a device, we hope to improve the long-term quality of life for fetuses diagnosed with spina bifida.

| Maya Mysore |

Major: Biomedical Engineering

Mentor: Dr. Jennifer Choi & Dr. Aijun Wang

Research Type: Engineering Design Project

Spinal Protective Implant for Neonatal Enhancements in Spina Bifida

Spina bifida is a condition in which the fetal neural tube does not close completely during gestation. In the United States, 1,427 children are born with spina bifida each year, with 87% of those children having the most severe case—Myelomeningocele (MCC). In MCC, the lack of closure to the neural tube causes a missing vertebrae arch and other support structures that protect the meninges, and spinal cord. The meninges and spinal cord balloon out of the gap, and can break through the epidermal layer. When this happens, the amniotic fluid causes damage to the spinal cord, which can lead to paralysis, lack of control of bowels and bladder, hydrocephalus, and Chiari 2 Malformation. Our objective is to create an implantable device that will protect the neurons of the exposed spinal cord and provide mechanical support at the enlarged gap between vertebrae in patients with spina bifida. Our device will be designed to be implanted in utero and prevent damage to the spinal cord, mimicking the natural environment of a healthy spine with intended application in safer, more effective spina bifida treatments. To develop a device that mimics the missing vertebrae, our team aims to combine a suitable biomaterial, the appropriate cell type, and the needed growth factors in order to create a full tissue engineered vertebrae. Specifically, we aim to recapitulate the bone mechanical properties through additive manufacturing of a composite alginate-hydroxyapatite scaffold seeded with placental mesenchymal stem cells that are intended to differentiate into the appropriate bone tissue. In developing such a device, we hope to improve the long-term quality of life for fetuses diagnosed with spina bifida.

| Anika Patel |

Major: Computer Science & Engineering

Mentor: Dr. Petr Janata

Research Type: Engineering Design Project

NeuroBiography Browser

The Janata Lab at the UC Davis Center for the Mind and Brain is currently facilitating studies on how music evokes different Music Evoked Autobiographical Memories (MEAMs) in the brain. The Engineering Design Project seeks to support this research by developing the NeuroBiography Music Memory Browser, a website that overlays colored pixels representing individual songs over anatomical fMRI scans of a participant's brain. Once authenticated, users can click on different areas of the three-view (sagittal, coronal, and axial views) scan of the brain to access the memories and play the songs associated with that area of the brain. The project uses a backend server developed with Django connected to a MySQL instance, and a frontend website developed with HTML, CSS, and JavaScript. The browser serves as a tool for authenticated researchers and participants of the study to quickly retrieve and analyze the music and memories associated with a certain brain.

| Alexander Orlando |

Major: Civil Engineering

Mentor: N/A

Research Type: Engineering Design Project

Passive Energy Housing for California's Migrant Workers

Due to California's high demand for migrant agricultural workers, it is essential to increase safe and affordable seasonal housing within the local Davis area. Our objective is to design a 2000 - 2500 square foot housing unit that utilizes two passive energy systems in hopes of reducing the energy consumption of the building. This will, in turn, lower the cost of living and provide affordable housing for essential workers. Code compliant architectural drawings and structural designs will be developed, as well as 3D renderings of the structure. The housing unit will be designed to comfortably fit two families of six people each, with a communal living room and kitchen in between each private family space. Each family will have two bedrooms each, and one full bathroom. A wind catcher and solar roof chimney will be designed into the structure of the house itself to facilitate passive air circulation and cooling within the building. This design is one of many that will be needed in order to provide safe, adequate, and affordable housing for migrant agricultural workers in California.

| Kevin Peng |

Major: Computer Science & Engineering

Minor: Statistics

Mentor: Dr. Xin Liu

Research Type: Engineering Design Project

MFAC: Mutant Fish Attribution and Classification

The goal of this project is to develop an AI system that can identify the difference between images of zebrafish with and without a mutation. A major area of biological research is identifying the genetic sources of various disorders. One method is to first create a list of candidate mutations, and then inject those mutations into an animal, such as zebrafish, to see if they have any effect. Our system works by first training a classifier to classify images of zebrafish with and without a certain mutation, and then we use feature attribution methods to determine how the classifier makes its decision. Ideally, the feature attribution will highlight portions of the image that differ between mutated and non-mutated zebrafish.

| Anthony Radtkey |

Major: Civil Engineering

Mentor: Dr. Veronica Morales

Research Type: Engineering Design Project

Comparative Analysis for Flood-Managed Aquifer Recharge in the Merced Irrigation District

The Merced Irrigation District (MID) is responsible for providing water to Merced County agriculture operations and Merced residents. Greater water demand and increasingly dry years has required more water extraction from the Merced Groundwater Subbasin which has resulted in the subbasin becoming critically overdrafted. Flood-Managed Aquifer Recharge (Flood-MAR), a water resource management strategy, redirects excess flood water to agricultural lands and working landscapes to supplement groundwater recharge. Three Flood-MAR scenarios were considered: initial, intermediate, and robust. These three scenarios increase in frequency and intensity by prolonged duration of diversion of flood waters. To assess the effectiveness of each scenario, the three scenarios were modeled using the Merced Groundwater-Surface Water Simulation Model (FM2SIM) resulting in simulated historical water levels from 1900 to 2000 with each implemented scenario. The resulting changes in groundwater levels for each scenario were compared to each other and a groundwater level baseline in three special MID management zones: disadvantaged communities, groundwater dependent zones, and subsidence zones. The groundwater level data in each special management zone was scored and compared through a pairwise matrix scoring system to determine which scenario is the best implementation of the Flood-MAR project. Based on the data analysis it was determined that the robust scenario was most effective in aquifer recharge to improve groundwater operations in MID.

| Ruby Telfer |

Major: Civil Engineering

Mentor: Dr. Colleen Bronner & Dr. Veronica Morales

Research Type: Engineering Design Project

Flood-MAR: A Groundwater Sustainability Strategy for the Merced Irrigation District

The Merced Irrigation District (MID) is seeking a recommendation for the implementation of Flood Managed Aquifer Recharge (Flood-MAR) to counteract the impacts of over pumping groundwater. The aquifers in the MID are critically overdrafted due to dependence on groundwater extraction. Additionally, climate change is predicted to increase the frequency of severe flooding events and drought conditions. Flood-MAR aims to recharge aquifers by diverting flood waters to locations like agricultural fields where percolation to aquifers can occur. Implementation of Flood-MAR may help Merced address some of the goals outlined by the Sustainable Groundwater Management Act (SGMA). This report provides a recommendation for implementing Flood-MAR in MID. Three potential implementation scenarios were analyzed for their ability to meet the design criteria of the project. The scenarios – initial, intermediate, and robust – increased in activation duration and volume of flood water application. The California Department of Water Resources (DWR) provided 100 years of simulated groundwater level data from the Merced Groundwater-Surface Water Simulation Model, FM2Sim, for each scenario in the entire Merced Subbasin. FM2Sim identified special management zones which include groundwater dependent zones, disadvantaged communities, subsidence-prone zones, and groundwater pumping regions.

