Undergraduate Research and Creative Work

5 May 2023 – 8:45am to 1:15pm
Kuykendall Hall and via Zoom
Honolulu, Hawai‘i

SCHEDULE

TIME	ACTIVITY	LOCATION
8:45-9:15	Presenter Registration and Continental Breakfast	Kuykendall Courtyard
9:15-9:25a	Welcome	Kuykendall Courtyard
9:30-10:20a	Showcase Oral Sessions I	Kuykendall Breakout Rooms
10:20-10:30	Break	
10:30-11:20a	Showcase Oral Sessions II	Kuykendall Breakout Rooms
11:20-11:30a	Break	
11:30a-12:30p	Showcase Oral Sessions III	Kuykendall Breakout Rooms
12:30-1:15p	Poster Session & Lunch	Kuykendall Courtyard

MEETING INFORMATION

Physical Location and Zoom Meeting Room

SESSION	KUYKENDALL LOCATION	ZOOM LINK	MEETING ID
Main	N/A	http://go.hawaii.edu/M4x	91022587603
Olonā	KUY 209	http://go.hawaii.edu/C4x	99819638583
Naio	KUY 210	http://go.hawaii.edu/q4x	94134811836
Kukui	KUY 213	http://go.hawaii.edu/Y4x	93136107100
ʻUlu	KUY 302	https://hawaii.zoom.us/j/96792952152	96792952152
Kalo	KUY 303	http://go.hawaii.edu/XNx	92021817039
Moa	KUY 304	https://hawaii.zoom.us/j/93881729185	93881729185
Makaloa	KUY 305	https://hawaii.zoom.us/j/92558941284	92558941284
ʻAwa	KUY 306	http://go.hawaii.edu/x4U	98073853987
Limu Kala	KUY 308	http://go.hawaii.edu/xNy	98638304444
ʻIlima	KUY 309	http://go.hawaii.edu/E4x	91754182568
Wauke	KUY 310	https://hawaii.zoom.us/j/94849163360	94849163360
Posters	TBA	N/A, in-person only	N/A

Zoom meeting password for all oral rooms*:* showcase

LOCATION

Kuykendall Rooms

Oral Presentations Session One	9:30a - 10:20a
Oral Presentations Session Two	10:30a - 11:20a
Oral Presentations Session Three	11:30a - 12:30p

Olonā	Kuykendall 209
Naio	Kuykendall 210
Kukui	Kuykendall 213
‘Ulu	Kuykendall 302
Kalo	Kuykendall 303
Moa	Kuykendall 304
Makaloa	Kuykendall 305
‘Awa	Kuykendall 306
Limu Kala	Kuykendall 308
‘Ilima	Kuykendall 309
Wauke	Kuykendall 310

Kuykendall Courtyard

Lunch & Poster Session	12:30p - 1:15p

Oral Presentations Session One
9:30 - 10:20a

Olonā	**Kuykendall 209**
Liliana Kershner	Shape-Dependent Motion of Microswimmers Near a Wall: A Numerical Study
Kian Viernes	Low-Cost Fabrication of Flexible, High Resolution Laser Induced Graphene Sensors via Metal Stencils
Kai Merchant	A Modified Laryngeal Mask Airway Device to Increase Placement Accuracy

Naio	**Kuykendall 210**
Brandon Dela Cruz	Spatiotemporal Analysis of Distribution Patterns of the Pathogen E. Coli in an Urban Wetland
Nicholas Yos	Studying the Effects of Climate Change on the Growth of Mānoa Lettuce (*Lactuca sativa*)
Kathy Ho	The Ultimate Relationship Between King Tides and Watercress Yield

Oral Presentations Session One
9:30 - 10:20a

Kukui	**Kuykendall 213**
Jarrod Alejo, Ezekiel Domingo, Jaynine Parico, Naveen Pathika, Cole Pelayo, Evan Peng, Linda Qu, Shawn Suda, Kenton Wong, Toshio Yoshizumi	Team Hōkūlele
Deborah Higa	Team RoSE: Autonomous Rover for Mars Competition
Nicholas Beydler	Hubble Tension

ʻUlu	**Kuykendall 302**
Christien Burgess	Genome Editing of *Phytophthora palmivora* Using CRISPR Cas12a
Yousef Jad Sarameh	Characterization of Potential Domestication Candidate Genes in the Tropical Yam *Dioscorea alata*

Oral Presentations Session One
9:30 - 10:20a

Kalo	**Kuykendall 303**
Sophia Hernandez	Monitoring Seismic Noise in Mānoa during Covid-19 and Beyond
Kyra Leon	Quantifying the Transition from Occasional to Chronic Coastal Flooding

Moa	**Kuykendall 304**
Ke Cao	Coping with Change: Tight Junction Proteins Offer a Clue on How Fish Acclimate During Dynamically Changing Salinities
Megan Cerio Wettlaufer	Dorsal Fin Scarring as an Indicator of Fisheries Interactions with Pantropical Spotted Dolphins (*Stenella attenuata*) in Oʻahu and Hawai ʼi Island

Oral Presentations Session One
9:30 - 10:20a

Makaloa	**Kuykendall 305**
Tanner Choudhry	Impacts on Coral Reef Health by Parrotfish Feeding at Different Life History Phases
Shawn Sora Kobayashi	A Study on Potential Genetic Radiation in *Siphonaria* Populations on O‘ahu
Santiago Yanez	Assessing the Efficacy of Marine Fish Survey Methods

‘Awa	**Kuykendall 306**
Kaye Rochelle A. Nono	The Effects of Alternative Ribosomal Proteins on Morphogenesis of *Mycolicibacterium smegmatis*
Yuewen Ding	Production and Characterization of Pre Fusion Ebola Virus GP2 Expressed in *Drosophila* S2 Cells for Analysis of Vaccine-Induced Immune Responses
Viviana Gaytan, Jenna Matsuyama	Cultivation of Bacteriophage from New Bacteria Species

Oral Presentations Session One
9:30 - 10:20a

Limu Kala	**Kuykendall 308**
Malia Hasegawa	Neural Activities in Social and Asocial Populations of the Free Swimming Fish
Marianne Garcia	Behavioral Impacts of the Ketone Ester Treatment in the Genetically Asocial Cavefish
Nina Korte	On the Need to Stop

ʻIlima	**Kuykendall 309**
Justin Gerald Ocampo	Kunyari: Directing A Short Film about Performative Social Interaction Among Filipino Americans
Aja Tani	Daughter of Fyre and Blood
Justin Pascua	Māka'i

Wauke	**Kuykendall 310**
Yejun Kweon	North Korean Science Fiction: Marine Resources and Futurity of a Nation
Sarah Cartee	"In Standing Water Between Boy and Man": Gender Fluidity and the Early Modern Stage

Oral Presentations Session Two
10:30 - 11:20a

Olonā	**Kuykendall 209**
Lisa Lowe, April Vidad	Water Purification in Cambodia
Winnie Lau	Development of a Card Based Diagnostic Array for Portable Diagnostics
Ruby Anne Polintang, Matthew Sinco	Vertical Aeroponic Lettuce Growing System for Low Income Urban Communities

Naio	**Kuykendall 210**
Juliana Salehi	DNA Analysis of Invasive Ant Guts to Determine Predation of *Episimus utilis* in Hawai‘i
Keanu Rochette-Yu Tsuen	Correlation Between the Presence of *Leptospira* and Precipitation in He‘eia Fishpond
Celyna Becerra	Understanding the Immunoepigenetic Gut Microbiome Axis in Self-Esteem

Oral Presentations Session Two
10:30 - 11:20a

Kukui	**Kuykendall 213**
Brenton Sasaoka	Hidden Geometry of the Kōkō Net
Stephan Devis, Andrew Vu, Yanan Zeng	Variability In Atmosphere from Solar Energetic Events study (VIA-SEEs)

ʻUlu	**Kuykendall 302**
Brandon Najarian	Vegetation Shifts Across 90 Years on Mānana Islet
Genevieve Triplett	Quantifying Leaf Traits in Coastal and Montane Populations of ʻIlima
Elizabeth Aquino Peterson	Predicting Range Shifts of Invasive Grasses in Hawaiʻi Based on Their Photosynthetic Pathways

Oral Presentations Session Two
10:30 - 11:20a

Kalo	**Kuykendall 303**
James Crawford	Understanding The Formation of Surface Water In Magnetic Anomaly Regions Near the Lunar Poles
Wade Naguwa	Temporal and Spatial Variation in Pua‘a (Feral pigs; *Sus scrofa*) Activity across the Hawaiian Islands
Emma Molaski	Helium Isotope Monitor

Moa	**Kuykendall 304**
Abigail Bierwert, Joshua Schreiber	Symbiotic Fungi Influence the Assembly of the Mosquito Microbiome
Caleb-Matthew Olaso	Assembly and Nutritional Function of the Mosquito Microbiome
Adrianna Leilani Dupriest	The Role of Microbiome Composition on Ovariole Mitochondria Activity

Oral Presentations Session Two
10:30 - 11:20a

Makaloa	**Kuykendall 305**
Tess Rigler	Basic Behavior in the Invasive Mantis Shrimp G. falcatus during Territorial Fights
Jolie Tosten	Zooplankton Diversity, Community Composition, and Migratory Behavior in a Region of the Ocean at Near-term Risk of Deep-sea Mining Impacts
Anneke Wirth-Yap	Transcriptomic Analysis of Sea Cucumber Vision

ʻAwa	**Kuykendall 306**
Kiani N. Cruz	Characterization of Distinct Spatial Localization and Protein Interactions Associated with Dynamin 2 Mutations
Ju-Ling Chen	Computationally Modeling Tight Junctions to Understand The Paracellular Passive Permeation
Princess Jena Dalit Santiago	The Characterization of Mice Lacking the Gene for Selenocysteine Lyase in Brown Adipocytes

Oral Presentations Session Two
10:30 - 11:20a

Limu Kala	**Kuykendall 308**
Rochelle Mae Cadiente	Underrepresented Minority Medical Students and their Multiple Worlds
Laura Daclison	Academic Integrity During the Pandemic: Examining Behaviors and Key Motives for Plagiarism
Nicole "Nikki" Jennings	Love-Hacking: Rapid Systematic Review of Intranasal Oxytocin for Couples Therapy

ʻIlima	**Kuykendall 309**
Jui-Lien Sanderson	Home—>Homeless
Martha Nicholas	Decolonizing the Screen: Hawaii's Safety Net

Wauke	**Kuykendall 310**
Jiin Park	A Comparison of Concussion Knowledge and Attitude Between College Students in United States and Japan
Paul Ulanowicz	NIL: The Mega Quake that Hit College Sports
Jessica Lau	Understanding School Level Spending Patterns in Hawaiʻi

Oral Presentations Session Three
11:30a - 12:30p

Olonā	**Kuykendall 209** [Session starts at 11:45am]
Haley Currier	Comparison of Two Laser Systems to Detect Physiological Changes in *Azolla filiculoides* Due to Lead Exposure Using Laser-induced Fluorescence (LIF)
Sarah Hamada, Hawi Kitila	Melanin-Compensating Pulse Oximeter
Kimberly Naruse, Riku Omata, Amy Shell	Monitoring Hydroponic Lettuce for Tip Burn and Growth with Machine Vision

Naio	**Kuykendall 210**
Nils Melbourne	Polymer Upcycling with Benzazaphospholes
Marielle Kaye Cendana	Placental-Specific Gene Modulation through *In Vivo* Electroporation of Mice Blastocyst

Oral Presentations Session Three
11:30a - 12:30p

Kukui	**Kuykendall 213** [Session starts at 11:45am]
Tatum Umiamaka	Machine Learning to Discover First Supernovae with the James Webb Space Telescope
Preston Garcia	Ensuring Social Justice and Equity In Autonomous Vehicle (AV) Systems

ʻUlu	**Kuykendall 302**
Makana Ioh	Fungal-Bacterial Interactions May Lead to Suppression of Bacterial Antibiotic Resistance
Beatrice Pujol	Effects of Temperature and Nutrient Concentration on Photosynthesis and Growth by Native Alga *Microdictyon setchellianum* and Invasive Seaweed *Eucheuma denticulatum*
Maile Kuuleilani Wong	E Paʻa I Ke Kahua: Building Foundational Skills for Engaging in Community Driven Research

Oral Presentations Session Three
11:30a - 12:30p

Kalo	**Kuykendall 303**
Katherine Crowell	Expanding Ecological Economics: Utilizing Genuine Progress Indicator to Shift Economic Priorities in Policy and Budgeting in Hawai‘i
Kimberly Martin	Developing InSAR Deformation Models and Coulomb Stress Change Simulations of the 2018 Kīlauea Eruption
Dennis Trotter	Water Isotope Analysis in Hawai‘i

Moa	**Kuykendall 304**
Diego Chavez Malacara, Tavish McGreevy	Creating a Black Soldier Fly Food Waste Processor
Tanner Okamura	Enhancing Detection of Infectious Hypodermal and Hematopoietic Necrosis Virus in Shrimp
Duyen Dinh, Delaney Singletary	Characterization and Comparative Analysis of the Parasite-microbial Community in the American Crocodile (*Crocodylus acutus*)

Oral Presentations Session Three
11:30a - 12:30p

Makaloa	**Kuykendall 305** [Session starts at 11:45am]
Caroline Edmonds	Mysteries of the Musician Seamounts
Kylie Sarah Bebe	Hixon Lab Internship

‘Awa	**Kuykendall 306**
Noa Brenner	Evolution of Selenocysteine Lyase: Emergence of the Selenocysteine Decomposing Trait in Organisms
Christian Fernando-Alonzo	The Role of Phosphoglucomutase 5 in Embryonic Development

Oral Presentations Session Three
11:30a - 12:30p

Limu Kala	**Kuykendall 308**
Vanessa Khachik	Houseless Voices: Unhoused Hawai‘i Residents Propose Solutions to Crisis and Criminalization
Destiny-Rose Bataya	The Significance of Homelessness Narratives to the Recovery of Homelessness: Personal V. Agency Success Stories
Binierose Cacho	Impacts of Behavioral Preferences in Experimental Fish Auctions

‘Ilima	**Kuykendall 309** [Session starts at 11:45am]
Alec Tuason, Megumi Sakuta	The Consequences of Convenience: A Series of Short Films to Educate About the Effects That Nano- and Microplastics have on Hawaii’s Ecosystems
Nicholas Bolduc-Broadhurst	Kaehukai: The Red Sea
Kenzie Ozoa	Alon: Art and the Queering of Oceanic Filipinx Identities

Wauke	**Kuykendall 310**
Jessica Wielgus	Exploring the Effects of Bilingualism Through Entrepreneurship
Trinity Oshiro	Japan Exchange and Teaching (JET) and Americanization

Poster Presentations
12:30 - 1:15p – Kuykendall Courtyard

Alena Albertson	Investigating Heat Stress and Unfolded Protein Response-signaling Pathways in Plants
Noa Brenner	Evolution of Selenocysteine Lyase: Emergence of the Selenocysteine Decomposing Trait in Organisms
Cielo Anne Carnate	Gene Flow of the Lava Cricket: *Caconemobius* within Hawai‘i Island Lava Flows
Ellen Hughes	Formal Grammars for the Hawaiian Language
Dustin Isaiah Kepano Palos	Ho‘omalu Wahi: Developing Indicators of Urban Kumu Lā‘au Biocultural Services and Relationships
Joseph Romero	*Schrankia* Living on the Island of Hawai'i
Julie Kobayashi	Increasing Access to Reproductive Healthcare in Hawai‘i Through Policy Reformation

ABSTRACTS

Abstracts of oral and poster presentations are listed in alphabetical order of presenter's last name. Information below the name includes the student's major, the category of their presentation, and time/location of presentation. The faculty mentor, if appropriate, is listed below the abstract.

Group abstracts are listed alphabetically by the Last Name of the group member whose name occurs in this list:

Jarrod Alejo, Ezekiel Domingo, Jaynine Parico, Naveen Pathika, Cole Pelayo, Evan Peng, Linda Qu, Shawn Suda, Kenton Wong, Toshio Yoshizumi
Abigail Bierwert, Joshua Schreiber
Diego Chavez Malacara, Tavish McGreevy
Stephan Devis, Andrew Vu, Yanan Zeng
Duyen Dinh, Delaney Singletary
Viviana Gaytan, Jenna Matsuyama
Sarah Hamada, Hawi Kitila
Lisa Lowe, April Vidad
Kimberly Naruse, Riku Omata, Amy Shell
Ruby Anne Polintang, Matthew Sinco
Megumi Sakuta, Alec Tuason

Abstracts are direct from presenters; wording and content are the author's responsibility.

Alena Albertson
Molecular Biology and Biotechnology
Natural Sciences
MARC
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Investigating Heat Stress and Unfolded Protein Response-signaling Pathways in Plants

High temperatures associated with climate change cause heat stress in plants, which decreases crop yields and reduces food production. Heat stress creates protein unfolding and degradation, leading to endoplasmic reticulum (ER) stress and the unfolded protein response (UPR). During UPR, proteins cannot perform their necessary functions. The protein disulfide isomerases (PDIs) are protein-foldases that help plants recover from heat stress and regain homeostasis. PDIs rescue unfolded proteins and fold them into their correct 3D conformation. The inositol-requiring enzyme-1 RNase-kinase, IRE1, of the ER membrane, senses heat stress, then activates UPR. IRE1 splices a small intron from the mRNA encoding the bZIP60 transcription factor, which then allows bZIP60 to enter the nucleus and activate PDI9 gene expression for the heat rescue response. This project tests the effects of IRE1A and IRE1B knockout mutants and PDI9 overexpression on the UPR. The IRE1A/IRE1B knockout state will be confirmed using genomic PCR, whereas PDI9 overexpression will be proven by western blot analysis using a PDI9-specific antiserum. UPR will be molecularly measured in Arabidopsis protoplasts using RT-PCR and by laser scanning confocal microscopy of GFP fluorescence from the unique bZIP60-intron-GFP-bioreporter, with proper WT controls. PCR genomic mapping showed no band in *ire1A/ire1B* mutants relative to WT IRE1A/IRE1B genes, verifying gene knockouts. As controls, the TDNA insert was verified in each *ire1A/ire1B* locus. For the PDI9 overexpressor (OE) lines, western blot analysis shows ~4x increase of PDI9 concentration in the OE vs. WT samples. Uniform protein loading of samples was confirmed by Coomassie-staining and protein quantification.

Mentors: Dr. David Christopher, Rina Carrillo

Jarrod Alejo, Mechanical Engineering
Ezekiel Domingo, Mechanical Engineering
Jaynine Parico, Mechanical Engineering
Naveen Pathika, Mechanical Engineering
Cole Pelayo, Mechanical Engineering
Evan Peng, Mechanical Engineering
Linda Qu, Mechanical Engineering
Shawn Suda, Mechanical Engineering
Kenton Wong, Mechanical Engineering
Toshio Yoshizumi Mechanical Engineering
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 213 (Zoom: Kukui)

Team Hōkūlele

Team Hōkūlele is an innovative project that aims to give mechanical engineering students the opportunity to apply concepts learned in the classroom to a real world engineering project. The project focuses on designing, building, and launching a high-powered, two-stage rocket capable of reaching 25,000 feet and carrying a scientific payload.

The design of the rocket, including the selection of materials, rocket engine, and structural components has been thoroughly vetted through multiple rounds of presentations and trade studies. The team's design incorporates a powerful motor for the first stage and a smaller, yet still powerful, motor for the second stage. The team incorporates the use of Openrocket to run simulations of all rocket trajectories and confirm hand calculations.

The team aims to win first at this year's Friends of Amateur Rocketry competition in the Mojave desert. The rocket will achieve an altitude of roughly 25,000 feet and will carry a camera array payload which will successfully collect data during the flight.

In conclusion, the research highlights the potential for two-stage rockets in space exploration and scientific research. The team has also identified areas for future research, including the optimization of the rocket design and the integration of even more advanced payloads.

Overall, Team Hōkūlele's High-Powered, Two-Stage Rocket is a pioneering project that demonstrates the potential of two-stage rockets for space exploration and scientific research. The team's success in designing and launching the rocket provides valuable insights for future research in this field.

Mentors: Dr. Trevor Sorensen
Co-Authors: Vincent Aguilar, Lillian Shibata

Elizabeth Aquino Peterson
Biology; French
Natural Sciences
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 302 (Zoom: ʻUlu)

Predicting Range Shifts of Invasive Grasses in Hawaiʻi Based on Their Photosynthetic Pathways

Previous research and species distribution modeling (SDM) indicates plants have already shifted their growth ranges over the past century in response to climate change. Among various plant groups, invasive grasses are expected to respond particularly quickly to climate change because they grow and reproduce rapidly, and their seeds are easily dispersed. Invasive grasses are a concern because they can promote wildfires. They often form dense monocultures that reduce biodiversity and disrupt valuable ecosystem services. This research investigated the projected range shifts of invasive grasses in Hawai'i in response to climate change. SDMs were used to compare range shifts among invasive grasses that utilize different photosynthetic pathways (C3 BOP, C3 PACMAD, C4 PACMAD) to test the prediction that the photosynthetic pathway used by a grass is an important predictor of its range shift response to climate change. We compared current expected growth ranges to future expected growth ranges and found there is a significant increase in predicted total spatial extent across grasses generally with the UN's RCP 8.5 pathway for climate change. However, there was no overall difference in degree of this effect among the photosynthetic types. Visually, we concluded all C4 PACMAD grass range shifts appear to be most expansive at lower elevations, where both rainfall and temperature may increase in the future. Nine of the ten introduced forage grasses expanded their ranges at lower elevations. Land managers should be able to use the model predictions to proactively manage invasive grass growth shifts into high value conservation areas in response to climate change and educate the public on the changing ecology in Hawaiʻi.

Mentor: Dr. Curtis Daehler

Destiny-Rose Bataya
Social Work
Social Sciences
Honors
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 308 (Zoom: Limu Kala)

The Significance of Homelessness Narratives to the Recovery of Homelessness: Personal V. Agency Success Stories

By obtaining narratives from homeless individuals and the agencies aiding them, this paper will help provide a set of narrative factors contributing to client success and failure. Literature used for the comparative analysis includes autobiographies and agency success stories posted on their webpage. The main objective of this project is to provide a comparative analysis between the success stories of the agencies and those found in personal narratives. This paper will help describe the personal and agency narratives of success and where they diverge and converge. The hope is that this research will contribute to agency change, improved caseworker performance, and the client's success in moving from houselessness to being housed.

Mentor: Dr. Michael DeMattos

Kylie Sarah Bebe
Biology (B.S.)
Certificate in Marine Option Program
Natural Sciences
Also presenting at MOP Symposium and Tester's
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 305 (Zoom: Makaloa)

Hixon Lab Internship

The cushion sea star (*Culcita novaeguineae*) is a corallivorous sea star species. The project I worked on during my internship had three objectives. First, we sought to determine the cushion sea stars' preferred prey coral species, second, we wanted to understand the correlation between cushion sea star abundance and their preferred prey at different sites around Oʻahu. Lastly, we developed novel techniques to identify individual cushion stars. For the feeding preference study cushion stars were collected and placed in a holding cage for a week without food. Subsequently, each cushion sea star was placed in a feeding cage with two corals of different species. KiloCams were used to determine the order of consumption. The results of the feeding trial study concluded that imperforate corallite species are preferred over imperforate corallite species. In the cushion star abundance and percent coral cover project, ten different sites around Oʻahu were surveyed. At each site, we searched for cushion stars and took pictures of quadrats along a transect to estimate the coral cover by species. The software CoralNet was used to identify coverage by species. The results of this survey are in progress. Finally, for the computerized photo identification of individual cushion stars project pictures were taken of each cushion star at three different time steps. The photos were edited in I^3S Spot software using 30, 40, or 50 points method. The results are in progress but the software has over 85% accuracy in the 30-point method and over 90% in the 40-point method.

Mentor: Dr. Cynthia Franklin, Daniela Escontrela-Dieguez

Celyna Becerra
Molecular Cell Biology
Natural Sciences
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 210 (Zoom: Naio)

Understanding the Immunoepigenetic-Gut Microbiome Axis in Self-Esteem

Native Hawaiians and Other Pacific Islanders (NHPIs) experience disparities in mental health, as they have a higher prevalence of having depressed moods, suicidal thoughts, and illicit drug usage compared to non-Hispanic White People. While existing literature describes social determinants of mental health in this population, little is known about the biological mechanisms underlying the disproportionately higher rates of low self-esteem (LSE) related to depression among NHPIs. Herein, we investigated the immunoepigenetic-gut microbiome axis in a cohort enriched with NHPI participants (n=68) who provided biospecimens and completed a questionnaire containing the Rosenberg self-esteem scale (SE score). We observed that compared to individuals with normal self-esteem (NSE), those with LSE exhibited significantly higher plasma concentrations of proinflammatory chemokine IL-8 (*P=0.051*) and cytokine TNF-α (*P=0.011*). Using 16s-based sequencing, we identified associations of specific gut bacteria whose relative abundance significantly varied between the SE groups and correlated with SE score. Microbial diversity measured by Chao-1, Shannon, and Simpson indices did not exhibit any differences between the SE groups at the family, genus, and species levels. From monocytes enriched from blood samples of each participant, we analyzed DNA methylation using Infinium MethylationEPIC Beadchip and identified 104 CpGs that were differentially methylated between the NSE and LSE groups and were preferentially involved in biological processes related to metabolism based on Gene Ontology analysis. Altogether, these data reveal novel differences in the immunoepigenetic-gut microbiome axis that relates to self-esteem among NHPIs and implicates this axis in the pathology of mental health conditions including depression, warranting further investigation.

Mentor: Dr. Alika Maunakea

Nicholas Beydler
Physics; Computer Science
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 213 (Zoom: Kukui)

Hubble Tension

The Hubble constant is a constant that relates how fast the universe is expanding from a point in space at different distances, but the value is in constant disagreement. The disagreement on the value has been coined the "Hubble Tension", and our aim in this project is to build and test a statistical model that quantitatively analyzes this tension.

The statistical model we built is a Bayesian model that considers the input and output uncertainty in terms of holistic probabilities. Thorough testing of the model through simulated data verified the validity of our model.

In a preliminary manner, a value of the Hubble constant was obtained through the use of our statistical model on a small set of supernovae, which led us to fix the value of the Hubble constant as a constraint to test how the other parameters that determined it would shift in correlation.

The results of this rigorous research may quantitatively either confirm the tension or it may express that the tension is not as statistically significant as previously believed.

Mentor: Dr. David Rubin

Abigail Bierwert, Biology (B.S.), Minor in Medical Anthropology
Joshua Schreiber, Biology (B.S.)
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 304 (Zoom: Moa)

Symbiotic Fungi Influence the Assembly of the Mosquito Microbiome

Mosquitoes rely on a community of symbiotic microorganisms to sustain biological processes. Variation in the diversity of this microbiome has pervasive impacts on mosquito phenotypes that scale to impact mosquito physiology. Interdomain interactions between fungi and bacteria may account for some of this variation, however this hypothesis remains inadequately tested in host-associated microbiomes. Here, we test whether symbiotic fungi influence the assembly of the symbiotic bacteria community in *Aedes albopictus*, a globally distributed vector of human arboviruses. We allowed a mosquito microbiome to assemble among mosquito larvae in a controlled experiment by exposing them to microbial-rich water collected from natural larval habitats. To manipulate the microbial composition, we differentially filtered this water. A 50 µm-filtration allowed most of the fungal and bacterial diversity from the water sample to interact with experimental mosquitoes. A 10 µm-filtration disturbed the diversity of fungi available to the experimental mosquitoes, but not bacteria. A 0.1 µm-filtration greatly reduced the diversity of all microorganisms in the water sample. We inventoried the microbiome of mosquitoes reared in the water from the filter regimens with Earth Microbiome Project protocols. Mosquitoes from the 50 µm-filtration regime had a different assemblage of symbiotic fungi and bacteria than mosquitoes from 10 µm-filtration, 0.1 µm-filtration, and control, suggesting that interdomain interactions between mosquito-associated fungi and bacteria may influence mosquito microbiome assembly, and promote symbiont diversity among hosts. These findings provide new insights into the microbial community ecology of mosquito microbiomes and could potentially inform novel control strategies for mosquito-borne disease vectors.

Mentors: Dr. Matthew Medeiros, Chase Griffin

Noa Brenner
Molecular Biosciences and Biotechnology
Natural Sciences
Honors, Also presenting for INBRE
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 306 (Zoom: ‘Awa)
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Evolution of Selenocysteine Lyase: Emergence of the Selenocysteine Decomposing Trait in Organisms

Selenium (Se) is a trace element that is utilized in the production of the amino acid selenocysteine (Sec), found in selenoproteins, which are involved mostly in strong redox reactions to curb oxidative stress in cells. Sec lyase (SCLY) is an enzyme that decomposes Sec into alanine and selenide, which can be utilized to produce more selenoproteins. Strikingly, cysteine desulfurase (CysD) is a protein that performs a similar function to SCLY, as it breaks down the similar amino acid cysteine into alanine and sulfide. CysD is present in all domains of life. It is currently unclear if the SCLY gene is present in all domains of life. In addition, it is unknown which trait evolved first: the Sec-decomposing function or selenoprotein presence. Our objectives are to uncover the evolutionary history of SCLY and to compare its presence with the evolution of CysD.

To accomplish our goal, we mined genomic databases for SCLY and CysD protein sequences. Using the sequence alignment program JalView, we manually curated collected data, and used the python package ete3 to generate phylogenetic trees of SCLY and CysD, combined with the phylogenetic gene reconstruction programs PhyML, RAxML, and IqTree. By mining protein sequences of both SCLY and CysD, we generated a tree of life for SCLY and CysD and compared their evolutionary history. We inferred that selenoproteins were the trait that appeared first among living beings. Also, SCLY is not present in bacteria, having first appeared in Archaea. CysD potentially functions in bacteria as a Sec-decomposing enzyme.

Mentors: Dr. Lucia Seale, Dr. Marco Mariotti

Nicholas Bolduc-Broadhurst
Digital Media (B.A.)
Minor in Creative Media
Arts & Humanities - Creative
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 309 (Zoom: ‘Ilima)

Kaehukai: The Red Sea

The research team of Kaehukai: The Red Sea has created a short film with the guidance of the School of Cinematic Arts (SCA). Processes used for said project include but are not limited to writing the story, planning the shots needed to film in order to tell the story, scheduling the filming, hiring actors, hiring crew, getting permits to shoot at specific locations, shooting the film, and editing the film to its complete form.

This narrative short film utilizes ideas of Hawai’i tourism and colonization as a foundation to create discourse among audience members regarding the false narratives mainstream Hollywood presents Hawaii to be.

This project was started by Kaimana Broadhurst who wanted to do something positive for his culture through film. This has been a goal of his since entering the SCA which could not be possible without the teachings of Professor Scott Schimmel, Lisette Flannery, Thomas Chock, and department chair Christine Acham.

Mentor: Scott Schimmel

Christien Burgess
Molecular Biosciences and Biotechnology (B.S.)
Minor in Business Administration
Natural Sciences
UROP, also presenting at CTAHR Student Showcase
Oral Presentation: Session 1 (9:30-10:20a) in KUY 302 (Zoom: ‘Ulu)

Genome Editing of *Phytophthora palmivora* Using CRISPR-Cas12a

Phytophthora palmivora is a destructive oomycete plant pathogen. This oomycete is responsible for destructive diseases in many economically important crops grown in Hawai’i. Previously, CRISPR-Cas9 genome editing was utilized to better understand the function of the putative pathogenicity genes in *P. palmivora* by observing the characteristics of the pathogen after mutation of the gene. The objective of this research is to genetically modify P. palmivora using the Cas12a system as the current Cas9 system has limitations that Cas12a can potentially overcome. Cas12a can modify T-rich genomic areas, and create staggered ends, which allows for site-directed integration of desired genetic material. CRISPR-Cas12a is used to induce mutation on an effector protein belonging to the RXLR family, which was shown to play important roles in pathogenicity of oomycetes. Two single guide RNAs were designed, synthesized, and cloned into the pSTU-1 vector. The resultant plasmids were used to transform *P. palmivora* zoospores via electroporation and antibiotic media selection was used to determine the success of the transformation. Single zoospores from the transformed *P. palmivora* will then be isolated and analyzed for mutation by PCR and sanger sequencing. These advancements using the Cas-12a system have the potential to speed up the identification of the pathogenicity factors of *P. palmivora*, which can lead to targets for chemical and genetic control of this oomycete.