| Soumil Shekdar |

Major: Computer Science & Engineering

Minor: Technology Management

Mentor: Dr. Jason Scumy

Research Type: Engineering Design Project

Deep Learning for Psychotic Episode Prediction

Psychotic-like experiences (PLEs) in children are indicative of future mental health problems. Nearly 1 in 5 Americans experienced Mental illness in the last year, so by predicting psychotic-like experiences in children we can help millions live healthier and happier. We use the Adolescent Brain Cognitive Development (ABCD) study to build deep learning models that can predict these experiences accurately, and provide insights into the determining factors that result in these experiences. The ABCD data is heterogenous sparse with different datasets (brain image and environmental) available for different patients. In addition to this, the categorical dataset outcome of the 3-year distress z-score trajectory is imbalanced with <5% of the samples having persistent distress. Lastly, given the medical health context of the problem our client is more interested in determining all persistent distress cases with high precision, rather than merely building the model with the highest accuracy. Given the challenges in the dataset, our project is a comprehensive analysis of Machine Learning algorithms that can be effectively used on this dataset. Along with this we also determine the best feature engineering, pre-processing, sampling, and validation methods to address the imbalanced outcome, and emphasize optimizing recall. We also implement explainable AI solutions that use the model and features to determine how each prediction is made, and what features are emphasized by the model across the dataset.

| Raihana Yarzada |

Major: Computer Engineering and

Electrical Engineering

Mentor: Dr. Bevan Bass

Research Type: Engineering Design Project

Aggie Snap and Play

Aggie Snap and Play (ASAP) is a real-time hardware video processing system implemented on the Terasic DE1-SoC FPGA using a D8M-GPIO camera and VGA video interface. The AR application allows for users to explore a variety of features ranging from multiple video processing functions (brightness, contrast, gaussian blur with convolutional 2D filter, grayscale), screenshots and storage, an interactive Davis themed asteroid game, and wand detection.

| Denise Zhong |

Major: Biomedical Engineering

Minor: Neuroscience

Mentor: Dr. Jennifer Choi

Research Type: Engineering Design Project

Diagnostic Device For Critical Congenital Heart Disease

The goal of this project is to design, prototype, and test a device for improved detection of critical congenital heart defects (CCHD) in infants. The current gold standard in CCHD screening is pulse oximetry which, alone, misses defects that affect blood perfusion. This leads to 51.2% of all CCHD cases being detected too late. There is a need to improve the sensitivity of CCHD screening such that healthcare providers can more reliably detect CCHD in newborns and expedite surgical intervention in order to increase patient survival. Our device uses a novel biomarker, radiofemoral delay, in conjunction with pulse amplitude index to provide a more sensitive test for CCHD when compared to the clinical standard.

College of Letters
and Science



| Tiara Abraham |

Major: Music

Mentor: Jonathan Nadel

Research Type: UHP Project

Faith, Hope, and Love - A Senior Honors Recital

The performer will present an hour-long vocal recital, featuring songs in English, Italian, German, French, and Spanish and from different style periods. The repertoire has been carefully selected to represent the theme 'Faith, Hope, and Love'. Program and program notes will be provided for audience members to better understand the historical, musical, and lyrical contexts of each song. The recital will be presented on May 22nd at 3pm in Ann E. Pitzer Center.

| Celine Busnelli |

Major: International Relations

Mentor: N/A

Research Type: UHP Project

The Thirst For A Dam Raise: The Legal, Environmental, and Cultural Implications of Raising The Shasta Dam

Lake Shasta is the largest reservoir in the State of California, contributing water supply to the state-wide, complex network of dams, rivers, and canals known as the Central Valley Project. Domestic and industrial users over 400 miles throughout the state rely on the Central Valley Project for their water supply, with a substantial portion of California's agricultural industry being reliant on this water network. In the light of increasingly dire drought conditions and the state's continuing agricultural need for water, the Bureau of Reclamation began revisiting the idea to raise Shasta Dam to increase water storage capacity under the Trump Administration. Though the plan was not completed, it could be pursued by a future administration. Through the exploration of most recent litigation concerning the dam raise proposal, conduction of stakeholder interviews, a site visit, and application of environmental justice and history-focused lenses, this research project serves as an evaluation of the implications of the Shasta Dam's construction and existence, and how future environmental policy decisions could escalate these implications. By thoroughly analyzing the intersecting issues of tribal rights, environmental impact, water management, jurisdiction and oversight of federal agencies, and approaches to solving California's dire water crisis, I conclude that the proposal to raise Shasta Dam is a band-aid solution to water supply issues, and is a matter of contention that illustrates a broader, overarching need for society to evolve its traditional relationship with natural resources and shift its approaches to changing climate conditions.

| Grace Chitouras |

Major: Philosophy and Plant Biology

Minor: Chinese

Mentor: Dr. Christina Rulli

Research Type: Honors Thesis in Major

Ethics of Vaccines and Refusals for Firefighters in a Pandemic

Global outbreaks of viruses such as COVID-19 raise concerns about what additional responsibilities first responders, such as firefighters, have in a pandemic setting. The immense impact of the coronavirus on the healthcare system as a whole has made the role of a firefighter riskier, yet more essential, as firefighters are on the front line, responding on or alongside ambulances to almost every medical emergency called into the 9-1-1 system. This paper will examine the duty not to infect others and the duty not to get sick, two of the moral duties a firefighter has that are particularly salient in a pandemic. An argument will also be made for a moral obligation for firefighters to get the COVID-19 vaccine, in part to uphold their duty not to infect others and their duty not to get sick. Finally, this paper argues that firefighters quitting their jobs in a pandemic due to a vaccine refusal are unethical.

| Gia James da Vinci |

Major: Psychology

Mentor: Dr. Emma Grigg

Research Type: UHP Project

Defining Dominance in Domestic Dogs: A Scoping Review

Dominance in domestic dogs remains a divisive topic, with interpretations differing widely between scientists as well as the general public. Studies suggest that dominance is a relationship status during encounters over limited resources (e.g., food, toys) rather than a personality trait. Although dominance is often equated with aggression, they are not synonymous. Dominance interactions are a method of minimizing or eliminating conflict, and they can include subtle behaviors that might go unnoticed by non-experts. Even between the same pair of dogs, dominance may vary depending on factors such as context, motivation, and age. Misunderstandings of dominance have been influenced by outdated research on wolf behavior and incorrectly applied to the human-dog relationship with detrimental results. Though canine dominance is most appropriately interpreted as being species-specific, the misbelief that people must establish social dominance over dogs frequently leads to the use of training methods emphasizing force and intimidation. Such techniques can heighten dogs' stress and increase aggression, potentially resulting in abandonment or euthanasia. My project will synthesize the literature about canine dominance, utilizing a systematized search with inclusion/exclusion criteria, and highlight best practices to promote effective science communication on the subject.

| Jacob Derin |

Major: English and Philosophy

Mentor: Dr. Hanti Lin

Research Type: Honors Thesis in Major

A Welfare Axiology Using Higher-Order Betterness Relations

Since Derek Parfit's *Reasons and Persons* the field of moral philosophy has been contending with the implications of bringing new people into existence and comparing various welfare distributions across possible populations. For instance, is a very small population where every member has extremely high quality of life better than a very large population where every member has a life just barely worth living? Parfit pointed out that many normative theories, including classical utilitarianism, which accept a "principle of beneficence" based on maximizing total utility would choose the latter option. This "Repugnant Conclusion" has spawned a whole literature of responses in a field of study now known as "population ethics."