Mentors: Dr. Miaoying Tian, Achyut Adhikari

Binierose Cacho
Economics; Psychology
Social Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 308 (Zoom: Limu Kala)

Impacts of Behavioral Preferences in Experimental Fish Auctions

We were interested in observing how individual characteristics such as cognitive abilities, attitudes toward risk, patience, regret, and competitiveness relate to economic decision-making. This study investigates how individual behavioral features measured by survey instruments correlate with bidder behavior and bidders' profits in experimental laboratory auctions. Two auction formats, frequently used in fish auctions worldwide, were investigated in an economics laboratory. The first is a traditional Dutch auction in which the price is set and decreases until the first bidder bids to buy at a price. The second is the unique Honolulu auction, which combines increasing and decreasing bidding formats. Students from the University of Hawaii at Mānoa and the University of Technology Sydney (N = 197) participated in these experiments as potential buyers in these auctions. They were incentivized to bid with cash according to the experimental economics methodology. Before the auction experiments, validated non-incentivized surveys were used to elicit cognitive abilities, risk attitudes, patience, regret aversion, and competitiveness. We then correlate their behavior in auctions measured by their earnings with behavioral features. Findings showed that participants scoring higher on cognitive abilities tasks were likelier to earn more in both auction formats. In contrast, none of the other behavioral measures showed any significance in their auction earnings. This study indicates significant economic benefits in investing in developing individual cognitive abilities. Future research would focus more on relationships between risk attitudes, time preferences, regret, competitiveness, and economic decision-making. We are also interested in comparing incentivized and non-incentivized measurements in eliciting behavioral features.

Mentor: Professor Ekaterina Sherstyuk

Rochelle Mae Cadiente
Psychology (B.S.), Biochemistry (B.S.)
Certificate in Clinical Research Certificate Program
Social Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 308 (Zoom: Limu Kala)

Underrepresented Minority Medical Students and their Multiple Worlds

Physicians in the United States are predominantly White and male, although research indicates that diverse physicians can more effectively address the needs of diverse patients. Physicians with a comprehensive understanding of their patients' language and culture have an easier time establishing rapport, thereby improving patient outcomes. Hawai'i's physician shortage, particularly on the neighbor islands and regarding those who come from culturally and linguistically diverse backgrounds, further emphasizes the need for a diverse physician workforce. Bridging Multiple Worlds Theory is a framework for understanding how diverse students move through the academic pipeline and into the workforce. The majority of studies that use Bridging Multiple Worlds Theory focus primarily on diverse students and their path to college. Few follow students after college and into their careers. This study applied Bridging Multiple Worlds Theory to investigate how underrepresented medical students at the University of Hawai'i John A. Burns School of Medicine navigated the academic pipeline. Five students were surveyed and interviewed about their experiences as learners pursuing medicine. Despite the obstacles that they faced as students from backgrounds historically underrepresented in medicine, namely lack of resources, difficulty balancing demands of medical school with demands of life, and chronic feelings of imposter syndrome, students expressed that their drive to persevere is rooted in their identifying as underrepresented. When asked about how medical education could better support underrepresented students, they suggested mentorship from individuals with similar backgrounds both in and outside of medicine early in the process.

Mentor: Dr. Lois Yamauchi

Ke Cao
Marine Biology (B.S.)
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 304 (Zoom: Moa)

Coping with Change: Tight Junction Proteins Offer a Clue on How Fish Acclimate During Dynamically Changing Salinities

Fishes are capable of maintaining hydromineral balance despite changes in external salinity. The primary site of osmoregulation in fish is the gill. Tight junction proteins (TJP), play a key role in maintaining paracellular structural integrity in the gill epithelia and thereby are involved in the capacity of fish to regulate water and solute movement. The role of TJPs in the branchial epithelia of fish subjected to dynamic changes in salinity, however, is poorly understood. Here, we employed the Mozambique tilapia, *Oreochromis mossambicus*, a euryhaline teleost fish native to estuarine environment, to address the effects of salinity challenges on the mRNA expression of TJPs. Specifically, fish were kept in fresh water (FW), seawater (SW), and a simulated tidal regime (TR), consisting of changes between FW and SW every 6 h for 15 d. The branchial mRNA expression of claudin (*cldn4*)*, claudin-like protein (zf-a89),* occludin *(ocldn),* and *the* TJP *zo-3* was upregulated in fish sampled in the FW phase of TR compared with those in the SW phase of TR or in steady-state salinities. Furthermore, the expression of the TJP *zo-1* in the SW phase of TR was lower than all other salinity treatments. Collectively, these results indicate that TJPs can be rapidly activated in hypoosmotic environments under dynamically changing salinities and thereby provide a new perspective in the transcriptional regulation of osmoregulatory epithelia.

Mentor: Dr. Andre P. Seale

Cielo Anne Carnate
Biology; Women, Gender, and Sexuality Studies
Minor in English
Natural Sciences
Biology 499
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Gene Flow of the Lava Cricket: *Caconemobius* within Hawai‘i Island Lava Flows

Hawai’i is one of the most biologically diverse regions in the world due to its geographical isolation. The young age of the island of Hawai'i provides an evolutionary timeline for exploring speciation and species dispersal. The pahoehoe lava tubes in Hawai'i provide a unique opportunity for study of species and ecology in order to fully understand the extent of biodiversity in Hawaii. The lava tubes are home to an understudied group of cave-adapted arthropods, including the cave cricket genus *Caconemobius.* Among the first species to colonize lava flows, crickets provide the anchor that allows other species to inhabit lava flows. In the lava tube community, little is known about species interactions and gene flow. The goal of this project is to study whether the population structure through the genetics of *Caconemobius* correlates with the age and geography of the Hawaiian lava flows across the island. I will collect three *Caconemobius* specimens from each of the different lava flows from three volcanoes. Using the CO1 gene, I will DNA barcode each cricket to identify the species, and use this to generate a phylogenetic tree showing the genetic relationships between crickets from the different lava flows. By understanding the gene flow and population structure of Caconemobius, we can better understand the overall arthropod ecosystem within lava tubes. This information will help characterize biodiversity in Hawai‘i, including those in caves, which is important considering that biodiversity is dwindling at an accelerated rate.

Mentors: Dr. Rebecca Chong, Dr. Megan Porter

Sarah Cartee
English
Minor in Communicology
Arts & Humanities - Research
Honors
Oral Presentation: Session 1 (9:30-10:20a) in KUY 310 (Zoom: Wauke)

"In Standing Water Between Boy and Man": Gender Fluidity and the Early Modern Stage

In today's political climate, politicians' efforts to justify anti-trans legislation often rests on the claim that trans people are a relatively new historical phenomenon: that gender has always been polarized into a stable binary, a polarization that has never been challenged until now. However, through a deep examination of the history, characterizations, and performances of boy actors on the early modern English theater, my research demonstrates the ways in which this institution complicates this assumption, pointing to a historical tradition of trans figures. My research specifically turns to three of Shakespeare's plays—*Twelfth Night*, *Cymbeline*, and *As You Like It*—to examine the way in which gender is represented through the category of the 'boy' on the early modern stage, and how these boys represent a status that echoes contemporary visions of trans figures. Combining close readings of historical texts, analyses of literary criticism, and insights generated by recent developments in trans theory, my research demonstrates the ways in which the early modern stage destabilizes the supposed fixed gender binary, pointing to a gender fluidity that was not only accepted by audiences, but celebrated by Elizabethan playgoers. Through an analysis of the boy figure on the early modern stage, my research challenges political arguments that presume trans people do not have a history and illustrates that gender fluidity is more common than not.

Mentor: Dr. Derrick Higginbotham

Marielle Kaye Cendana
Biology
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 210 (Zoom: Naio)

Placental-Specific Gene Modulation through *In Vivo* Electroporation of Mice Blastocyst

Introduction: The placenta is a transient organ critical for embryonic development. It serves as the interface between the mother and fetus and provides nutrients to the fetus and other vital functions. Placental dysfunction has been associated with diabetes mellitus and cardiovascular diseases in adult life. This phenomenon has been termed fetal programming and the underlying mechanisms are not fully established. Placental-specific gene modulation will allow us to explore the mechanistic role of placental signaling pathways mediating the adverse effects of placental dysfunction.

Methods: Electroporation of red fluorescent protein (RFP) plasmid to blastocyst stage embryos in mice were utilized to achieve placental-specific gene expression. We expect that RFP will transfect into the embryo's trophectoderm, the cells which differentiate into the placenta. Embryos were collected from C57BL/6 female mice after superovulation and were electroporated at various voltages in high concentrations of RFP (0.5-1μg/μL). Electroporated embryos were transferred into pseudopregnant CD-1 females at E2.5 after coitus and then humanely sacrificed to detect RFP expression in the placenta and/or fetus (E12.5). PCR analysis was also performed to confirm successful transfection.

Results: Embryo transfer into surrogate females demonstrated a low successful implantation rate. However, of those with successful implantation (n=5), fluorescence was expressed in the placenta, with no apparent expression in the fetuses.

Conclusion: These findings suggest that electroporation of genetic elements can achieve placental-specific modulation. This method has the potential to further understand the role of genes in placental health and could be used to create intervention strategies for pregnancy complications.

Mentor: Dr. Johann Urshitz

Diego Chavez Malacara, Entrepreneurship
Tavish McGreevy, Entrepreneurship
Certificate in Business
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 304 (Zoom: Moa)

Creating a Black Soldier Fly Food Waste Processor

The goal for this project was to design and create an efficient way to deal with household food waste using Black Soldier Fly Larvae. We believed that we could design a device that could self-harvest larvae without any intervention from the user.

We began by building a very crude prototype which we used for two main purposes. Firstly, to establish a healthy Soldier Fly population. Second, to test out if mature larvae would self harvest themselves by crawling up a 35 degree ramp and into a container. Both objectives were met with the first prototype so we moved on. We used a variety of manufacturing techniques to build V2, the box was built using a combination of 3D printed parts and plywood panels held together by dovetail joints and sealed with a marine grade epoxy coating. We found tremendous success with V2 which started yielding larvae from day one. We are now able to process 100% of our personal household organic waste as well as small amounts of restaurant waste.

Through our research we were able to prove that a self-harvesting Black Soldier Fly system is an effective way to deal with household organic food waste. Additionally, we were able to create a base model from which we are continuing to build from. We are currently working on V3 aiming to make it cheaper, simpler, and have higher larval yields.

Mentor: Dr. Samir Khanal

Ju-Ling Chen
Biochemistry (B.S.)
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 306 (Zoom: ‘Awa)

Computationally Modeling Tight Junctions to Understand the Paracellular Passive Permeation

The organ and blood vessel surfaces of multicellular organisms are protected with sheets of closely joined cells, where cell-cell adhesion points are sealed by tight junctions (TJs) placed apically in the intercellular space. TJs are protein complexes that prevent the free diffusion of molecules, avoiding leakage between cell compartments and separating the bloodstream from underlying tissues. The primary barrier that mediates TJs results from a family of proteins called claudins, which polymerize in the membrane to create a continuous network of fibrils called TJ strands.

The crystal structure of human claudin-9 (PDB ID: 6OV3) was used to computationally model TJ pore arrangements integrated along the plasma membrane, surrounded by charged-neutralized water solvent at physiological pH. The stability of the modeled TJ was assessed using the Root-Mean-Square-Deviation (RMSD) of the system simulation at an equilibrium thermodynamic state. In addition, Transition-Tempered Metadynamics (TTMetaD) was applied to transport simulations permeating water and Na+ and Cl- ions, testing the pore’s charge- and size-selectivity.

The RMSD resulted in a stabilized TJ model that can be employed for transport simulations. The free-energy profiles of TTMetaD simulations indicate further force restraints necessary to avoid permeation interacting at the face of the membrane. Furthermore, the increased frequency for Cl- ion permeation was seen relative to the Na+ ions, attributing to charge-selectivity at the claudin-9 ECL1 loop. The established TJ model gives promising tools for understanding pathological pathways and designing therapeutics that require an atomistic-level understanding of paracellular permeation.

Mentor: Dr. Rui Sun, Christopher Kang, Mabel Bernaldez

Tanner Choudhry
Marine Biology
Natural Sciences
UROP, also presenting at Tester's
Oral Presentation: Session 1 (9:30-10:20a) in KUY 305 (Zoom: Makaloa)

Impacts on Coral Reef Health by Parrotfish Feeding at Different Life History Phases

Parrotfish are vital to coral reef health. They feed on the bottom substrate which contains crustose coralline algae, filamentous algae, turf algae, sediment, detritus, cyanobacteria, and live coral. Parrotfish excavate and scrape the substrate which also creates space for invertebrate and coral settlement and distributes sand through bioerosion. They are sequential hermaphrodites, starting as initial phase (IP) females before becoming terminal phase (TP) males. This study explores the hypothesis that bite rates differ among phases in both excavator and scraper species. I studied the feeding activity of the bullethead (*Chlorurus spilurus)* and palenose (*Scarus psittacus)* parrotfishes at Hanauma Bay from September 2022–April 2023. Single IP and TP individuals (n=30) were followed by snorkeling at a distance of 2-4 m and the number of bites taken on the benthic substrate recorded for 3 minutes. A two-way ANOVA on bite rate data showed a difference in feeding between phases ($p<0.001$) and species ($p<0.001$) supporting the hypothesis. There was no significant interaction effect between phase and species ($p=0.25$) which indicates that the two variables function independently. The average bite rate for IP was 29.2% higher than TP (12 (10:30-11:20a) bites/min) for palenose and 16.3% higher for IP bulletheads (TP=10.4 bites/min) ($p<0.001$). Current fishing regulations in Hawaii for each parrotfish species are based on a minimum length limit. Adding the feeding rate and unique policy for both TP and IP individuals will help protect the individuals which have the greatest positive impact on coral reefs. These data warrant a re-evaluation of parrotfish fishing regulations.

Mentor: Dr. Timothy Tricas

James Crawford
Earth Sciences
Certificate in Earth and Planetary Exploration
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 303 (Zoom: Kalo)

Understanding The Formation of Surface Water In Magnetic Anomaly Regions Near the Lunar Poles

While the presence of water (OH & H2O, hereinafter referred to as “water”) has been confirmed on the Moon, its origin on the lunar surface is not yet well understood. In this project, I assess these three possible origins for the presence of lunar water: solar wind, impacts, and the degassing of the lunar interior. I propose that solar wind implantation would be a major contributor to the formation of lunar surface water. Solar wind implantation occurs as its bombardment into the lunar surface brings with it positively charged hydrogen which interacts with the traces of oxygen residing on the lunar surface, then forming hydroxyl. I use ArcGIS software to compile lunar data collected from the Moon Minerology Mapper (M3), and the Lunar Reconnaissance Orbiter Camera (LROC) Wide-Angle Camera (WAC) to examine the variation of water distribution at lunar magnetic anomaly regions where there appears to be a reduction of solar wind flux locally while other variables remain constant. These areas provide a seemingly controlled environment to examine solar wind’s effect in relation to the formation and retention of lunar surface water. How such magnetic field anomalies play a role in the production and presence of lunar water has yet to be well understood and this project aims to address that void.

Mentor: Dr. Shuai Li

Katherine Crowell
Natural Resources & Environmental Management; Political Science
Minor in Chinese
Social Sciences
Honors, UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 303 (Zoom: Kalo)

Expanding Ecological Economics: Utilizing Genuine Progress Indicator to Shift Economic Priorities in Policy and Budgeting in Hawai‘i

Genuine Progress Indicator (GPI) is an economic welfare indicator that accounts for the costs and benefits experienced by a specific population at a specific point in time as a result of economic activity. Where Gross Domestic Product measures the total market value of goods and services produced annually within a country's borders, GPI aims to provide a more holistic view of the health of the economy, and challenges existing beliefs that economic prosperity is solely based on the growth of the market sector. Because GPI accounts for environmental and social health and wellbeing, utilizing this measure can prove key to shifting economic priorities, promoting sustainable development, and influencing public policy.

This research sought to answer the following objectives: 1) establish which legislative committees, and state departments have jurisdiction over policy areas corresponding with GPI sub-indicators, and therefore the potential to positively or negatively influence GPI indicator performance, 2) determine if a relationship exists between performance in GPI sub-indicators, and the amount of funding allocated to associated state departments, and 3) identify existing limitations, and potential opportunities, to utilize GPI in Hawai‘i's budgeting and legislative processes. The results from this study highlight that for nearly all GPI sub-indicators, jurisdiction is spread across multiple committees and departments and sub-indicator performance is not solely impacted by correlated department funding. Furthermore, findings demonstrate that departmental accountability, stakeholder engagement, and cross-department and cross-committee communication and coordination focused on enacting policies targeted at sub-indicator performance, are essential for the integration of GPI into Hawai‘i governmental policy.