Parfit was optimistic that some "Theory X" would be found which could avoid the Repugnant Conclusion without implying equally unintuitive results. So far, despite the formulation of a large number of so-called "welfare axiologies," or methods of ranking populations and welfare distributions, none has been found. In this paper, I define a welfare axiology grounded in "higher-order betterness." A higher-order betterness relation ranks the application of ranking theories to potential populations.

| Ellie Feder |

Major: Religious Studies

Minor: Political Science

Mentor: Dr. Naomi Janowitz

Research Type: Honors Thesis in Major

Blood and Body: Agency as Enacted Through Child Sacrifice and Sexuality in Toni Morrison's *Beloved*

I analyze the novel through the lens of ritual sacrifice to understand the structure of genealogy, sexuality, gender, and patrilineity in the structure of slavery.

| Lia Freed-Doerr |

Major: Cognitive Science and Neurobiology, Physiology
& Behavior

Mentor: Dr. Charan Ranganath

Research Type: UHP Thesis

Encoding Variability and Event Segmentation Across Narrative Contexts

Humans face a constant stream of information, and encoding this information is key to learning. The encoding variability theory suggests that varying the context of encoding benefits recall. One modulating factor in this is event segmentation of constant information streams into discrete units. Neither has been well-examined in real-world contexts, including in long-form narratives. In this study, psychology undergraduates will recall a TV episode after encoding it twice in one of two conditions: watching with captions only twice or watching with captions only once, then listening to an audio description of the episode. In line with prior results using simple stimuli, we predict that varying encoding context will significantly boost memory. In addition, we will consider the importance of event perception within the show on recall. To do this, a different group will segment the events of both presentation versions, and we will consider how differences may influence memory. It is possible that mixing contexts will increase the total number of event boundaries, which will allow for greater detail in recollection; or, if event boundaries remain consistent, increasing variability in details encoded within each event may create more cues for recall. This study aims to help assess how learning through different methodologies may assist in recall.

| Owen Gao |

Major: Computer Science
and Applied Mathematics

Mentor: Dr. Jesús De Loera

Research Type: Honors Thesis in Major

An Exploration and Catalogue of 4-Dimensional Polytopes and Oriented Matroids

Defined by a set of hyperplane arrangements, polytopes are higher-dimensional generalizations of familiar 2-dimensional and 3-dimensional geometric objects such as squares, cubes, pyramids, and other polygons/polyhedra. Oriented matroids provide another avenue to study polytopes as they are combinatorial model of polytopes. Both these mathematical objects are important in a variety of fields, such as linear programming and algorithm development, providing great motivation for further study. Mathematically the lower dimensional versions of these objects are pretty well understood. However, once we get to 4 dimensions, there are a number of unanswered questions about polytopes and oriented matroids. Approaching these open questions from a computational perspective, in this ongoing project with Dr. Jesús De Loera, we generate, catalogue, and investigate several properties of these mathematical objects in an effort to find useful patterns or counterexamples for proposed conjectures.

| Diana Garcia Perez |

Major: Sociology

Minor: Political Science

Mentor: Charlotte Elizabeth Siggins

Research Type: UHP Project

Supporting Previously Incarcerated Youth During their Reentry: A Project to Support the Northern California Aftercare Program

This Honors Thesis Project focuses on an aftercare program that serves young men, ages 18-25, who have been discharged from California's three youth correctional facilities. The Northern California Juvenile Aftercare Program (Aftercare Program) helps discharged young men with many goals, including attaining a job and pursuing further education, which can help reduce their likelihood of future involvement in the criminal legal system. The Honors Thesis Project strives to make the already impactful Aftercare Program more organized and effective through the development of more efficient processes to establish clear expectations, track activities, measure program success, and support re-entry. As a result of the Honors Thesis Project, the Aftercare Program will be better able to help society at large, as crimes that the discharged individuals might have engaged in are more likely to be avoided. This results in the young men having a chance to focus on maintaining their freedom and pursuing happiness.

| Jackson Gaydon |

Major: Computer Science

Mentor: Dr. Joshua McCoy

Research Type: UHP Project

We Journeyed Together: An Online Tabletop Roleplaying Game

The COVID-19 pandemic has caused the tabletop role-playing game community to adapt to virtual settings, often using voice chat and virtual tabletops. However, these games were not designed to be played online, causing the new format to be awkward. This causes challenges to new players who struggle with joining the hobby due to current games either focusing heavily on the rules and leaving storytelling as secondary, or being rules-light and not having game masters to moderate and ensure the game has an existing structure to follow. This has motivated development of this online tabletop role-playing game, that provides the experience of traveling with a group of people on an adventure to confront a great threat over only a few hours. It follows similar role-playing formats to Fiasco and Weave, but provides a rules-light but rigid structure of play so that it is easier to have an ideal experience. The game design philosophy ensures that any features must be simple to understand and use, leading me to hope that it will fill the current gap in internet-focused, accessible games, which we will be measuring the success of by playtesting over these next few months.

| Brian Graves |

Major: Anthropology

Minor: Education and History

Mentor: Dr. Teresa E. Steele

Research Type: Honors Thesis in Major

Ochre Powder and Hafting Adhesives in Prehistoric South Africa

During Africa's Middle Stone Age (MSA), the archaeological record reveals an increase in behavioral variability, including early personal ornaments and art. Excavations in South Africa have found at least 23 MSA sites with rich concentrations of ochre, quarried elsewhere and often imported. Ethnographic accounts and replication studies have demonstrated that one use of this substance was likely as a loading agent for adhesives. The archaeological record preserves this mineral in conjunction with many lithic points, some bearing the traces of ochre residues and plant resins indicative of hafting. Experimental archaeology is required to link these materials to their potential use with hafted spears and allows us to ask questions such as: What are the benefits in utilizing different consistencies of ochre? Do firing or drying conditions need to be carefully controlled during adhesive manufacture or application? Ethnographic accounts exist of ochre use in hafting adhesives, but ethnographic analogy alone cannot be used to explain methods of prehistoric adhesive manufacture. Experimental archaeology affords researchers a means to simulate the creation of these adhesives and hypothesize the cognitive and technological skills necessary for construction. This project provides a detailed literature review of what is known from the ethnographic and archaeological record for adhesive manufacturing and use and proposes an experimental design to investigate the energetic trade-offs of production.