Mentors: Dr. Kirsten Oleson, Dr. Regina Ostergaard-Klem

Kiani N. Cruz
Neuroscience, Interdisciplinary Studies
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 306 (Zoom: ‘Awa)

Characterization of Distinct Spatial Localization and Protein Interactions Associated with Dynamin 2 Mutations

Charcot-Marie-Tooth disease (CMT) and centronuclear-myopathy (CNM) are inherited neuromuscular-disorders affecting the nerve and muscle, respectively. There is currently no known overlap between the mutations that are associated with CMT and CNM. Dynamin-2 (DNM2) is a large, five-domain, protein GTPase which aids vesicle release into cells by facilitating cell membrane breakage during endocytosis. In this study, despite being linked to different diseases two DNM2 mutations, DNM2-ΔDEE and DNM2-R369W, are suspected to yield analogous spatial localization and protein interactions. Hence, reinvestigating the prevailing consensus that CMT-associated and CNM-associated DNM2 mutants possess different physical and enzymatic properties. Via confocal microscopy, the CMT-linked mutant, DNM2-ΔDEE, and the CNM-linked mutant DNM2-R369W are compared to the DNM2-wildtype. In each construct, the DNM2 plasmid is transfected with GFP (green-fluorescent-protein), and the protein measuring endocytic behavior, RAB11, is transfected with mScarlet-I (a red-fluorescent-protein). Thus, only DNM2 differs amongst the constructs i.e. wildtype, ΔDEE-mutant, and R369W-mutant; all three DNM2-constructs are co-transfected with RAB11. Colocalization data analysis will showcase if CMT/CNM pathology overlaps, contrary to contemporary literature. Preliminary data suggests that DNM2-ΔDEE and DNM2-R369W exhibit statistically significant Rab11-interactions that differ from the DNM2-WT. Supporting the notion that DNM2-R369W and DNM2-ΔDEE mutations potentially exemplify overlapping pathologies. Indicating that CMT and CNM potentially possess similar pathology, opposing other findings that CNM and CMT are gain-of-function and loss-of-function mutations, respectfully. Dynamin is a key cell signaling molecule, therefore progressive contribution to its distinct behaviors and mechanisms holds promising potential. Which may lead to additional novel downstream molecular interactions associated with disrupted DNM2 function.

Mentor: Dr. Nicholas James
Co-Author: Luke Nelson

Haley Currier
Earth Science
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 209 (Zoom: Olonā)

Comparison of Two Laser Systems to Detect Physiological Changes in *Azolla filiculoides* Due to Lead Exposure Using Laser-induced Fluorescence (LIF)

Deposition of heavy metals and radionuclides from anthropogenic activities such as mining and industrial production may pose a high degree of toxicity within the environment. These contaminants can be stored in a plant's tissue and cause metabolic fluctuations that can induce physiological changes. That physiological change is a response to changes in chlorophyll a/b ratios which can be detected using laser-induced fluorescence (LIF) spectroscopy. LIF is a spectroscopic tool that can be used for real-time analysis of chlorophyll by observing shifts in molecular energy levels due to laser excitation that causes fluorescence as a biological response. LIF responses are captured as images using a CMOS camera in which pixels are extracted and analyzed as histograms to show the change in RGB decimal code values. These histograms demonstrate the strong correlation between changes in total chlorophyll content and metal uptake. Two laser systems with wavelengths of 445 nm and 462 nm corresponding to chlorophyll a and b absorption peaks were used, respectively. *Azolla filiculoides,* an aquaponic fern that is commonly used for extraction and removal of contaminants from an environment, was used as a study plant. The goal of this project was to test laser capabilities, specifically the various distances and light conditions that can be used to image plants, as well as the sensitivity of detecting plant response to different levels of heavy metals. This testing helps fine tune laser system settings and explore its capabilities to further enhance this remote sensing technique in identification and quantification of heavy metals concentrations within the environment.

Mentor: Dr. Henrietta Dulai
Co-Author: Kelly Truax

Laura Daclison
Secondary Education General Science
Social Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 308 (Zoom: Limu Kala)

Academic Integrity During the Pandemic: Examining Behaviors and Key Motives for Plagiarism

Academic honesty is a major concern in education. Previous studies identified nine underlying reasons for plagiaristic actions. Due to the difficulty in researching

student plagiarism and minimal time to do so during the pandemic, there are few studies that target how academic dishonesty has been impacted by the COVID-19 pandemic. In Spring 2020, in-person courses quickly transitioned to on-line courses that adhered to pandemic-related safety regulations. This study compared students' behaviors and experiences related to academic honesty through an analysis of plagiaristic actions and survey responses that collected qualitative and quantitative data prior to and during the pandemic. Results showed an increase in students who plagiarized during the pandemic and those who reported increased pressures due to underlying conditions and stress. Researchers also review methods and strategies to overcome plagiarism when transitioning from on-line to in-person courses based on our findings.

Mentor: Dr. Michael-Brian Ogawa
Co-Author: Branden Ogata, Sean Mosier, Brendan Urayanza

Brandon Dela Cruz
Global Environmental Science
Certificate in Geospatial Information Science
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 210 (Zoom: Naio)

Spatiotemporal Analysis of Distribution Patterns of the Pathogen E. Coli in an Urban Wetland

Escherichia Coli (*E. coli*) is a naturally occurring pathogen and is ubiquitous throughout aquatic environments in tropical climates. Despite the multitude of natural sources, it may also be originating from wastewater linked to human sources and in high concentrations can lead to severe health issues l.

This study set out to monitor *E. coli* concentrations across a wetland that is surrounded by urban land uses, including wastewater infrastructure, cemented stream beds capturing runoff, parking lots, and a highway. The approach to understanding the distribution patterns of *E. Coli* over space and time was to collect monthly water samples at 20 different locations across the wetland. Multiple hypotheses explored E. Coli distribution concerning proximity to wastewater infrastructure, runoff from parking lots and roads, and springs delivering groundwater to the wetland. On the temporal scale, the hypotheses explored *E. coli* surges' relations to rainfall events linked to surface runoff or alternatively to higher temperatures relating to stagnant water bodies on the wetland.

All water samples were processed and analyzed using an IDEXX Colilert 100 mL format system for presence-absence detection and quantification according to the manufacturer's instructions. The results indicate that there is a spatial pattern to *E. Coli* distribution with higher occurrences along the eastern plots. There was no correlation found with rainfall although there were no major precipitation events during the course of study.

Mentor: Dr. Henrietta Dulai

Stephan Devis, Physics
An Vu, Mechanical Engineering (Aerospace Application)
Yanan Zeng, Mechanical Engineering
Certificate in Earth and Planetary Exploration Technology (EPET) Certificate
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 213 (Zoom: Kukui)

Variability In Atmosphere from Solar Energetic Events study (VIA-SEEs)

Project VIA-SEES aims to address key knowledge gaps as defined by NASA across multiple decadal references as well as the NASA Heliophysics Roadmap (Our Dynamic Space Environment, 2014). In particular, this roadmap outlines the importance of understanding Earth's atmospheric response to auroral, radiation belt, and solar energetic particles in the form of variability in Nitrogen Oxides (NOy) and Ozone (O_3). This can be done by collecting measurements of baseline levels of atmospheric ozone in non-SPE intervals, and the magnitude of ozone depletions, before, during, and after solar energetic particle events. The VIA-SEEs team is particularly interested in collecting measurements of both relativistic electrons and energetic protons simultaneously with NO_x and ozone measurements. The acquisition of these measurements with both high fidelity time and energy resolution would provide new data on the speed and extent of these depletion events which would be constructive for atmospheric science models. While remote-sensing data of solar energetic particles and mesospheric composition spectra have been collected by separate missions (e.g. AURA, UVSC Pathfinder), no previous mission has flown two instruments on a single spacecraft bus to collect a unified, bimodal data set of such phenomena.

To accomplish this, project VIA-SEEs intends to utilize one 3U CubeSat in Low Earth Orbit (LEO) to measure the direct correlation between solar energetic particle fluxes and the variabilities in the total reactive Nitrous Oxides (NO_2) and Ozone (O_3) concentration in the mesosphere. The VIA-SEEs mission was one of eight missions selected for launch during the 14th round of NASA's CubeSat Launch Initiative (CSLI) program. We are projected to launch in Q1 of 2025 in order to be fully operational during Solar Maximum.

Mentor: Dr. Peter Englert
Co-Authors: Matthew Leonard, James Crawford, Yan Shan Liu, Glen Miguel-Matsumoto, Katlynn Vicuna, Kenny Son

Duyen Dinh, Biology
Delaney Singletary, Animal Science; Minor in English
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 304 (Zoom: Moa)

Characterization and Comparative Analysis of the Parasite-microbial Community in the American Crocodile (*Crocodylus acutus*)

We examine and characterize the bacterial microbiome composition of nematodes collected from the gastrointestinal tract of wild American crocodiles (*Crocodylus acutus*) from Belize. The microbiome is a bio-ecological community composed of multiple symbiotic, commensal, and even pathogenic microorganisms -- known as microbiota -- residing in a living host (Turnbaugh et al., 2007; Jenkins et al. 2019). This project will be based on the expected goals of the Parasite Microbiome Project, also known as PMP, which catalogs parasite microbiomes and elucidates their importance and function with respect to their associated hosts (Dheilly et al., 2017). The composition and diversity of bacterial populations in host microbiomes are known to affect host resistance, parasite virulence, and parasite-associated diseases (Jovel et al., 2016; Dheilly et al., 2017). Currently, there is a paucity of data studying the role of microbes in host-parasite interactions, in addition to the mechanisms driving microbiome variation in parasites and infected hosts. The goal of our study examine the characteristics of microbiomes of parasites from the American crocodile and to be able to add to the expanding catalog of parasite-host interactions. Our objectives for this study were therefore (1) to use morphological characteristics and genetic barcoding to first identify the nematode species collected from *C. acutus* hosts; (2) to characterize the microbiome composition of collected nematodes; and (3) to analyze the compositional diversity between the host species.

Mentors: Dr. Floyd A. Reed, Helen Sung

Yuewen Ding
Molecular Cell Biology
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 306 (Zoom: ‘Awa)

Production and Characterization of Pre-Fusion Ebola Virus GP2 Expressed in *Drosophila* S2 Cells for Analysis of Vaccine-Induced Immune Responses

Introduction: The Ebola virus (EBOV) causes hemorrhagic fever with high mortality rates in humans. The EBOV’s glycoprotein (GP) contains two subunits (GP1 and GP2). GP1 is responsible for receptor binding. Upon receptor binding, pre-fusion GP2 undergoes conformational changes, facilitating membrane fusion to release viral RNA. Our lab has developed a recombinant Ebola GP subunit vaccine which has shown high protective efficacy in non-human primates (NHPs). However, the mechanism by which GP-specific antibodies confer protection requires further investigation. Our research focuses on defining the role of GP2-specific antibody binding in vaccine-induced protection.

Methods: The EBOV GP2 gene was designed as a synthetic gene with stabilizing mutations and ligated into pUHM plasmid with a C-tag on the C-terminal end. Generated plasmids were amplified in *E. Coli* and transfected into *Drosophila* S2 cells. Stably transformed *Drosophila* S2 cell lines were selected by adding hygromycin. Protein expression was induced by adding CuSO4 and purified using affinity chromatography before characterization by SDS-PAGE and Western blot.

Results: The EBOV GP2 gene was cloned into the pUHM vector, and Sanger sequencing showed the presence of targeted mutations and the C-tag. Double-digest reactions and gel electrophoresis confirmed the correct gene size indicating the successful generation of an expression plasmid encoding stabilized pre-fusion GP2.

Conclusion: Stable pre-fusion EBOV GP2 can be used to characterize serum antibody response from NHPs immunized with an EBOV subunit vaccine. We will investigate whether pre-fusion GP2 is more effective than the prior GP2 lacking stabilizing mutations at detecting antibodies in immunized NHP sera.

Mentor: Dr. Axel Lehrer
Co-Authors: Aquena Ball, Albert To, Bryan Suechting

Adrianna Leilani Dupriest
Molecular Biosciences and Biotechnology
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 304 (Zoom: Moa)

The Role of Microbiome Composition on Ovariole Mitochondria Activity

The goal of this project was to determine the effect of the microbiome on mitochondrial activity and reproductive physiology, using the model organism *Drosophila melanogaster* (fruit fly). The microbiome is the aggregate of all microbes that reside in an organism and plays a major role in the metabolism, immunity and overall health of the host[1]. Previous studies have shown that differences in microbial composition have significant effects on reproductive development and fitness of *D. melanogaster*[2] . The pathways by which microbes may impact reproductive development are currently unknown. Mitochondrial activity has previously been linked to oogenesis (egg production)[3]. This project will test the following hypothesis: the microbiome impacts reproduction by changing mitochondrial activity in the developing ovary.

The experiments utilized two lab populations of *D. melanogaster* (W1 and W2) that had been inoculated with microbes from wild flies collected from two sites in Waimea Valley, along with axenic (germ-free) counterparts. Single ovarioles from each population were dissected, stained with a fluorescent mitochondrial marker (Mitotracker) and tetramethylrhodamine, ethyl ester (TMRE), a mitochondrial potential dye, and imaged using confocal microscopy. Based on the relative fluorescent intensity of the TMRE marker, our results indicate that W2 flies have greater mitochondrial membrane potential than the W1 flies, consistent with preliminary results showing that W2 flies are more fecund than W1 flies. Axenic counterparts to the W1 and W2 flies showed no significant differences in mitochondrial membrane potential. These results indicate that the microbiome impacts reproduction by changing mitochondrial activity.

Mentor: Dr. Joanne Yew

Caroline Edmonds
Marine Biology
Minor in Geography (emphasis in GIS)
Natural Sciences
Honors, Also presenting at Tester's
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 305 (Zoom: Makaloa)

Mysteries of the Musician Seamounts

Deep sea habitats are susceptible to exploitation. One habitat of utmost importance is seamounts. Seamounts or underwater mountains serve as a hotspot for biodiversity in the deep sea and have rare earth metals like manganese present. A handful of previous studies have focused on large-scale biogeographic studies of seamounts but very little is known about the fine-scale distribution of species on seamounts. A series of dives were conducted throughout the Pacific where the count and identification of species were done by HURL Lab (UH) and NOAA for all the dive transects. The data collected was treated to investigate the fine-scale patterns of deep-sea gorgonian corals and sponges along ten seamounts in the Musicians seamount group. The results of the analyses will be compared to a similar study conducted in the Atlantic Ocean.

Mentor: Dr. Les Watling

Christian Fernando-Alonzo
Psychology (B.S.); Biology (B.S.)
Natural Sciences
MARC
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 306 (Zoom: ‘Awa)

The Role of Phosphoglucomutase 5 in Embryonic Development

Phosphoglucomutase 5 (PGM5) is an enigmatic member of the PGM family of glycolytic enzymes. Studies in muscle tissue suggest PGM5 serves as a structural protein promoting cell-cell adhesion in association with cytoskeletal proteins, which distinguishes PGM5 from the other four PGM proteins that clearly function as enzymes. While some members of the PGM family have been shown to be essential for development using mouse models, it has not been determined whether this is the case for PGM5. This project will determine whether PGM5 deficiency in mice is embryonic lethal and, if so, at what stage of embryonic development is disrupted. To this end, we have established a mouse strain with exon 2 of both alleles of the mouse PGM5 gene flanked by loxp sites ($PGM5^{fl/fl}$). These mice have been mated with a strain of mice with one copy of the Cre recombinase driven by a CMV promoter (CMV-cre). PCR was used to track the presence of the loxp sites as well as CMV-cre transgene. Results showed that the PCR protocol used successfully confirms both of the DNA elements. This has enabled our research group to plan a breeding scheme to generate offspring with PGM5 deleted at both alleles, i.e. a homozygous knockout mouse. The pups generated from this breeding scheme will be analyzed for frequency of knockout pups and compared to expected Mendelian frequencies.