| Sallie Hollingshead |

Major: International Relations

Mentor: Dr. Grace Wang

Research Type: UHP Thesis

Women in Sports and Media Representation of Them

The purpose of this project is to determine the media coverage of women's sports and to delve into how social media has advanced women's sports, but also how there is still a long way to go until men's and women's sports are equal. The paper demonstrates that there is deeply ingrained sexism within society and it is especially revealed through how the media portrays and represents female athletes. This project is being implemented through accumulating prior academic articles and research, and then combining the findings to give an overview of how women in sports are represented. Following this research, I then applied it to the UC Davis Athletics Department's social media to determine if what I found applies to my own university. Through an internship with UC Davis Athletics Multimedia Services, I was able to observe how all of the social media accounts are run, as well as the differences between the social media accounts of the women's Intercollegiate Athletic (ICA) teams versus the men's teams. I mostly concentrated on the Men's and Women's Basketball teams, as well as the Football team and the Women's Gymnastics team. This then allowed me to compare my findings from my research of female athletes in the media to how UC Davis Athletics Media Department represents the ICA teams. While the social media accounts of UC Davis did not reflect the exact gendered norms of today's media, I found that the way that female athletes are treated in general was still applicable to UC Davis Athletics.

| Thea Hudson |

Major: Design
Mentor: Dr. Kory Ching
Research Type: UHP Project

A Text-based Game: Exploring Critical Theory Texts Through Game

While there are many contemporary artists and theorists investigating the potential of critical or “artistic” video games, the field is new and relatively unexplored. I wish to contribute to this field by testing the potential of a game development approach in which I first choose a theoretical text that has been influential to me in past years, and then begin a process of designing a game that responds intuitively to the texts. In this process, I hope to simultaneously come to better understand the philosophical concepts whilst I develop a novel game prototype. First, I approach Giles Deleuze and Felix Guattari’s *Anti-Oedipus: Capitalism and Schizophrenia* and Baruch Spinoza’s *Ethics* with the intention of gaining a basic understanding of the texts, discovering connections to other promising sources, and locating places of emotional resonance and political potential. Next, I select a few concepts to explore in-depth, responding to them by inventing and prototyping mechanics, visual art, dialog, and sound, while allowing the artistic process itself to be informed by the texts. I then present a proposal for a video game in the form of a design document, with the potential for further development. Finally, I evaluate the success of the project as a response to the original texts and as an exploration of political potential and reflect on this method of game development from the perspective of an artist.

| Dorothy Hung |

Major: Design and Communication
Minor: Education
Mentor: Tom Maiorana

Research Type: Honors Thesis in Major Bridging User Experience and Learning Design: A Platform Introducing Visual Thinking Strategies

The pandemic forced education to be remote, providing an impetus to reproduce the classroom setting online. What proved unsuccessful revealed the constraints of the digital learning environment, but explored new means of presenting curriculum that would not have been possible with in-person instruction. This case study focuses on how to optimize user experience (UX) research for online learning and how to design interfaces that promote engagement and interaction. To better understand the structure and needs of distance learning tools, a prototype was developed to teach children about visual thinking strategies. Users are guided through a series of narrative-building activities where they engage in image analysis and make observations to develop a storyline. Usability testing was conducted to explore the effectiveness of design choices, along with research on micro-interactions, and how this contributes to the user’s motivation in completing the learning activities. The findings of this case study provide recommendations for designing interactions and interfaces for the purpose of online learning.

| Dariush Imani |

Major: Physics and Philosophy
Mentor: Dr. John Conway
Research Type: Honors Thesis in Major

Clustering Techniques and Background Analysis in the Hadronic High Mass Pair Search

Searches for physics beyond the Standard Model (SM) often heavily rely on our ability to reconstruct events from collider experiments like those done in the Large Hadron Collider (LHC). This project presents a search for a new physics signal, one where two particles collide to form an unknown high mass particle (the *Suu*), which then in turn decays into two other unknown “*chi*” particles. The algorithm works by boosting into the frame which minimizes parallel momentum along the beam axis and then sorting jets of particles according to their angle along the thrust axis. We then boost into the center of mass frame of each cluster of jets on either side of the axis, and examine the existing jet substructure within each “superjet”.

Estimating the background from real data is done by running our search algorithm on simulated background data in order to obtain a probability that background events pass our cuts in the real data. This technique, called anti-tagging, will be used to predict the background on real data, before examining the results of the analysis. There is also the possibility of utilizing the results of the anti-tagging procedure to train a neural network to distinguish between background and signal.

| Dhanya Indraganti |

Major: History and Anthropology
Mentor: Dr. Adam Zientek
Research Type: Honors Thesis in Major

Of Advice and Community: Marie-Claire Magazine During the Second World War

Between 1940 and 1944, as French citizens experienced hardship, Nazi occupation, and Vichy authoritarianism, the popular women’s magazine *Marie-Claire* published nearly 150 issues. At a time when most other presses had shut down, *Marie-Claire*’s editors, led by Marcelle Auclair, wrote and produced near-weekly advice columns, news features, fashion spreads, makeup tips, and cooking advice for their readers. That is, until the Gaullist state established after the Liberation of France in June 1944 struck a death knell to the magazine, banning it for “collaboration” with the Nazis. Early scholars of wartime France viewed the state, its people, and presses through the binary categories of resisters and collaborators, and any association with the Nazis was considered collaboration. This research joins recent scholarship in challenging the dichotomy of resistance and collaboration which has characterized much postwar memory/history of the Second World War in France by extending the moral/legal ambiguities of Vichy France to the women’s press, arguing that while Marcelle Auclair and her editors provided community and support to readers, the magazine was also a vehicle of subtle anti-feminist Vichy propaganda.

| Raj Jagannath |

Major: Computer Science
Minor: Managerial Economics
Mentor: Dr. Xin Liu

Research Type: Engineering Design Project

Rise of the Zoo Empire: Real-Time Multiplayer Strategy Game for Android

My Signature Work is a class project for ECS 193AB, which is the Engineering Design Project for Computer Science students. My group is working with our client, Travis Heppel, who is a software engineer at Google. Our project is to create a mobile game and publish it to the App Store/Google Play Store. We decided to create a tower defense game in Android game using Java, which we plan to publish to the play store by the end of the quarter.

| Markus Kaeppli |

Major: Political Sciences – Public Service
and Cinema & Digital Media
Mentor: Dr. Kris Fallon

Research Type: Honors Thesis in Major

The Apparatus of the Body Snatchers

Although dismissed by scholars and audiences as exemplars of b-movie entertainment, *The Invasion of The Body Snatchers* films have proved remarkably resilient — being remade 4 times. This paper will account for this by pointing to the films' abilities to reflect the political context of the times they were made in and wider concerns with the role of media in society. In doing so the *Invasion* films demonstrate a surprising connection with the material framework of the film medium, what theorists often refer to as the cinematic apparatus.

| Vivian Kellner |

Major: Chemistry
Mentor: Dr. Sheila David

Research Type: Honors Thesis in Major

Investigation of Conserved Residues in Adenine Glycosylase MutY and their Importance in DNA Damage Repair Activity

Exposure to reactive oxygen species (ROS) causes oxidation of guanine (G) to 8-oxo-7,8-dihydroguanine (OG), a common form of DNA damage. This damage is problematic because OG preferentially pairs with adenine during replication, resulting in potential G:C to T:A transversion mutations. The adenine glycosylase MutY (MUTYH in humans) plays an important role in maintaining genome integrity by removing adenine bases mispaired across from OG. Inherited biallelic mutations in the MUTYH gene are linked to a cancer predisposition syndrome known as MUTYH associated polyposis (MAP), underscoring the essential role of MUTYH in protecting the genome. A cellular assay is employed in the present work which uses mutation frequency as a proxy for evaluating MutY function.

This assay was employed to compare wild type MutY function several variants of MutY, and bacteria in which MutY is not expressed. The variants studied were H292A, H292Y, and F294A, all of which were modifications to the HXFSH motif in the C-terminal domain, which is known to be critical for substrate recognition. H292A showed a mutation frequency almost as low as wild type MutY. H292Y showed a very high mutation frequency that was almost indistinguishable from that of the negative control group which expressed no MutY.

F294A was in between these, showing some mutation suppression activity, but not as much as wild type MutY. These results highlight the important roles of these residues in MutY function and give us insights into how substrate recognition takes place.

| Riley Kibbee |

Major: Physics
Minor: Chemistry

Mentor: Dr. Eric Prebys

Research Type: Honors Thesis in Major

Developing a Methodology for Stacked Target Nuclear Cross-Sectional Measurements using a 76" Isochronous Cyclotron

Cross-sectional measurements for $^{59}\text{Co}(p,x)$, $^{59}\text{Co}(d,x)$, $^{93}\text{Nb}(p,x)$, and $^{93}\text{Nb}(d,x)$ – all nuclear reactions occurring from a cobalt-59 or niobium-93 target interacting with a proton or deuteron – will be carried out on foils composed of cobalt or niobium using a stacked-target activation technique with a proton or deuteron beam. Cross-section measurements are of interest as they inform the rate at which nuclear reactions occur and the products of nuclear reactions, these having applications to nuclear energy, stockpile stewardship, and astrophysics. These initial measurements will lay the foundation for further cross-sectional measurements to be taken at Crocker Nuclear Laboratory.

| Jill Kraus |

Major: English and Psychology

Mentor: Dr. Elizabeth Freeman

Research Type: Honors Thesis in Major

Sexual Trauma, Reproductive Control, and the History of Slavery in Octavia Butler's Dawn

Although Octavia Butler's Dawn is framed as a post-apocalyptic encounter with an extraterrestrial species, the "Oankali," the subtext of the novel allegorizes the treatment of enslaved women under colonialist conditions. Narrated from the perspective of Lilith—a black woman tasked with the responsibility of birthing the first generation of human-Oankali hybrids—the text draws upon the history of reproductive control that colonizers exert over their captives. The imperialist motive of galactic domination is represented by the dynamic between the captors and Lilith, whose repeated sexual coercion and abuse is presented as a necessary consequence of her role in the Oankali's anticipated repopulation of earth. Despite her resistance to various Oankali measures of subjugation, Lilith perpetrates the sexual abuse to which she once fell victim. I examine the conflicting attitudes and behavior of the female narrator in this abuse of her fellow humans, and the ways in which Lilith's perspective and employment of autonomy differ from the motherhood forced upon enslaved women. Butler communicates the central role of slave mothers in colonialist endeavors through the lens of a futuristic plot, revealing the nearly impossible existence of these women under the confines of a system that both rejects and depends on their reproductive contributions.

| Ashley Lo |

Major: Political Science
and Economics

Mentor: Dr. Amber Boydston

Research Type: Honors Thesis in Major

Sustaining Open Economies: The Effects of Social Spending and Labor Market Policies on Immigration Attitudes

Economic globalization, the increasing interdependence of the world's economies, has risen rapidly. While trade has brought benefits, there have also been adverse effects. In particular, China's dramatic rise in manufacturing, a phenomenon known as the China Shock, has caused jobs in countries' once booming industries to disappear. Scholars have found that economic insecurity caused by this flood of imports are associated with anti-immigrant stances, thus driving votes for right-wing nationalist candidates. Compensation literature suggests that social spending can reduce opposition to globalization, and some posit that labor market policies may have similar effects, but the latter remains untested. This study utilizes sub-national survey data on immigration attitudes to determine whether government compensation spending weakens the anti-immigrant effect of the China Shock, and specifically, whether spending on labor market programs do so. Findings suggest that active and passive labor market policies mediate the effect of the China Shock upon immigration attitudes.

| Miriam Lewis |

Major: Music

Mentor: Chris Froh

Research Type: Honors Thesis in Major
Senior Recital Process and Reflection

This senior recital is a culmination of Miriam's work as a performer and composer at UC Davis with repertoire ranging from mid-20th century to the present contemporary. Pieces include works by Carter, Abe, Miyoshi, Applebaum, and Kopetzki with works for marimba, multi-percussion, timpani, and electronics. These pieces show an understanding of musicianship, interpretation, and knowledge not just as a performer, but also as a composer. While this performance is a one-time event, it was influenced and prepared for through years of performance opportunities in both large and small ensembles, solo performances, and the guidance of lecturers and private instructors.

| Alyse Lodigiani |

Major: Cognitive Science
and Cell Biology

Mentor: Dr. Steve Luck

Research Type: Honors Thesis in Major

Visual Working Memory in Schizophrenia and Other Mental Illnesses: Evidence from Electrophysiology

Schizophrenia and other psychotic disorders can be qualified by several symptoms that are broken up into three types: positive symptoms (e.g., hallucinations), negative symptoms (e.g., loss of motivation), and cognitive dysfunction (e.g., memory or attention difficulties). The positive symptoms of schizophrenia are most commonly identified and understood by the general population and are the targets for many anti-psychotic medications. Negative symptoms and measures of cognitive dysfunction tend to be better predictors of long-term outcomes, such as number of future hospitalizations, ability to hold a job, ability to live independently, etc. than positive symptoms. This project will investigate neural correlates of visual working memory dysfunction in people with schizophrenia relative to (1) people living with one of three different psychotic diagnoses (schizophrenia, schizoaffective disorder, or bipolar disorder with psychosis), (2) people with a nonpsychotic mental illness (major depressive disorder), and (3) control subjects. From these comparisons, this project will work towards determining whether visual working memory dysfunction is specific to people with schizophrenia, psychotic disorders, or non-specific.

| Stacy Lopez |

Major: Spanish and Sociology

Minor: Education

Dr. Maisha Winn

Research Type: UHP Thesis

Creative Alternatives to Zero-tolerance Policies in Schools through the Arts

Zero-tolerance policies, punishment and vigilance of, mainly Black, Indigenous and students of color in classrooms affects the ways in which students perceive learning and their importance in the classroom. In order to encourage Black and Brown students in an educational environment, schools should promote responsible citizenship, promote creative thinking, and induce a problem solving mindset through arts. These creative outlets and school-based performing arts are vital to a well-rounded education, where students have the opportunity to engage in school activities outside of academia. Providing opportunities for students to partake in visual and performing arts motivates students of all backgrounds to be part of a team, learn new skills, and encourages attendance and participation. This preliminary study analyzes the implementation of creative arts in primary and secondary schools that help with student academic achievement outcomes that positively impacts students of all backgrounds. The aim of this study is to inform educators and funders to further invest in visual and performing arts, as well as to emphasize the importance of these activities in learning spaces. We must encourage students to use creative outlets to further expand their knowledge and experiences in schools, where these tools have proven to positively impact BIPOC students.