Mentor: Dr. Peter Hoffmann
Co-Authors: Lance Nunes, Chi Ma, Fukun Hoffmann

Marianne Garcia
Molecular and Cell Biology (B.S.)
Natural Sciences
Honors
Oral Presentation: Session 1 (9:30-10:20a) in KUY 308 (Zoom: Limu Kala)

Behavioral Impacts of the Ketone Ester Treatment in the Genetically Asocial Cavefish

Previous studies have shown that the ketogenic diet can benefit the human physiologies, including the tumor suppression and mitigating epilepsy and Alzheimer enhancing metabolism and endurance, while negatively affecting gut and bone homeostasis, and body growth. The medical applications of the ketogenic diet remain one of the less researched fields, and there remains a large gap in the mechanistic knowledge of how ketosis mitigates asociality. The Mexican tetra known as *Astyanax mexicanus* has been identified as an experimental platform to explore the effects of the Ketogenic diet on ASD-like behavior. The cavefish subspecies of *A. mexicanus* in particular has exemplified several phenotypic behaviors consistent with ASD-like behavior including asociality, sleeplessness, hyperactivity and repetitive behavior, compared with its conspecies, a typical riverine-form surface fish. To reveal the effect of ketone body molecules rather than the ketogenic diet, which contains numerous nutrients, this study use the Oxford Ketone Ester (KE: ketone body)as a dietary supplement. The 5 week supplemental treatment in both the surface fish and cavefish confirmed the ability of exogenous ketones to promote social interaction in the cavefish, as well as reduce hyperactivity, however no detectable effect on the reduced sleep. The KE treatment also increased the midgut width in cavefish, indicating that the Ketone Ester could potentially induce a larger surface area to facilitate efficient energy absorption. This study provides the foundation of exploring mechanisms for regulating the ketone body-brain function path, and introduces the Oxford Ketone Ester as a potential supplement to mitigate asociality and hyperactivity.

Mentor: Dr. Masato Yoshizawa

Preston Garcia
Computer Science Data Science Track
Minor in Mathematics
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 213 (Zoom: Kukui)

Ensuring Social Justice and Equity In Autonomous Vehicle (AV) Systems

In this work, the potential for optimizing vehicle paths of different people's recorded household activities in the context of a public autonomous vehicle (AV) system taking requests to pick up and drop off people. Discussions have already envisioned an AV that circulates without a fixed route or schedules, for example, on campus it has been discussed as community members requests arise over time. To investigate this potential, data was collected on Hawaii resident's daily household activities. The data was formatted so that it could be modeled as a household activity pattern problem (HAPP). Then, the AV would be simulated as four different heuristics implemented to solve the HAPP previously proposed by Wilfred Recker: the (i) saving heuristic, (ii) an insertion heuristic maximizing partial route benefits, (iii) an insertion heuristic minimizing total distance and time, and (iv) an insertion heuristic prioritizing customer urgency. The heuristics were compared to each other and the original paths taken by the households on the basis of three different metrics: number of vehicles used, idle time of the vehicle, and the duration that the vehicle was out of the household. After running the heuristic simulations, it was found that the heuristics often have less vehicles used, less wait time, and less duration outside of the households.

Mentor: Dr. Roger Chen

Viviana Gaytan, Biology
Jenna Matsuyama, Botany
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 306 (Zoom: ‘Awa)

Cultivation of Bacteriophage from New Bacteria Species

All *Bacteria* are assumed susceptible to infection by bacteriophage. However, few *Bacteria* genera have been well studied in terms of such infections. Most *Bacteria* species have not been tested at all, and that is especially true for recently discovered species. The range of *Bacteria* that bacteriophage can infect varies, with some infecting many species, and others able to infect just one. Still, the number of known bacteriophage species is a fraction of the formally described *Bacteria* species. Six *Bacteria* cultures from six known genera, cultivated from diverse aquatic, terrestrial, and urban habitats in Hawai‘i, are being formally described as a new species in our host laboratory: JM171 (*Luteimonas* sp.) from coral, BL16A (*Bradyrhizobium* sp.) and BL16E (*Paraflavitalea* sp.) from a lava cave, MD30B (*Chitinophaga pendula*) from an air conditioner, 73W (*Caulobacter* sp.) from seawater, and K61 (*Brenneria* sp.) from a lo‘i. Genes related to those in bacteriophage were detected in each cultures’ genome: we thus aimed here to cultivate phage from 22 soil and 13 water samples that would infect these new species. A laboratory culture of *Escherichia coli* was included because it is widely known to be susceptible to phage in the environment. In all, we cultivated six bacteriophages that infected *E. coli*, but none that infected any of the new *Bacteria* species. We provisionally describe these bacteriophages here.

Mentor: Dr. Stuart P. Donachie

Sarah Hamada, Biological Engineering
Hawi Kitila, Biological Engineering
Engineering & Computer Sciences - Research
UROP, also presenting at the CTAHR Student Showcase
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 209 (Zoom: Olonā)

Melanin-Compensating Pulse Oximeter

Over the course of the COVID-19 Pandemic, the use of fingertip pulse oximeters increased greatly due to their ability to measure blood oxygen (SpO2) levels. However, these devices have been found to overestimate the SpO2 levels in people with darker skin tones. This is due to melanin interference, since both melanin and oxygenated hemoglobin absorb light at 940 nm. This extra absorption results in the overestimation of SpO2 levels in people with more skin pigmentation. This project aims to develop a pulse oximeter that can compensate for the user's skin tone in order to give an accurate SpO2 reading. The prototype will implement the design of a fingertip pulse oximeter as well as implement the Fitzpatrick Scale and a camera to categorize the user's skin tone and use a correction factor to output an accurate SpO2 reading.

Mentor: Dr. Daniel Jenkins

Malia Hasegawa
Biology
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 308 (Zoom: Limu Kala)

Neural Activities in Social and Asocial Populations of the Free Swimming Fish

Animals evolved their behaviors to adapt to their environments, including the level of social interactions. However, how the brain activities are different in-between social- and asocial-naturally evolved populations are unknown. We use an experimental and comparable fish model, *Astyanax mexicanus,* which consists of riverine social population (surface fish), and its highly distinct cave-dwelling population (cavefish). Cavefish were diversified from surface-type ancestors 20-200 thousand years ago and evolved in perpetually dark caves. Besides cavefish regressing their vision, they also reduced their social affinity. In contrast, surface fish still show high social affinity even in the dark, a vision-deprived condition. Up until today, it is largely unknown how neuronal activities generally associated with sociality are attenuated in the asocial cave population. By using an immediate early gene, p-ERK, which labels the active neurons and is detectable through immunohistochemistry, we visualized the active neurons and mapped them in the entire brain region. Tissue clearing was performed with CUBIC (Clear, Unobstructed Brain/Body Imaging Cocktails and Computational Analysis) which can allow for whole-brain imaging by a combination of fluorescent labelings. Using confocal scanning, we were able to see that we successfully stained the preoptic area and striatum which are associated with sociality in the brain and were active in the social surface fish. We are excited to share the most updated results in this Undergrad Showcase Presentation.

Mentor: Dr.Masato Yoshizawa

Sophia Hernandez
Earth Science
Minor in History
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 303 (Zoom: Kalo)

Monitoring Seismic Noise in Mānoa during Covid-19 and Beyond

Since July 2020, Dr. Helen Janiszewski has installed five Raspberry shake seismometers in Mānoa Valley, including one at the University of Hawai‘i at Mānoa campus. During this time, lockdowns due to the ongoing COVID-19 pandemic were in full swing, during which seismic noise due to anthropogenic sources decreased dramatically (Lecocq et al., 2020a). The goal for this project is to use these Raspberry shakes and collect data to create graphical figures using programs such as Python and MATLAB to further analyze. The results from the analysis will determine the change in seismic noise in in Mānoa Valley from the height of the COVID-19 lockdown to when students returned to campus, along with the inevitable increase of tourism following the lifting of all restrictions on the island.

Mentor: Dr. Helen Janiszewski

Deborah Higa
Mechanical Engineering
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 213 (Zoom: Kukui)

Team RoSE: Autonomous Rover for Mars Competition

The purpose for Team RoSE (Robotic Space Exploration) is to establish a rover team at the University of Hawaii at Manoa (UHM), to promote the robotics and aerospace field by completing the University Rover Challenge (URC). Team RoSE has designed a rover capable of completing components of a Mars exploration mission derived from the URC rules, which include the ability to perform in-situ life analysis, equipment servicing, object delivery in extreme terrains, and autonomous navigation. The rover has been able to successfully perform isolated mission operations, but has yet to demonstrated full mission competence. Moving forward, the rover system will undergo rigorous system testing to ensure the system is capable of reliably performing mission operations in a simulated Mars environment.

Mentor: Dr. Frances Zhu

Kathy Ho
Environmental Earth Science (B.A.)
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 210 (Zoom: Naio)

The Ultimate Relationship Between King Tides and Watercress Yield

Watercress (*Nasturtium officinale*) is of great economic importance in the Hawaiian Islands due to limited supply and popular demand in the food industry. Sumida Farm is located on the island of O'ahu in the Pu'uloa aquifer. The watercress fields at Sumida Farm depend on the freshwater supply that comes from the Kalauao Springs. King tides push seawater into the aquifer and through channels on to the farm. Change in the salinity of the water provided to Sumida Farm may negatively impact watercress growth so the objective of this study is to monitor salinity spatial and temporal distribution at the farm over a 12-month period.

The study focuses on 12 watercress plots along the discharge canal that is connected to Pearl Harbor. The measurements taken at these locations are temperature, salinity, and dissolved oxygen levels. The samples collected at 3 watercress plots are analyzed for nutrients. Weather, tides, and watercress harvest yield data are also collected. This allows for identification of correlations between fluctuations in salinity, the appearance of king tides and whether these tie into lower watercress crop yield.

Analysis of measurements taken along the discharge canal with a multiparameter sonde (YSI) so far revealed that during low tides (identified from NOAA tide tables) the salinity decreased whereas higher tides were associated with increased salinity.

This study reports tentative findings as the research project is at its early stages and only captured a wet season, without getting any insights on the monitored parameters during king tides.

Mentor: Dr. Henrietta Dulai

Ellen Hughes
Mathematics
Natural Sciences
UROP
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Formal Grammars for the Hawaiian Language

One way to model the syllables in Hawaiian words is to assume each syllable can either begin with a consonant, contain a dipthong, contain a kahakō, or not. In the case of a dipthong, the kahakō is usually on the first vowel. We encoded the syllables into binary and base 7-numbering systems. We studied exceptions to this rule found in the Ulukau collection of Hawaiian dictionaries. We used edit distances to correct errors in commonly misspelled Hawaiian words, and to investigate the extent to which the rule that a consonant must be followed by a vowel can act as a form of error correction. From randomly selected words with errors we calculated an error detection rate and found the numbering system covers most of the kahakō in practice.

Mentor: Professor Bjørn Kjos-Hanssen

Makana Ioh
Molecular Cell Biology
Natural Sciences
Honors, UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 302 (Zoom: ‘Ulu)

Fungal-Bacterial Interactions May Lead to Suppression of Bacterial Antibiotic Resistance

Antibiotic resistance by bacteria is a continued public health challenge due its impact on human health and wellbeing. While attributed to the overuse of antibiotics by humans, resistance has existed in nature prior to human introduction of antibiotics, indicating that there are mechanisms in place that mediate the spread of resistance in bacteria and maintain it in the natural environment. In the soil environment, fungal-bacterial interactions are ubiquitous, and their interactions are essential drivers of environmental processes. It is currently not known whether fungal-bacterial interactions are a mechanism that contributes to bacterial antibiotic resistance in the soil. This project tested the hypothesis that interactions with fungi would allow bacteria to overcome the effects of antibiotics and to grow at higher concentrations.

A bioassay of 4 bacterial strains (genera: *Chryseobacterium spp.*, *Stenotrophomonas spp.*) with two fungal strains (*Mortierella alpina*, *Fusarium sp.*) and four classes of antibiotics (Cefepime, Vancomycin, Erythromycin, Levofloxacin) was conducted in two phases: bacterial minimum inhibitory concentration (MIC) identification and bioassay of bacterial resistance in the presence of fungi via co-culture. Bacterial growth was quantified via a plate reader and a modified single plate-serial dilution spotting (SP-SDS) method. The results did not support the hypothesis but showed that fungal-bacterial co-culture led to less bacterial growth for all bacterial strains across both fungi, suggesting that microbes engage in a competition-like behavior in nutrient limited environments, such as within the soil.

Mentor: Dr. Nhu Nguyen

Nicole "Nikki" Jennings
Psychology
Social Sciences
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 308 (Zoom: Limu Kala)

Love-Hacking:
Rapid Systematic Review of Intranasal Oxytocin for Couples Therapy

Although it may seem contrary to fairytales, the neuropeptide oxytocin, a biological modulator of love, collaborates with our social milieu to foster relationships that ensure survival. Administration of intranasal oxytocin (INOXT) has been shown to ameliorate pro-social behaviors and is undergoing appraisal for its efficacy in enhancing relationship-specific attributes. Couples therapy combats the harmful consequences of struggling relationships, but the ethics of implementing pharmaceutical interventions such as INOXT requires evaluation. A literature review evaluating the ethical implications of medicalizing love will complement a Rapid Systematic Review, adhering to Cochrane's recommended guidelines. Using protocol outlined in PROSPERO, 242 studies were found after searching PsychINFO, PubMed, and Hawaii's ONESEARCH. 17 studies met inclusion criteria, yielding outcomes from heterosexual couples (n=1292) where INOXT was administered to one or both individuals in the experimental group. Overall, INOXT was found to have positive effects on emotional (jealousy, etc.), behavioral (conflict, etc.), and physiological (immunity response, etc.) outcomes for healthy couples, with distinctions made for couples with hormonal contraceptives. However, the studied populations may not be generalizable to those who are hypothesized to benefit from INOXT in couple's therapy. Exploring the efficacy of INOXT in more couples or individuals within different contexts is needed since maladaptive behavior may diminish positive relationship effects of INOXT. Sex differences were observed and attributed to endogenous systems, which require further investigation. INOXT holds promise as a health-promoting treatment for couples. Future studies should focus on optimal dosage, longer-term and repeated administration, and adjunct therapy sessions.

Mentor: Dr. Scott Sinnett

Liliana Kershner
Mathematics; Japanese
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 209 (Zoom: Olonā)

Shape-Dependent Motion of Microswimmers Near a Wall: A Numerical Study

Swimming at the microscale differs from swimming at larger length scales due to the significant viscous forces opposing the motion of minute objects embedded in a liquid. In the field of active matter, or the study of self-propelling microswimmers, agents that can achieve a net displacement do so via non-reciprocal motion with respect to time. Biological swimmers such as sperm cells are good examples of this as they propel themselves forward with flagella in a corkscrew, non-reversible pattern. To understand the mechanisms behind behaviors such as clustering and phase separation displayed by these swimmers, we consider a simplified system in which to computationally model microscale flows (Stokes flow). As Stokes flow is entirely determined by its boundary conditions, we leverage the boundary element method to compute the tractions on the particle surface. Further, recognizing the importance of asymmetry to successful propulsion, we chose a range of geometrically asymmetric particles, namely disk trimers with appendage asymmetry. In this setup, however, geometric asymmetry alone is insufficient for net motion. Therefore, we consider the case where one base of the particle is coated with a metal, a common framework in active matter studies. This material anisotropy breaks the symmetry of the system and enables particle swimming. Numerically, this was done by developing and extending an existing boundary element software library for modern multicore architectures. We verified the accuracy and performance of our code for unbounded Stokes flow and particle motion near and towards a wall through simulations and mathematical analysis.

Mentor: Dr. William Uspal

Vanessa Khachik
Political Science; American Studies
Social Sciences
Honors
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 308 (Zoom: Limu Kala)

Houseless Voices: Unhoused Hawai‘i Residents Propose Solutions to Crisis and Criminalization

The aim of this project is to center the voices of houseless residents on O‘ahu to better understand the needs and experiences of this community. If individuals with lived experience are provided with a platform to share their perspectives, valuable contributions will be made which may influence lawmakers in the policy process. A process that has generally overlooked or ignored houseless voices. In Hawai‘i, Kānaka Maoli, Kūpuna, and other Pacific Islanders have been disproportionately impacted by the housing crisis and comprise the majority of the houseless population. Instead of addressing systemic barriers, many solution efforts have been centered around moving people from the public’s eye. This is an exploratory study that utilizes a combination of observational experience and interviews. The observational experience is from the time I have spent working inside houseless communities around O‘ahu. Interview participants are adult individuals, primarily Kānaka Maoli, either residing in those encampments or that have recently experienced houselessness. The research findings suggest a disparity between the current methods for solving the housing crisis and what those living without shelter believe they could benefit from. These current methods primarily consist of shelters and sweeps. Both of these are temporary solutions that fail to address the systemic barriers that make it difficult to obtain housing and sweeps cause further displacement and physiological trauma to impacted individuals. Instead, we should open the conversation to include affected people and communities and create more permanent solutions together (eg. increase the number of available housing units).