| Nancy Marshall |

Major: Design

Minor: Archaeology

Mentor: Susan Avila

Research Type: Honors Thesis in Major

Reawaken: Screen Printing With Natural Dyes for Contemporary Fashion Production

Fashion production and dyed textile manufacturing are major sources of industrial pollution due in part to the nature of synthetic dyes. This project explores sustainable silkscreen printing with a visual theme inspired by streetwear and more bizarre art than is typically associated with the practice of using natural dyes. The inspiration for the visual component of this project comes from my own artistic style, surrealism and abstraction, and historical art. These inspirations were utilized to create motifs that can be put into repeating textile patterns for production of patterned fabric yardage. Natural dyes, namely indigo, madder, weld, and myrobalan, were thickened with guar gum and tested to perfect a formula for screen printing ink suitable to traditional printmaking practices. Following the printing process, these textiles were used to create a fashion collection highlighting their versatility. Through refining and documenting these techniques, this project strives to bring consciousness to the viability of natural dye printing for contemporary streetwear manufacturing.

| Rebecca Martin |

Major: English

Mentor: Dr. Kathleen Peterson

Research Type: Honors Thesis in Major

Femininity, Womanhood, and the Fringe Female in Carol Duffy's *The World's Wife*

| Aislinn Matagulay |

Major: International Relations and Economics

Mentor: Dr. Yael Teff-Seker

Research Type: Honors Thesis in Major

The Effect of State and Non-State Actors on Environmental Conflict Resolution in East Africa

As the world braces for more extreme weather patterns due to climate change, the number and intensity of environmental conflicts are only expected to increase in coming years. This study examines the question: what is the correlation between the types of actors involved in the environmental conflict resolution process and the outcome of this process? Does the type of actor involved help explain the success of this process? By conducting a multiple regression of 74 cases of environmental conflicts in East Africa over the past 50 years, I find that there is no statistically significant difference between the types of government actors involved (local, federal, international) and the success of the initiative. However, local EJOs (environmental justice organizations) are consistently more likely to be correlated with a successful outcome compared to international EJOs (with a p-value of 0.02). These findings suggest that incorporating local EJOs into the conflict resolution process has the potential to lead to more environmentally just outcomes for future environmental conflicts.

| Minerva Melendrez |

Major: Political Science and Psychology

Mentor: Dr. Bradford Jones

Research Type: Honors Thesis in Major

Understanding Latinx Political Heterogeneity Through the Lens of Linked Fate

Recent U.S. elections have revealed a steady increase in Latinx affiliation with the Republican party despite this group's historical alignment with the Democratic party. This shift in electoral voting trends raises the question, why do some individuals choose to deviate from the collective's political preferences? Using the 2016 Collaborative Multiracial Post-Election Survey (CMPS), I examine how linked fate, a form of group consciousness, influences Latinx political decision-making by investigating its variance by national origin, citizenship status, and political partisanship. Through regression analyses, I find evidence suggesting that linked fate levels remain relatively stable across national origin and citizenship status. I also find that linked fate covaries with partisanship, indicating that strong Latinx Democrats have the highest levels of linked fate. Finally, my results suggest that citizenship status moderates the relationship between partisanship and linked fate. This study challenges the belief that Latinx voting patterns are monolithic and highlights that differences in linked fate help gauge Latinx party affiliation

| Krishnapriya Nair |

Major: Computer Science

Minor: Mathematics

Mentor: Dr. Kurt Eiselt

Research Type: Honors Thesis in Major

Comm-unity: An Online Communication Platform for Children with ASD

Through the COVID-19 pandemic and the shift in modern technology, much of our communication platforms are online forums. As such, there is an expectation to be able to communicate via online platforms. For many neurodivergent individuals, methods of communication are different than those that their neurotypical peers. The research question of this project is two-fold: can we provide a sense of community online through this communication platform and to what extent can software tools, such as the social media application, help improve social skills. I aim to create a social media-style web application for middle school-aged children on the autism spectrum to practice their communication skills and create a sense of community among their peers. Typically, this process is done through Social Skills Training Programs (SSTP) creating a right and wrong way of communicating. Rather than introducing a standard of correctness for communication, the aim of this project is to provide an outlet for individuals on the spectrum to practice and improve their social skills in the ways they feel most comfortable. The application will allow users to create a profile, customize it, and communicate via chat with other users with similar interests. In addition, the application will contain a publicly available help guide, for young adults with ASD to find resources. Further research can include creating a game interface in the application, allowing a summary report of user interactions, or testing the effectiveness of the application.

| Juliana Oliveira |

Major: International Relations

Mentor: Dr. Michal Kurlaender

Research Type: Honors UHP Thesis

What Factors Determine Transfer Students' of Color Choices to Attend a Four-Year University?

Despite constituting almost 70% of the community college population, students of color represent less than a third of public four-year university campuses in California. While student choice is researched among students of color, few studies distinguish between the choices of freshman and transfer admits. This project aims to understand college choice for California Community College transfer students of color who transfer to campuses in the University of California (UC) system. This mixed-methods study analyzes quantitative data from the UC Office of the President and qualitative interviews with current transfer students of color to discover what factors motivate them to transfer to a four-year institution. The research hopes to identify key factors in their transfer decisions, including location, costs, and quality of transfer resources among the responses. The importance of this research could determine how public four-year universities in California can create stronger transfer partnerships with a specific focus on supporting students of color.

| Madeleine Payne |

Major: Psychology
Minor: Public Health Sciences
Mentor: Dr. Camelia Hostinar
Research Type: UHP Thesis

Sleep, Stress, and Greenspace Access Among Children

With global urbanization rapidly increasing in the past century, interactions between individuals and their environment have been constantly evolving, exposing inequalities in access to greenspace. Previous research on greenspace access has examined associations with childhood obesity and physical activity, but more limited research exists on the relationship between biomarkers of stress in children and access to greenspace. We hypothesize that children who live in neighborhoods with less park access may exhibit heightened hair cortisol concentrations, an indicator of chronic stress, and worse sleep. Using data from 180 children ages 9 to 11 years old (Mean age = 9.91, SD = .58 years) in Northern California, we examined the association between children's hair cortisol concentration, baseline salivary cortisol samples and sleep behaviors, with their access to greenspace as indicated by the California Healthy Places Index (HPI). The HPI is a data and policy platform that provides accessible data regarding neighborhood-level factors that drive health, such as economic, environmental, and educational factors. For the current study, we conducted bivariate correlations to examine the associations between children's neighborhood park access and tree canopy (greenspace), sleep behaviors, hair cortisol concentration, and salivary baseline cortisol. We also examined children's sleep in relation to park access and baseline cortisol levels using multiple regression models, controlling for child age, sex, and race. In a model predicting salivary cortisol controlling for age, sex, and race, HPI score significantly predicted salivary cortisol ($B = .002, p = .046$). Age was also a significant predictor of salivary cortisol ($B = .09, p = .013$). Sex and race, however, were not significant predictors of salivary cortisol in this model, although the overall model was significant, $R^2 = .09, F(4, 126) = 3.2, p = .015$. These study results can inform researchers, providers, and families on the importance of greenspace for children's stress and health.

| Emma Phillips |

Major: Communication
Minor: Computer Science and Political Science
Mentor: Dr. Bo Feng
Research Type: Honors Thesis in Major

Assessing the Effectiveness of Communication in Face-to-Face vs. Computer-Mediated Therapy

Although previous research has examined the ethics and efficacy of computer-mediated therapy, little is known about the effectiveness of computer-mediated therapy in comparison to face-to-face therapy, especially for college-aged populations. This research is increasingly pressing as more and more young adults seek therapy online for convenience and comfort, or because of the COVID-19 pandemic. The present study examines this comparison, gathering data about participants' levels of self-disclosure, their working alliance with their therapist, and their perception of their therapist's nonverbal immediacy to determine whether the communication in their therapy session is effectively producing desired outcomes. It is predicted that participants will experience higher levels of working alliance with their therapist, greater levels of self-disclosure and nonverbal immediacy in face-to-face therapy sessions, as computer-mediated communication often includes filtered-out cues, hindering the communication in those online sessions.

| Viktor Pertl |

Major: Psychology and Anthropology
Mentor: Dr. Joe Anistranski
Research Type: UHP Thesis

First-Generation Perspectives on Transactional Stress-Coping and Measures of Academic Achievement

In higher education, researchers have often used the Transactional Model of Stress-Coping to assess relationships between stress-coping strategies (e.g., problem-focused and emotion-focused) and measures of academic achievement. Previous studies have focused narrowly on specific achievement measures (e.g., course grades, examination scores, GPA) and populations of students (e.g., medical students, first-year undergraduates, high-school students). However, researchers have rarely focused on these variables in academic environments for first-generation college students (FGCS). An extensive literature search found only one contemporary study focusing on stress-coping and achievement variables among FGCS, and this study claimed to be the first of its kind. Additionally, few studies have considered transactional stress-coping with qualitative methodologies investigating participants' lived experiences. This study will address the lack of qualitative research through an interview approach, using interpretative phenomenological analysis to examine how FGCS attempt to manage stressors under the context of the Transactional Model of Stress-Coping. Furthermore, the study will explore how transactional stress-coping strategies play a role in individual FGCS' experiences of academic achievement. Recurring stress-coping themes in participants' responses will be used to derive implications for the University of California, Davis.

| Judy Shamshikh |

Major: Political Science
Minor: Statistics
Mentor: Dr. Ryan Hubert
Research Type: Honors Thesis in Major

Digital Privacy Laws in the United States: The Variation in Protection Across States and the Federal Government

This thesis seeks to analyze the level of protection offered in digital privacy laws on the federal level compared to the state level. The surge in consumer demand for more data protection has highlighted the importance of evaluating the varying levels of digital privacy protection in the United States. By creating a codebook containing all possible components of a comprehensive digital privacy legislation, I analyze all federal and state legislation to quantify each policy's strength. In comparing the federal and state laws, I find that the states provide much more average protection than the federal government, implying that an individual's data privacy protection depends heavily on the state he or she lives in. Additionally, this thesis analyzes whether the strength of a state's digital privacy legislation correlates with its political leniency; however, no relationship between strong digital privacy laws and left/right leaning states is found.

| Karen Shlesinger |

Major: Psychology

Minor: Music

Mentor: Dr. Steve Luck

Research Type: Honors Thesis in Major

The Effects of Trait Anxiety on Cortical Excitability and Music Listening-Induced Modulation

Music is known to have effects on our emotions and physical state, whether it makes us happy, sad, aroused, or sleepy. This has prompted an ongoing investigation of how music can be used to modulate our physiological state, including relieving anxiety. To date, this question has been researched more in the context of state anxiety, which is due to stress-inducing events, as opposed to trait anxiety, which is personality-based. The current study aims to investigate how listening to calming music affects symptoms of trait anxiety. We use transcranial magnetic stimulation (TMS) and electromyography (EMG) to measure neural excitability, specifically motor-evoked potentials, as individuals with trait anxiety are believed to have an excess of neural excitation. We compare motor-evoked potentials and short intracortical inhibition (SICI) between individuals with low and high trait anxiety as determined by the State-Trait Anxiety Inventory (STAI), before and after calm music-listening. This study is in progress, but we hypothesize that individuals with higher levels of trait anxiety will have larger motor-evoked potentials that will be reduced after music-listening. The ultimate goal is to demonstrate the clinical relevance of music and provide evidence for music as an additional therapeutic tool for treating trait anxiety in everyday life.

| Priyal Thakral |

Major: International Relations and Managerial Economics

Mentor: Dr. Stephen Boucher

Research Type: Honors Thesis in Major

The Impact of Microcredit in Sub-Saharan Africa

| Denisse Vega Zarate |

Major: Sociology

Minor: Human Rights

Mentor: Dr. Jacob Hibbel

Research Type: Honors Thesis in Major

The Best Thing You Can Do with Your Life is Study: Parental Involvement in Mexican Immigrant Families from the Perspective of Academically Successful Students

Research has consistently shown that parental involvement plays an important role in children's schooling and academic achievement. However, past definitions of parental involvement are narrow and exclude the contributions of Mexican immigrant parents simply because they differ from the white middle-class standard. This exclusion creates harmful stereotypes that characterize Mexican parents as uninvolved and can lead school authorities to approach them and their children from a deficit perspective. Utilizing qualitative data from semi-structured, in-depth interviews conducted with twelve adult children of Mexican immigrants, this study aims to shed light on Mexican immigrant parents' unique experiences and contributions that past definitions of parental involvement fail to capture. This study explores how Mexican students perceive the involvement of their parents at the school site as well as their involvement through at-home practices. The data reveal common obstacles that Mexican parents face when navigating the school system and provide a better understanding of family dynamics and everyday practices that characterize their involvement. Findings from this study will help school authorities understand how to better support students by creating meaningful partnerships with their families that recognize and build upon their unique strengths.

| Anjini Venugopal |

Major: Cognitive Science and Linguistics

Minor: Computer Science

Mentor: Dr. Emily Morgan

Research Type: Honors Thesis in Major

Naturalness and Lifespan of Bugs in Code: Investigating the Effects of Predictability on the Life-cycle of Simple Coding Errors

Existing research shows that predictability plays a role in language processing, especially as demonstrated by people reading predictable text faster than unpredictable text. This thesis uses simple bugs as mined in the ManySStuBs4J dataset to examine whether the same trend holds in code processing. Does predictability of code and code context affect coders' ability to spot or gloss over errors? I ascertain latency in error correction based on the dates that the bugs were introduced and corrected, and use machine learning models to assess the predictability of the bugs and surrounding lines of code. I expect to see that bugs originally introduced in a less predictable context generally take less time to correct than bugs in a more predictable context. An important consideration is that the context at the time a bug is introduced could greatly differ from the context at the time the bug is fixed. The results of this research can help inform the growing body of findings on how code processing aligns with language processing.

| Adam Vogel |

Major: Statistics

Minor: Economics

Mentor: Giovanni Peri

Research Type: Honors Thesis in Major

Determining the Effectiveness of Residential Property Assessed Clean Energy Programs in Promoting Residential Solar Panel Adoption