Mentor: Dr. Robert Perkinson

Julie Kobayashi
Public Health
Social Sciences
Honors
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Increasing Access to Reproductive Healthcare in Hawai‘i Through Policy Reformation

Access to reproductive healthcare in the United States has faced significant challenges over the past few years due to restrictive policies and politicians with anti-abortion stances. Currently, some restrictive laws that contribute to limiting pregnant peoples' access to reproductive healthcare are the Hyde Amendment, Texas's Senate Bill 8, and the *Dobbs Decision*, with people of color and low-income populations experiencing the most health disparities. Therefore, continued legal access to abortions, contraceptives, and comprehensive sexuality education is necessary to reduce the rates of maternal mortality, sexually transmitted diseases, and unintended pregnancies.

Through a literature review, this paper will analyze the advantages and disadvantages of three state level policies that have the potential to increase access to reproductive healthcare introduced in the 2023 legislative session: H.B. N.O. 1441, H.B. N.O. 1343 HD1, and H.B. 1155. Of the three policies, H.B. N.O. 1441 provides the most benefits by eliminating criminal provisions for abortion providers and explicitly states an individual's right to obtain an abortion in the state of Hawai‘i. Should the bill pass, reproductive healthcare in Hawai‘i will become more accessible for residents.

Mentors: Dr. Denise Nelson-Hurwitz; Dr. Vanessa Buchthal

Shawn Sora Kobayashi
Marine Biology
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 305 (Zoom: Makaloa)

A Study on Potential Genetic Radiation in *Siphonaria* Populations on Oʻahu

Marine evolutionary radiations in Hawaiʻi are rare in comparison to terrestrial radiations. This is likely because many marine organisms have highly motile larval stages causing a lack of gene flow. However, the marine gastropod *Siphonaria normalis* lacks planktonic larvae. The absence of planktonic larvae may induce populations like *S. normalis* to have many genetically distinct populations despite their cryptic appearance. There are not many studies done on non-planktonic larval groups within Hawaiʻi, which leads to a lack of understanding the breadth of diversity these populations may actually hold. Recent phylogenetic evidence suggests there are at least four species of *Siphonaria* within the Hawaiian archipelago, directly refuting the assumption that *Siphonaria* is monotypic in Hawaiʻi. The goal of this project is to test a non-destructive method using environmental DNA to catalog a baseline of species richness and distribution of *Siphonaria spp.* This information will be necessary to better understand ecosystem interactions and the niches fulfilled by this prolific genus. We sampled multiple locations around the island of Oʻahu by utilizing environmental DNA (eDNA) to distinguish and potentially discover additional cryptic species.We expect genetically distinct populations based on geographic isolation.

Mentor: Dr. Peter Marko

Nina Korte
Philosophy
Arts & Humanities - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 308 (Zoom: Limu Kala)

On the Need to Stop

Political philosopher Hannah Arendt observes in the prologue of *The Human Condition* (1958) that the world is in a state of crisis due to the automatization of science, in which technical innovations rapidly advance the development of civilization without adequate consideration of the repercussions. These observations came even before the AI-madness that is now taking over social media and everyday life. I aim to build upon Hannah Arendt's work about the process of changing how one thinks, speaks and works, addressing the reigning mood of discontent and hopelessness about democracy, peace-politics and environmental justice. My project investigates one crucial step--the moment of stopping--that occurs before significant change is enacted.

The research for this project included close reading of philosophical texts as well as attending a conference at the Hannah Arendt Center at Bard College on “Judgment, Pluralism, and Democracy: On the Desirability of Speaking with Others.”

My research objective is to investigate how the process of self-examination (including individual and collective reconsideration of a hitherto unquestioned rut of thinking, feeling, and acting) may require genuine stopping in order to initiate a healthy change. The project attempts to distinguish between an apparent pause and a real stop; questions to what degree stopping is a matter of free will; and aims to show that without negative but active stopping, no new beginning and no healthy change of voluntary collective or individual conduct is possible.

Mentor: Dr. Arindam Chakrabarti

Yejun Kweon
Asian Studies
Arts & Humanities - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 310 (Zoom: Wauke)

North Korean Science Fiction: Marine Resources and Futurity of a Nation

North Korean literature is often viewed as propaganda due to its ties to the party's ideals and national campaigns. However, it is important to interpret North Korean literature beyond their propagandistic appearance through focusing on their settings and hidden metaphors. This paper examines three North Korean science fiction: *Green Seedlings* (*P'urŭn isak*, 1988), *Two Arrows* (*Tugae ŭi hwasal*, 1989), and "Make the Ocean Blue" ("Padarŭl p'urŭge hara", 2004). These three texts express the necessity of advancement in medical technology, active international relations, and the restoration of the environment by involving marine resources. In *Green Seedlings,* scientists try to cultivate rice plants to treat and prevent cancer. In *Two Arrows*, specialists from North Korea are working in South Africa to help South Africans to develop useful marine resources that could boost the country economically. In "Make the Ocean Blue," two different ways seaweed can benefit the country are specified: as reagent energy for factories and as a method to rehabilitate the polluted environment. From these three texts, I propose that North Korean science fiction texts address current issues while simultaneously expressing apprehensions about the future. Moreover, the significance of the marine setting in North Korean science fiction is to point out both the ongoing scientific and environmental problems of the nation the readers should be aware of as well as the key roles the ocean can play in North Korea, especially in the development of marine industries.

Mentors: Dr. Cheehyung Harrison Kim, Dr. David Krolikoski

Jessica Lau
Psychology; Human Development and Family Studies
Minor in Communicology
Certificate in Peace Studies
Social Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 310 (Zoom: Wauke)

Understanding School Level Spending Patterns in Hawai‘i

Recent design-based studies indicate that school spending is positively linked to student success. Prior to the Every Student Succeeds Act of 2015 (ESSA), per-pupil expenditures were primarily reported at the district level. Through ESSA, state educational agencies were mandated to report per-pupil expenditures at the school level. This policy change was especially important for Hawai'i, which has only one public school district. Given the diversity of students served in the Hawai'i Department of Education (HIDOE), it is critical to examine school-level per-pupil expenditures with an emphasis on equity. Our research explores and describes per-pupil expenditures in relation to school-level characteristics for HIDOE schools.

Relying on school-level expenditure and enrollment data from 2018-19, we used a descriptive quantitative approach. Specifically, using linear regression, we predicted patterns of per-pupil expenditures based on the percentage of students eligible for the National School Lunch Program (NSLP) for each school type (i.e., elementary, middle, or high school). This approach enabled us to consider trends in school-level per-pupil expenditures in relation to this key student subgroup.

Our findings indicate that across school type, HIDOE schools spent more per-pupil if they had a higher proportion of students who qualified for NSLP. Specifically, we estimate that a one percentage point increase in students who qualified for the NSLP resulted in increased per-pupil expenditures by $39 at elementary schools, $42 at middle schools, and $47 at high schools. Our results help provide insight into the level of equity in the distribution of educational resources in Hawai‘i.

Mentor: Dr. Mark Murphy

Winnie Lau
Mathematics; Molecular Biosciences and Biotechnology
Engineering & Computer Sciences - Research
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 209 (Zoom: Olonā)

Development of a Card Based Diagnostic Array for Portable Diagnostics

Polymerase Chain Reaction (PCR) is the gold standard for molecular diagnostic tests for specific nucleic acid sequences (RNA and DNA), and is widely used for medical applications and in clinical lab settings. It is much more challenging to implement PCR in the field for applications such as agriculture and food safety where cost and complexity constrain routine use in detecting pests and pathogens. Several promising technologies based on isothermal nucleic acid amplification, such as Loop-Mediated AMPlification (LAMP), are simpler and more cost-effective alternatives to PCR, though requirements for internal controls and standards to ensure reliable quantitative results still require cumbersome user manipulation when implemented in affordable commercially available instruments. We report on the progress towards development and application of a portable, ready-to-use diagnostic card that automatically distributes a sample to an array of reaction wells that can each test for different targets or internal controls. Miniature heaters are used to actuate fluid manipulation via thermal expansion and increased vapor pressure to distribute the sample to an array of wells with freeze-dried reagents, and to control the reaction temperature. Progress of reactions can be monitored in real time using fluorescence imaging, or simple color imaging where reaction readout is colorimetric. We manufacture cards by vacuum forming onto a custom designed 3D printed form, with some required fine features engraved with a laser engraver. We have designed a simple handheld instrument with temperature controlled heaters and a simple imaging sensor for reaction readout.

Mentor: Dr. Daniel Jenkins
Co-Authors: Jacob Umeno, Dr. Ryo Kubota, Dr. Mohammad Arif, Dr. Shefali Dobhal

Kyra Leon
Global Environmental Science
Natural Sciences
Honors, also presenting at Tester's
Oral Presentation: Session 1 (9:30-10:20a) in KUY 303 (Zoom: Kalo)

Quantifying the Transition from Occasional to Chronic Coastal Flooding

Many coastal locations currently experience occasional instances of flooding. With rising global sea level, many locations will experience a shift in the frequency of flooding events. Coastal flooding threatens property and infrastructure, and growing instances of flooding could threaten to displace significant portions of the global population currently living in coastal areas. In addition, decreased time between severe flooding events could negatively affect the time available to respond to damages. Meaningful adaptation and preparation for a changing flood regime is reliant on quantifiable data. The purpose of this study is to quantify the transition from occasional to chronic coastal flooding for locations globally. Using sea level rise scenarios based on emissions scenarios and time-series from a global set of tide gauges, we established a timeline for the transition across global locations. For the intermediate scenario, the median transition time was 35.71 years. However, the transition times for many islands and lower latitude locations was below the global median. Flooding is expected to increase in most locations, but islands and lower latitude coastal areas are the most threatened with the shortest projected transition times to chronic flooding conditions.

Mentor: Dr. Philip Thompson

Lisa Lowe, Biological Engineering
April Vidad, Biological Engineering
Engineering & Computer Sciences - Product Development
Senior Engineering Design
Oral Presentation: Session 2 (10:30-11:20a) in KUY 209 (Zoom: Olonā)

Water Purification in Cambodia

Cambodia's rural communities lack accessibility to clean water essential for drinking, sanitation, and hygiene. This has led to many detrimental effects on their health and has affected their community disproportionately. Essentially, their current methods of obtaining safe drinking water is too costly or is not regulated well, making it unsafe.

Our approach to this problem is to create a decentralized water purification device, which combines unit processes including coagulation / flocculation, filtration, and adsorption units to purify water from the Mekong River. Each unit being designed, built, and tested. Experimental validation of the design was conducted on campus, rather than traveling or sending the device to Cambodia to avoid unnecessary costs. Simulated water much like that in the Mekong River was created in the laboratory for testing. Although there are numerous contaminants and toxic chemicals that are present in the Mekong River, this project focuses specifically on E. coli, total coliform, conductivity, turbidity, and nitrate concentrations. These parameters are indicators of the presence of other contaminants as well, and are noted as key factors when testing the quality of drinking water by the World Health Organization (WHO) standards. The specific methods tested were the IDEXX Colilert-18 which tests for E. coli and total coliform. Also utilizing a turbidity kit, conductivity probe, and chemical tests for nitrates.

This device is promising for providing a household with 500 liters per day of water purified from the simulated Mekong River water, and complying with the WHO standards of drinking water.

Mentors: Dr. Marek Kirs, Ryan Kurasaki

Kimberly Martin
Earth Science (B.S.)
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 303 (Zoom: Kalo)

Developing InSAR Deformation Models and Coulomb Stress Change Simulations of the 2018 Kīlauea Eruption

From May-August 2018, Kīlauea volcano erupted causing major surface deformation along the summit caldera and Lower East Rift Zone (LERZ). Surface deformation maps of the eruption, constructed using interferometric synthetic aperture radar (InSAR), were used to inform the community about volcanic hazards in near-real-time. These maps can be used to assist with interpretations of source characteristics of Kīlauea's magma chamber and faulting styles that accompany volcanic/tectonic events.

The objective is to study sources of volcanic/tectonic deformation by identifying a set of modeled event parameters that best reproduce InSAR-derived deformation, and then using these parameters to simulate stress changes pre/post eruption.

To meet this objective, I used freeware SAR processing algorithm GMTSAR and plotting code GMT (Generic Mapping Tools) to construct interferograms (surface change and line-of-sight displacement maps). I processed ascending Sentinel-1 SAR data (provided by the European Space Agency) from May 2, 2018 and May 8, 2018 to construct interferograms showing deformation changes of the 2018 eruption. Results yield deformation maps that reflect the May 4, 2018 M6.9 Leilani Estates earthquake and deformation associated with the eruption along the LERZ from May 2-May 8, 2018. Following this I processed the data in MATLAB, and by trial and error, adjusted the individual event parameters to identify the best fit stress change models that align with the interferograms. Results obtained from this study will help advance understanding of Kīlauea's eruption processes and can help inform hazard response in Hawai'i's communities.

Mentor: Dr. Garrett Apuzen-Ito

Nils Melbourne
Chemistry (B.S.); Physics (B.S.)
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 210 (Zoom: Naio)

Polymer Upcycling with Benzazaphospholes

As a consequence of the low cost, durability, and versatility of plastics, consumer products derived from these polymers are encountered in everyday life. Large-scale manufacturing of these polymers is possible because the starting monomers are easily accessed from petroleum reserves. However, this combination of resistance to degradation and industrial level production has created an unsustainable situation whereby most plastics end up in a landfill or in the environment. We investigate basic reactivity of select Phosphorus-containing compounds, benzazaphospholes, with the intention to upcycle polymers to their component monomers for reuse.

Mentor: Dr. Matthew Cain

Kai Merchant
Mechanical Engineering
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 209 (Zoom: Olonā)

A Modified Laryngeal Mask Airway Device to Increase Placement Accuracy

In the medical field, being able to utilize endoscopic tools are paramount in situations that requires observations on a patient's internal organs. The current standard to safely put the instrument in a subjects' body is having a medical staff member use a curved, metal blade that requires significant force, and manipulation of the neck to move the tongue. Once the vocal cords are seen, tools can be inserted such as endoscopes to look though the esophagus or plastic tubes to provide oxygen. Occasionally, seeing the internal structure of a patients' body is difficult due to an enlarged tongue or body fluid buildup. When inserting the tube into the subjects' mouth, being able to see inside, the amount of time it takes to put the tube in and confirming that the tube is inserted correctly are crucial in a procedure. Therefore, the project mission is to fabricate a device that increases the placement accuracy for intubation devices used by EMS services since those working in that profession are somewhat novice to the using the previous method compared to those working in hospitals. This is based on Laryngeal mask airway (LMA) device, which is a relatively new type of supraglottic airway device meant to make the procedure quicker and easier. Following the engineering design process, research and interviews with doctors were conducted to find areas of improvement to current devices to help define the problem, leading to brainstorming ideas to solve the problem. A new LMA with optical and CO_2 sensing capability was manufactured and tested on a mannequin. Its effectiveness was qualitatively measured and critiqued by Dr Scott Kuwada, the medical collaborator on the project.

Mentor: Dr. Scott Miller

Emma Molaski
Earth Science
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 303 (Zoom: Kalo)

Helium Isotope Monitor

Studies of the $^{3}He/^{4}He$ stable isotopic ratio in volcanic emissions has been found useful in predicting the course of volcanic eruptions and the advent of large earthquakes. We added an internal $^{3}He/^{4}He$ isotopic standard to the lab and field instrumentation that was fabricated "in house". We made the standard to compare to other known isotopic standards and to lab air, which contains a known $^{3}He/^{4}He$ isotopic ratio and amount of helium. Adding this internal standard allows a check on such instrument drift, as well as adds credibility to the analyses generated in the field. Calculations were made to budget the amount of standard gas delivered over a proposed deployment period.

Mentor: Dr. Gary McMurtry

Wade Naguwa
Natural Resources and Environmental Management
Natural Sciences
Presentation Practice
Oral Presentation: Session 2 (10:30-11:20a) in KUY 303 (Zoom: Kalo)

Temporal and Spatial Variation in Pua‘a (Feral pigs; *Sus scrofa*) Activity across the Hawaiian Islands

Human activity and environmental conditions are drivers of species behavior and activity patterns. Thus, understanding species behavioral dynamics may improve the efficiency of invasive species removal actions. In this study we identified trends across three islands in the behavior and activity of feral pigs in relation to both environmental and anthropogenic activity factors. We utilized a dataset from motion-activated game cameras at 144 unique survey locations on the islands of O‘ahu, Maui, and Kaua‘i. A total of 814 cameras were deployed from 2016 to 2021 resulting in a total trap effort of 3,426 trap nights. We found that foraging was the most frequently observed behavior (*n* = 2018 events) followed by general movement (*n* = 1497 events) and digging (*n* = 831 events). The group size of pigs varied between the spring and fall (spring adults *n* = 1.81± 0.01 pigs; spring juveniles *n*=3 (11:30a-12:30p)1±0.17 piglets; fall adults *n*=1.08±0.01 pigs; fall juveniles *n*=1.92±0.08 piglets). Feral pigs had two daily peaks in activity between the hours 0200 to 0700 and 1400 to 2000. Vegetation density, human modification, and the presence of hunting pressure all had a significant influence on nocturnal activity levels with feral pigs becoming more active with increasing human modification and hunting pressure and less active with vegetation density. Our results are similar to previous studies that suggest pigs shift their activity toward nocturnal hours when human activity is present.

Mentor: Dr. Melissa Price
Co-Author: Derek Risch

Brandon Najarian
Botany
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 302 (Zoom: ‘Ulu)

Vegetation Shifts Across 90 Years on Mānana Islet

Mānana islet, or Rabbit Island, is a 63-acre islet off Kaupō beach in Waimānalo. Mānana is an important nesting ground for many species of seabirds that do not frequent the main Hawaiian Islands and has been designated a Seabird Sanctuary by the state of Hawai’i. The vegetation of Mānana has been surveyed or reported 21 times between 1927 and 2008. To investigate recent changes in vegetation, I conducted a survey in collaboration with the Barton lab at UH Mānoa and the Department of Land and Natural Resources. Updated vegetation data will assist with current and future conservation and restoration plans on Mānana, including native out-plantings and the removal of non-native plants. The survey entails haphazard foot surveys across the islets to generate a comprehensive species list. These methods are consistent with previous surveys, allowing for the identification of species turnover across the 90-year period. My survey identified 46 species, ten of which are new records. Nine of the ten new records are non-native species, indicating the persistent threat of invasion. Over time, there has been a positive shift in native species richness on Mānana, likely reflecting conservation efforts. However, the number of non-native species has also increased, especially between 1998 and 2023. Whether the increase in native species richness coincides with an increase in native species abundance remains unclear, highlighting future research needs to include abundance in addition to presence. Continued research and restoration of Mānana Islet will support native seabirds, ensuring these diverse coastal islets persist in the future.

Mentor: Dr. Kasey Barton

Kimberly Naruse, Biological Engineering; Minor in Biology
RIku Omata, Exploratory Business
Amy Shell, Finance; Certificate in Data Science
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 209 (Zoom: Olonā)

Monitoring Hydroponic Lettuce for Tip Burn and Growth with Machine Vision

Tip burn is a common issue to lettuce plants affecting growth and yield. This is caused by water retention lowering concentrations of calcium. The water build up is caused by high relative humidity levels that impede transpiration from leaves. To resolve this issue, an imaging and environmental monitoring system was created to visually monitor lettuce heads and identify occurrences of tip burn while taking measures to reduce humidity. The main module within the system includes a camera that is aimed at individual lettuce heads with pan and tilt servo motors controlled through computer code, locating lettuce within the field of view. Additionally, a distance sensor is used to triangulate the height of each lettuce head. The main module communicates wirelessly with remote SHT40 sensors to measure humidity and temperature at specific locations, such as at the crown of the lettuce. To identify and analyze the images of lettuce for tip burn, a Tensorflow model was trained using 500 images of lettuce with and without visual tip burn. The current model achieves a 91% training accuracy and a 91% validation accuracy. Further development on the camera module, sensors, and image processing will precipitate more efficient growth and automation.

Mentor: Ryan Kurasaki

Martha Nicholas
American Studies, The School of Cinema Arts
Arts & Humanities - Creative
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 309 (Zoom: ʻIlima)

Decolonizing the Screen: Hawaii's Safety Net

With the continual attention to climate change in the past few years, more development in community-based villages and volunteer opportunities in nature preserves provides solutions by utilizing indigenous practices. Due to modern innovations and shifts in urban lifestyles, the idea of resorting to Native traditions seems foreign. However, the housing complex project, Pu'uhonua o Wai'anae, and the land conservation, Kōkua Kalihi Valley, integrate indigenous agriculture and community engagement in the present day. By volunteering on work days, learning about personal experiences, and reviewing educational ʻĀina curricula, these locations are supplied with numerous methods from producing medicine to implementing invasive plants into traditional practices. This research has been formatted into a Pilot script for television programs designed for children. The genre is suitable for teaching a wide variety of viewers because of its family-friendly nature and accessibility. It's also vital for children to learn how to appreciate the ʻĀina during their upbringing and become environmentally conscientious as adults. Continuing the theme of incorporating indigenous and modern lifestyles, the episode focuses on a future where Ahupuaʻa are reinstated and occupied by a diverse Polynesian population.

Mentor: Brandy Nālani McDougall

Kaye Rochelle A. Nono
Microbiology
Minor in Japanese
Certificate in Honors
Natural Sciences
Honors, UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 306 (Zoom: ‘Awa)

The Effects of Alternative Ribosomal Proteins on Morphogenesis of *Mycolicibacterium smegmatis*

Tuberculosis (TB) is a deadly disease caused by *Mycobacterium tuberculosis* bacteria *(Mtb)*. Zinc is an essential micronutrient, which is restricted by the immune system to prevent pathogen growth. However, *Mtb* are resilient to zinc limitation. One of the possible mechanisms for this resilience is the expression of alternative ribosomal proteins (AltRPs). AltRP-containing ribosomes are formed under zinc limitation and may provide a role in survival during infection. AltRPs are conserved across mycobacteria, so a related non-pathogenic *M. smegmatis* bacteria (*Msm*) can be used as a model to study them. When zinc is limited, expression of AltRPs in Msm causes cell elongation. It is not known if this morphogenesis requires both AltRPs and zinc depletion, or just AltRPs. We hypothesized that AltRPs can cause morphogenesis independently of zinc, i.e., that zinc limitation is not required for morphogenesis. In order to test this hypothesis, a strain of *Msm* that expresses AltRPs under an inducible promoter was constructed. This *Msm* construct was then grown in zinc-limited and zinc-replete medium, and the inducer was added to stimulate expression of the AltRPs in both conditions. Our data show that expression of AltRPs under zinc-replete conditions did not cause cell elongation, indicating that zinc limitation may be required to act in concert with AltRPs to cause cell morphogenesis in *Msm*. Better understanding of how mycobacteria adjust to zinc limitation may help identify new drug targets to treat TB.

Mentor: Dr. Sladjana Prišić

Justin Gerald Ocampo
Digital Cinema; American Studies
Arts & Humanities - Creative
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 309 (Zoom: ‘Ilima)

Kunyari: Directing A Short Film about Performative Social Interaction Among Filipino Americans

Kunyari (in English: Pretend) is a romantic comedy short film about two past lovers pretending to be together at a party in an act of preservation against the expectations of their intrusive, gossiping families, confronting unresolved feelings along the way. A creative work project with a distinctly Filipino-American identity, the primary goal of the film is to provide a satirical, lighthearted audio-visual investigation into how familial, personal, and cultural expectations inform and define behavior. The overarching thematic message of the film is that being genuine to one’s true self brings about more fulfilling relationships.

The script for Kunyari was adapted into a short film by a cohort of ten School of Cinematic Arts students ranging in professional disciplines from production design to more technical aspects of filmmaking like lighting and videography. The filmmaking process was segmented into pre-production, filming, and post-production editing. Funded by UROP, wardrobe, and set design were purchased to bring to life this external world of the Filipino party.

Over winter break and the first month and a half of the spring semester, a primary cast of 5 actors and over a dozen extras were cast and directed.

At its core, Kunyari was made to entertain an audience. The film is expected to be screened at the SCA Student Showcase in Spring 2023 and premiere domestically, regionally, and internationally to wider audiences at film festivals for the remainder of Fall and Winter 2023 as well as Spring 2024.

Mentor: Scott Schimmel

Tanner Okamura
Biology
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 304 (Zoom: Moa)

Enhancing Detection of Infectious Hypodermal and Hematopoietic Necrosis Virus in Shrimp

Infectious Hypodermal and Hematopoietic Virus (IHHNV) is a foreign animal disease responsible for steep death rates in certain species of shrimp and high consequence trade restrictions and losses, among other adverse effects. The World Organization of Animal Health (OIE) Aquatic Animal Disease Manual published internationally-recognized test methods for diagnostic testing of IHHNV. However, some tests were developed more than 20 years ago, raising questions regarding their current effectiveness in distinguishing infectious IHHNV and endogenous virus-related sequences in the shrimp's genome (noninfectious). To determine the effectiveness of these tests, three primers were compared: IHHNV 1608F/1688R primer (Primer 1), IHHNV 309 primer (Primer 2; infectious), and IHHNV-qEVE primer (Primer 3; noninfectious).

DNA was extracted from 90 shrimp tissue samples (30 positive control (PC) shrimp, 30 specific pathogen free (SPF) shrimp, and 30 shrimp of unknown infection status (UIS)). The UIS samples, purchased from a local grocery store, originated from three different countries (Argentina, Indonesia, and India). Real-time PCR assays were performed in triplicate. A synthetic positive control (gBlock) and a non-template control were used to validate the assay.

With few exceptions, Primers 1 and 2 yielded positive results in the PC shrimp, and were negative in SPF shrimp; therefore, they can be used to detect IHHNV infection. Using Primers 1 and 2, some UIS samples yielded positive results. No PC shrimp were positive using Primer 3, as expected; however, assay runs for the SPF and UIS samples failed to yield validated results.

Mentor: Dr. Jenee Odani
Co-Authors: Taylor Peterson, Karin Kurkjian

Caleb-Matthew Olaso
Marine Biology (B.S.); Chemistry (B.A.)
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 304 (Zoom: Moa)

Assembly and Nutritional Function of the Mosquito Microbiome

Microbial symbioses are important modulators of host biology. In mosquitoes, the composition of the microbiome has been associated with factors that affect host fitness, such as larval development and immune system function. Recent research has shown that metabolic pathways related to fatty acid synthesis are also altered in response to disturbances of the microbiome. However, the identity and quantity of fatty acids that are stored in mosquitoes as a result of microbiome structure has yet to be investigated. In this study, we used 16s rRNA amplicon sequencing to compare the microbiome of *Aedes albopictus* mosquitoes raised in laboratory environments to those raised in microbial-rich, natural substrates. Using gas chromatography-mass spectometry, we then characterized the fatty acids that arose from these microbiome treatments in the larval stage. Additionally, we tracked mosquito pupation and starvation survival rates to determine whether lipid composition affected the fitness of reared mosquitoes. Our study shows that the host's total fatty acid content changes with the mosquito microbiome, which implicates the role of specific microbes in the metabolism and storage of host lipids. Under filtering regimes designed to remove bacteria from natural water (0.1 μm filter), reared larvae stored less fatty acid than filtering regimes designed to remove eukaryotic microbes (10 μm filter). The rate of larval development and adult survival was also found to increase with smaller filter pore sizes. Our findings suggest that the microbiome is an important determinant of mosquito fitness and that this effect is governed by changes in the mosquito lipid profile.

Mentor: Dr. Matthew Medeiros

Trinity Oshiro
History
Minor in Education (EDUC)
Arts & Humanities - Research
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 310 (Zoom: Wauke)

Japan Exchange and Teaching (JET) and Americanization

The JET program is currently well-known for its internationalization objective by placing foreign teachers in the local classrooms of Japan. It has become so well-known that the American roots of the JET program are forgotten. The JET program was created in the midst of an American wave of culture which spread quickly in the years following the occupation of Japan. In deciding on a topic for the senior capstone requirement, I became interested in the JET program. Through the use of the Hamilton Library, archives, and online databases, I compiled a research paper on the roots of the JET program and its place in the postwar years of Japan. The paper includes discussion on the occupation of Japan, history of the JET program, history of English as a foreign language learning in Japan, as well as the rippling effects the JET program made in the following years, and the globalization of English as a world language. Once the research concluded, it was clear that the Americanization of Japanese society during the occupation had deeply influenced the creation of the JET program. In short, the Americanization of Japanese society went beyond the occupation years. Its everlasting effect reached the education sector of Japanese society, developing one of the most successful English education programs that later started to promote a friendship between Japan and the world. This is the history of the JET program and its roots in America.

Mentor: Dr. Cheehyung Harrison Kim

Kenzie Ozoa
Ethnic Studies; Women‘s Gender and Sexuality Studies
Social Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 309 (Zoom: ‘Ilima)

Alon: Art and the Queering of Oceanic Filipinx Identities

Rooted in the renaissance and re-centering of queer Filipino narratives throughout history, in the present, as well as the future, this project, Alon: Art and the Queering of Oceanic Filipinx Identities, aims to bring the experiences of queer Filipinos to the forefront as a means to honor and keep alive our existences and legacies. The first part of this project is a collection of poetry and spoken word created by the researcher and the second part is a collection of oral histories and creative performances and showcasings with featured queer Filipino artists from San Diego, Washington D.C., and the illegally occupied Kingdom of Hawai‘i. Queer folks, especially bakla (a term that refers to queer Filipinos), have existed throughout all eras of time and have been violently suppressed and oppressed at the hands of imperialism and colonialism. Living in a world rooted in heteropatriarchy continues that violence and manifests as the erasure, silencing, and overall suppression of queer folks as well as their experiences and (hi)stories. But again, we know we are very much alive and breathing in all eras and places. Alon: Art and the Queering of Oceanic Filipinx Identities will not only bring life to these experiences, but will do so in a way that centers creation, craft, and the ways such art can articulate and breathe new life.

Mentor: Dr. Roderick Labrador

Dustin Isaiah Kepano Palos
Nautral Resources and Environmental Management
Minor in Botany
Natural Sciences
None
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Hoʻomalu Wahi: Developing Indicators of Urban Kumu Lāʻau Biocultural Services and Relationships

Kauluwehi was developed by the University of Hawaiʻi Maui College (UHMC) Sustainable Living Institute of Maui (SLIM) as a biocultural restoration project. Kauluwehi is home to diverse native and introduced plants that promote cultural specimens and food crops that feed the community. A priority of Kauluwehi is to ensure that living laboratories become a resource to produce biocultural, regenerative, and added value to different species of flora that support kānaka maoli to rebuild stronger relationships with the natural environment. Kīpuka divides the garden into different zones: dry land forest, cultural sections for hula, lei, lāʻau lapaʻau, māʻawe in the southern entrance, a central section for traditional farming mala kalo *(Colocasia esculenta), ʻ*uala (*Ipomoea batatas*)*,* maiʻa *(Musa spp.),* and ʻōlena (*Curcuma longa.)*; the northern section features a variety of tropical fruit trees. Over the four years, over 6,000 pounds of kalo, maiʻa, ʻulu, exotic fruits, and cassava (*Manihot esculenta*) have been provided to native Hawaiian community entities, which have easily distributed these quantities. There is, therefore, potential for considerable expansion with proper support. Being able to provide healthier food sources is important for a healthy lāhui. The next step is to build a ranking system to value kumu lāʻau appropriately by conducting interviews with practitioners, kūpuna, and kumu. Participants at Kauluwehi practice kilo (careful environmental observations) and draw on ʻike kūpuna (ancestral knowledge) as indigenous and intergenerational science finds new relevance to modern projects and lifeways across our pae ʻāina (archipelago).

Mentors: Dr. Aurora Kagawa-Viviani, Dr. Kealohanuiopuna Kinney

Jiin Park
Kinesiology and Rehabilitation Science
Social Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 310 (Zoom: Wauke)

A Comparison of Concussion Knowledge and Attitude Between College Students in United States and Japan

Introductions: Every state in the US has a concussion law that mandates concussion education for youth athletes, which is presumed to increase their knowledge and attitude. However, many countries have not implemented legislation on concussion management despite the fatal risks of improperly managed concussions. More severe forms of brain trauma have been reported in novice Japanese Judo athletes due to lack of knowledge on proper management. Therefore, the purpose of this study is to compare the concussion knowledge and attitude levels between collegiate students in the US and Japan.