Residential distributed solar panel systems are widely regarded as a viable alternative to traditional modes of energy generation. Residential Property Assessed Clean Energy Programs (R-PACE) allow homeowners who live within a participating R-PACE district to finance the up-front cost of solar panel retrofits on their property with no down payment. After R-PACE enabling legislation is passed by a State government, municipalities may opt to participate in the program. In this paper, I exploit the variation in R-PACE participation dates among a subset of 81 cities in Southern California in order to determine the effectiveness of the program in increasing yearly residential solar panel installations. Using a difference in differences model under both static and dynamic event-study specifications, I find that a municipality's participation in R-PACE does not result in an increase in that municipality's yearly residential solar panel installations after the program is implemented, relative to cities which never implement the program. The insignificant findings are robust under multiple cutoffs, with the loosest event study cutoff suggesting that a city's participation in R-PACE may lead to a decline, rather than increase, in that city's yearly residential solar panel installations, relative to those municipalities which never implement the program. These findings contradict previous research on the effectiveness of R-PACE programs in California (Kirkpatrick and Benneer, 2014) which find a positive impact of program participation on yearly solar panel installations, and therefore may be of interest to policy makers who wish to better understand the effectiveness of the R-PACE program.

| Claire Volkmann |

Major: English

Mentor: Dr. Darnel Degand

Research Type: Honors Thesis in Major

Illustration's of Alice in Wonderland: Theories and Ways of Reading Pictures and Conversations

Alice in Wonderland is a story told through twin, interdependent narratives: writing and illustration. At the intersection of visual art and literature, illustrators are readers, interpreters, and translators of stories. Wonderland is kaleidoscopic, a place where meaning—about childhood, growing up, dreams and reality—is made, not found. I consider “childhood” in illustrations of Alice as falling into two categories: the eerie, where childhood is an unpleasant memory, and the familiar, where childhood is a time/place of nostalgia. These are not opposites but are connected by anxieties about growing up and the sometimes-violent loss of childhood. With this, I perform a critical analysis of Alice and a sample of its illustrations from the combined perspectives of art historian and literary scholar. This approaches illustrations simultaneously as existing independently from text (illustrator as artist) and as imposing a personal interpretation of the text (illustrator as translator). Ultimately, I suggest the ways that illustration makes, changes, or adapts meanings of classic children's texts especially for the adult reader, who seeks something more than childish delight: a reader who seeks purpose and meaning, solace and healing, fantasy and familiarity.

| Hannah Wang |

Major: Communication and Managerial Economics

Mentor: Dr. Seth Frey

Research Type: Honors Thesis in Major

Governing for Free: Rule Process Effects on Reddit Moderator Motivations

Developing a strong community requires empowered leadership capable of overcoming governance challenges. New online platforms have given users opportunities to practice governance through content moderation roles. The over 2.8 million “subreddit” communities on Reddit are governed by hundreds of thousands of volunteer moderators, many of whom have no training or prior experience in a governing role. While moderators often devote daily time to community maintenance and cope with the emotional effects of hate comments or disturbing content, Reddit provides no compensation for this position. Thus, moderators' internal motivations and desire to continue filling this role is critical for their community. Drawing upon the relationship between governance procedures and internalized motivation, we investigate how the processes through which subreddit moderators generate community rules increase moderators' motivation through the meeting of social-psychological needs: Procedural Justice and Self Determination, and Self-Other Merging. Preliminary analysis of survey data from 620 moderators across Reddit shows a correlation between moderators' administrative behaviors and the social-psychological needs underpinning their motivations. Understanding these relationships will allow us to empower moderators to build engaging and cooperative online communities. Keywords: Reddit, Self-governance, Moderation, Online communities, Leadership

| Luke Wangsness |

Major: Computer Science and Economics

Mentor: Dr. Giovanni Peri

Research Type: Honors Thesis in Major

Medicaid and Mobility: Investigating the Welfare Magnet Hypothesis Using US State Medicaid Program Expansions

I study the effect of public healthcare coverage availability on the location decisions of new immigrants to the US using the Children's Health Insurance Program Reauthorization Act (CHIPRA) of February 2009. Before CHIPRA, states were legally barred from covering most groups of new immigrants under state Medicaid and Children's Health Insurance Programs (CHIP) using federal funding for the first 5 years of their residence in the US. If states wanted to cover newly arrived immigrants, they had to do so using state-only funds. However, the CHIPRA reform gave states the option to use federal funding to cover new immigrant children and pregnant women through state Medicaid or CHIP without the 5 year waiting period that has been in place for most groups of newly arrived immigrants since the 1990s. I use the variation in state responses to the CHIPRA reform and find that there is no evidence that the reform increased immigration of pregnant women or children to states that expanded healthcare coverage to these groups.

| Katherine Weltzien |

Major: Psychology and Communication

Mentor: Dr. Alison Ledgerwood

Research Type: Honors Thesis in Major

Exploring Individual Differences in Attribute Framing and Reframing Effects

Research suggests that people's attitudes toward an issue depend on how that issue is described, or framed. Building on this literature, recent work has explored the effect of sequentially encountered frames. Studies on these reframing effects have found that people's attitudes tend to shift less when framing switches from negative to positive than from positive to negative. Though this "negativity bias" was initially understood as a universal human tendency to focus on potential threats, recent research indicates that both contextual and individual factors can influence negativity bias strength. In the present study, I focus on attachment style and personality traits as potential moderators. Using data from an undergraduate sample, I ran regression analyses testing participants' attachment scores and personality trait scores as moderators of negativity bias strength. None of the potential moderators significantly affected negativity bias strength, suggesting that these individual differences may not substantially alter reframing effects.

| Rain Yekikian |

Major: English

Minor: Professional Writing

Mentor: Dr. Joe Wenderoth

Research Type: Honors Thesis in Major

Creative Writing Portfolio

This portfolio is a compilation of poetry and creative nonfiction focused on experiences in my life, primarily my life with my family. My family has been one of the biggest parts of me; my grandparents in particular. My grandparents on my father's side passed away during the time I spent writing some of the material in this portfolio, so much of the work focuses on me overcoming that loss and reflecting on the time I was lucky enough to have with them. Yet some of the other work is just bits of my life and experiences as well. I do not have a specific theme for this portfolio, although I am sure there are multiple themes underlying the pieces here, such as love, loss, family, music, etc.

| Leon Zhuang |

Major: Computer Science

Mentor: Dr. Glenda Drew

Research Type: UHP Project

Visaudio: User-Driven Audio Visualization Database

Music evokes a variety of responses in a listener. Emotions - nostalgia, happiness, or sadness. Or memories - of better times, or of a loved one. Or even mental imagery - a serene forest, or perhaps a frozen tundra. The same song can evoke vastly different responses and experiences in different people. How can we communicate what music evokes in us? One possibility is audio visualization; it can be experiential and thought-provoking. A 2018 journal article on audio visualization and new media establishes a link between musical notes, visual imagery and emotions. Visaudio is a web application where users can choose a song and design a visualization based on what the song evokes. Users can then submit their visualization for others to experience. Visaudio uses the Web Audio API and one or more JavaScript graphics libraries for the audio visualization, and a database to save users' visualizations. By creating and sharing visualizations of music, my hope is that users will be able to convey their thoughts and feelings and gain a deeper understanding of what specific musical pieces mean to each of us.