Methods: The modified Rosenbaum Concussion Knowledge and Attitudes Survey-Student Version (RoCKAS-ST) was used. Concussion Knowledge Index (CKI) and Concussion Attitude Index (CAI) were calculated for comparisons. An independent t-test was used for statistical analysis.

Results: A total of 510 (US n=204, Japanese n=306) participants completed the survey. The CKI of US participants was significantly higher than that of Japanese participants (US mean= 40.09, SD= 6.08; Japanese mean= 25.29, SD=8.15; t=22 (10:30-11:20a)6, df=508, $p< .001$). The CAI of US participants was also significantly higher than that of Japanese participants (US mean= 5.77, SD=2.41; Japanese mean= 3.56, SD=1.79; t=11.84, df=508, $p< .001$).

Conclusion: The legislation in the US may be a significant factor that contributed to higher concussion knowledge and attitude of US participants.

Mentor: Kyoko Shirahata

Justin Pascua, Creative Media Digital Cinema Track
Nathan Roberts, Creative Media Digital Cinema Track
Arts & Humanities - Creative
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 309 (Zoom: ʻIlima)

Māka'i

Our action/drama short film follows Chris, a local patrol officer on the verge of retirement, who mentors Hunter, the son of his abusive ex-partner, through skateboarding. When Chris chooses to take action against Hunter's father, Chris' passion for policing is rekindled when he is reminded of his purpose to serve in the community he grew up in.

Our team consists of five core film students in our capstone class, filming up to twelve hours a day for eight days. UROP funding allowed us to hire a police officer and props-master to adhere to our school's prop weapons policies, while also providing meals to our cast and crew, and authentic costumes and props to accurately portray a Honolulu Police Officer.

As the director of a smaller independent production, I coordinated with the different film departments in addition to working with our actors as we prepared for, shot, and finalized the final product. This meant ensuring that each crew member, whether they were responsible for costumes, camera work, or editing, seamlessly worked together to accurately and creatively portray the ideas of the written story on screen.

We will be putting our film through a festival circuit to reach a wider audience of Americans, offering a different perspective on community policing in the different states. I hope our team can both leave with a professional project under our belts and the skills gained with it, as well as spark a positive discussion on the controversial profession that is policing in America.

Mentor: Professor Scott Schimmel

Ruby Anne Polintang, Biological Engineering
Matthew Sinco, Biological Engineering
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 209 (Zoom: Olonā)

Vertical Aeroponic Lettuce Growing System for Low Income Urban Communities

To grow lettuce for densely populated urban centers in Hawai‘i, we designed and fabricated an indoor High Pressure Aeroponics (HPA) system. HPA sprays a nutrient water solution directly on the roots suspended in the air. The immediate absorption of the water and the nutrients allows the system to use less resources and grow the plants closer together than other forms of hydroponics and conventional soil agriculture, while the increased root airflow allows for faster growth and a higher yield. The work focused on addressing the higher cost operations of the lighting and spraying. To produce optimal lettuce growth, the LED lighting system consists of a light controller that controlled the light intensity and duration throughout the growth stages of the lettuce to continuously provide a daily light integral (DLI) of 17 $\mu\mathrm{mol}/\mathrm{m}^2/\mathrm{day}$. The water/nutrient delivery system optimized the distance from nozzle to plant roots to ensure the plant's safety and ideal nutrient absorption were satisfied. Furthermore, we analyzed and compared the economic impact of our HPA system to other methods of agriculture and developed accessible educational materials that explains how to set up and operate a HPA system. The HPA system can then be scaled up in future work to provide enough lettuce for these urban centers in Hawai‘i to reduce food insecurity.

Mentor: Ryan Kurasaki

Beatrice Pujol
Marine Biology
Natural Sciences
Honors, UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 302 (Zoom: ʻUlu)

Effects of Temperature and Nutrient Concentration on Photosynthesis and Growth by Native Alga *Microdictyon setchellianum* and Invasive Seaweed *Eucheuma denticulatum*

The physiological complexities driving growth of the mat-forming seaweed, *Chondria tumulosa* found only in the Papahānaumokuākea Marine National Monument (PMNM) remains difficult to study. This project involved using two readily-available proxy algal species: invasive *Eucheuma denticulatum*, which forms large, reef-smothering mats in Kāneʻohe Bay, and abundant *Microdictyon setchellianum*, a native in the Main Hawaiian Islands that also competes for reef space at Manawai, where *C. tumulosa* was first discovered. We hypothesized that increased nutrient supplies would favor growth of the invasive alga over the native, although their anatomies are quite distinct. Laboratory trials subjected specimens to PMNM-relevant combinations of temperature and nutrients over specified experimental periods. Daily growth rates and photosynthetic efficiency were used to compare effects of temperature and nutrients in the two species. Mean growth rate for *M. setchellianum* with the highest nutrient subsidies was 29.30% compared to 8.39% in the lowest ($p<0.05$). Plants in the highest temperature also displayed a higher growth rate than in the lowest ($p<0.05$). Similarly, photosynthetic rates (rETRmax) were greater in the highest nutrient (63.60 µmol electrons $m^{-2}s^{-1}$) and temperature (65.50 µmol electrons m^{-2} s^{-1}) treatments than in the lowest (50.20 µmol electrons $m^{-2}s^{-1}$, 45.90 µmol electrons $m^{-2}s^{-1}$: $p<0.05$). *E. denticulatum* trials resulted in significant tissue loss in numerous individuals, precluding statistical analysis of this species. Nevertheless, this species' vulnerability to experimental conditions is important and may inform future investigations. These results provide greater insight into the physiological adaptations of a native alga to the nutrient conditions in the Hawaiian waters at PMNM.

Mentors: Dr. Celia Smith, Dr. Angela Richards Donáa

Tess Rigler
Marine Biology
Natural Sciences
UROP, also presenting at Tester's
Oral Presentation: Session 2 (10:30-11:20a) in KUY 305 (Zoom: Makaloa)

Basic Behavior in the Invasive Mantis Shrimp G. falcatus during Territorial Fights

Prior research showing that mantis shrimp are territorial will be recreated to determine if similar behaviors are displayed by the invasive species *Gonodactylaceus falcatus*. Because previous studies have focused on Atlantic species, this project will be the first to look at aggressive behavior in Pacific mantis shrimp, as well as the first to establish basic behavioral sequences. It will serve as a baseline for future research studying invasive species aggression compared with that of native species, and how that plays a part in the invasiveness of *G. falcatus*. Little is known about the different behaviors of invertebrates located around the Hawaiian islands, and invasive species such as *G. falcatus* can be extremely detrimental to native species. A species of the genus *Gonodactylellus*, found to be native to the Hawaiian islands, is much smaller than *G. falcatus*. Size difference may affect aggressive behavior during territorial battles intraspecifically, however little is known about the relationship between the two. This project will be able to establish baseline behaviors of *G. falcatus* during territory invasion and will open the door for research involving the native and invasive species of mantis shrimp and their aggressive interactions.

Mentor: Dr. Megan Porter
Co-Author: Sophia Hanscom

Keanu Rochette-Yu Tsuen
Global Environmental Science
Natural Sciences
Also presenting at Tester's, MARC
Oral Presentation: Session 2 (10:30-11:20a) in KUY 210 (Zoom: Naio)

Correlation Between the Presence of *Leptospira* and Precipitation in He‘eia Fishpond

Leptospirosis is a zoonotic disease of emerging importance caused by the bacterial pathogen *Leptospira interrogans,* transmitted via environmental dissemination through the urine of mammal carriers (rats, feral swine). Pathogenesis of leptospirosis can be attributed to the gene *lipL32*, prominent and conservative across pathogenic strains of *Leptospira*. Hawai‘i has the highest incidence of leptospirosis in the United States, however, cases of the disease are likely to remain undiagnosed due to the non-specific nature of clinical symptoms. He‘eia Fishpond receives large amounts of water from He‘eia watershed where traditional agricultural sites, channelized streams and established populations of feral swine may facilitate the transmission of the disease. We hypothesized that the prevalence of *Leptospira* in the fishpond positively correlates with significant rainfall, and the rainy season of Hawai‘i. Water samples were taken at He‘eia fishpond every week from 2014 - 2015 and 2017 - 2019 to perform bacterial community analyses and collect data on salinity, temperature, and nutrients while precipitation data were retrieved from the Hawai‘i Climate Data Portal. 16S amplicon sequence variants (ASV) were clustered to identify the temporal distribution of the presence of *Leptospira* in the fishpond. qPCR targeting the *lipL32* gene on samples containing the *Leptospiraceae* family will be performed to quantify the abundance of pathogenic *Leptospira*. Pearson’s correlation coefficient will be calculated to determine the correlation between the presence of *Leptospira* and precipitation. This project will give valuable insights to coastal communities and medical practitioners on the most at-risk periods of infections to reduce exposure to *Leptospira* and provide better diagnosis.

Mentors: Dr. Rosie Alegado, Nalani Olguin

Joseph Romero
Biology
Natural Sciences
Biology 499
Poster Presentation: Poster Session (12:30-1:15p) in KUY Courtyard

Schrankia Living on the Island of Hawai'i

Hawai'i contains a very biodiverse ecosystem due to the isolation between itself and other land formations. The island itself is very young and is still being shaped today by the volcanoes that exist on the island. When these volcanoes erupt, there is a chance that the lava flow could be pahoehoe which forms a lava tube. Lava tubes that exist on the island of Hawai'i host a very specific and diverse ecosystem that is very understudied. There are moths that live in the lava tubes that belong to the genus *Schrankia*, but very little is known about these lava tube adapted moths. The main goal of this project is to determine if the age and distance between lava tubes on the island of Hawai'i affects gene flow of *Schrankia*. Schrankia that are used will be from each lava flow from three different volcanoes. To compare the species found in each lava tube, I will be using the CO1 gene and DNA barcoding first identify the species. After identifying the species I will then create a phylogenetic tree which will show the relationship between each sample collected in each lava tube. Results that are produced can not only help with understanding the population structure of Schrankia, but the whole lava tube ecosystem which is being threatened by invasive species and the limited lifetime of lava tubes.

Mentors: Dr. Rebecca Chong and Dr. Megan Porter

Megumi Sakuta, Communications/Journalism
Alec Tuason, Communications
Arts & Humanities - Creative
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 309 (Zoom: ‘Ilima)

The Consequences of Convenience: A Series of Short Films to Educate About the Effects That Nano- and Microplastics have on Hawaii’s Ecosystems

For decades, plastic pollution has plagued our planet and has been left mostly unchecked. Although plastic pollution is constantly in the news, most of the current warnings are mainly focused on larger, visible waste. However, a major danger lies unseen in nano- and microplastics with particles as small as 0.001 micrometers. These particles have been found in increasing concentrations at every corner of the globe in foods, waters, cosmetics, and people. These particles can also be extremely harmful to humans when ingested. However, there is a severe lack of public awareness when it comes to the existence and consequences of nano- and microplastics and how to best mitigate the problem.

The goal of this project is to educate the general public about the effects that nano- and microplastics have on local ecosystems and steps they can take to tackle this issue. Lengthy research papers filled with confusing jargon are are standing in the way of the general public’s understanding of modern day science. Through a series of short videos, we aim to bridge the gap between scientists and the general public to more effectively communicate research surrounding nano- and microplastics so it can be understood by anyone.

The film’s visuals were shot on a Canon R6 camera with multiple different lenses alongside an underwater housing, as well as a DJI Avata drone for aerial shots. Audio was captured with a Sennheiser MKE600 and the DJI Wireless microphone system. Everything was shot and recorded on Oahu in the Spring of 2023.

Mentor: Patricia Buskirk

Juliana Salehi
Tropical Agriculture and the Environment- Pests, Pathogens, and Invasive Species
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 210 (Zoom: Naio)

DNA Analysis of Invasive Ant Guts to Determine Predation of *Episimus utilis* in Hawai‘i

Episimus utilis (Lepidoptera: Tortricidae) caterpillars were released in Hawai‘i as a biocontrol agent against Brazilian peppertree (*Schinus terebinthifolia*) in 1954. Contrary to expectations, these caterpillars have had little impact on the spread and abundance of *S. terebinthifolia* in Hawai‘i. The primary objective of our study is to determine if ant predation is playing a role in limiting the success of *E. utilis* against Brazilian peppertree. Specific Polymerase chain reaction (PCR) primers were designed to detect *E. utilis* DNA in ant guts. Ant samples were collected from various locations on O‘ahu with an abundance of Brazilian peppertree and *E. utilis* moths. After collection, the contents of the ants’ guts were analyzed for the presence of the caterpillars’ DNA to see if predation is occurring. The ant species examined include: *Pseudomyrmex gracilis* (Hymenoptera: Pseudomyrmecinae), *Solenopsis geminata* (Myrmicinae), *Technomyrmex albipes* (Dolichoderinae), *Ochetellus glaber* (Dolichoderinae), *Brachymyrmex obscurior* (Formicinae), and *Anoplolepis gracilipes* (Formicinae). Sensitivity and specificity tests were performed to determine the ratio of ant to caterpillar DNA necessary for the prey to be detected from ant guts, and to determine the accuracy of the primers. PCR was performed, amplifying the DNA to be visualized using gel electrophoresis. Results from this study will help determine if ant predation is an important factor in limiting the success of *E. utilis* in controlling Brazilian peppertree populations. This will help guide future introductions of biocontrol for the Brazilian peppertree in Hawai‘i and weed biocontrol in general.

Mentor: Dr. Mark G. Wright

Jui-Lien Sanderson
Painting (B.F.A.)
Arts & Humanities - Creative
Honors, UROP, BFA Exhibit
Oral Presentation: Session 2 (10:30-11:20a) in KUY 309 (Zoom: ʻIlima)

Home—>Homeless

The reality of Hawaiʻi is often disguised by the romanticized images of the travel industry when, in fact, Hawaiʻi has one of the highest per capita rates of homelessness in the nation. Native Hawaiians are disproportionately affected. Home→Homeless investigates the displacement of Native Hawaiians through the lens of historical events, political and social injustice, the impact of tourism, as well as pollution and sustainability. The health and abundance of the land are crucial to the traditional Hawaiian way of life. By dissecting Eugene Savage's *Annexation* (1956) and *Festival of the Sea* (1940) murals, I constructed a contrasting reality that reflects the struggle of Native Hawaiians and the degradation of Hawaiʻi's environment and ecosystem.

Savage (1883~1978) was an American painter. From 1938 to 1940 he did a series of murals commissioned by the Matson Navigation Company for the purpose of decorating the passenger ships destinated for Hawaiʻi. As with many artworks done by Westerners about Hawaiʻi during the art deco era, Savage's paintings are fantasies. The *Annexation* was a later addition, the depiction of the event was completely false. Savage's work continues to circulate on the internet and merchandise.

Mentor: Professor Wendy Kawabata

Princess Jena Dalit Santiago
Biochemistry
Natural Sciences
Honors, UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 306 (Zoom: ‘Awa)

The Characterization of Mice Lacking the Gene for Selenocysteine Lyase in Brown Adipocytes

Selenium (Se) is an essential micronutrient necessary for energy metabolism and thermoregulation. Brown adipocytes are responsible for producing heat and maintaining body temperature by expending energy. Selenocysteine lyase, Scly, is an enzyme that assists in recycling selenium in the body through the degradation of the amino acid selenocysteine (Sec), essential to the process of selenocysteine biosynthesis. Whole-body deletion of Scly leads to obesity and impaired glucose tolerance, with hepatic steatosis and enlargement and whitening of the brown adipocyte tissue (BAT). This project aims to examine the consequences of knocking out Scly in the brown adipocyte of mice.

We hypothesize that BAT-specific-Scly knock-out (KO) animals will exhibit metabolic dysfunction, including weight gain, glucose and insulin intolerance. The goal will be achieved by feeding customized diets of known amounts of Se and exposing animals to the cold initiating adaptive thermogenesis. Thermo probes were surgically implanted in the mice to record internal body temperature and glucose levels were measured. Western blotting assessed changes in specific selenoproteins associated with BAT thermogenic activity. Our results suggest that mice challenged with low Se diets exhibited higher weight gain and increased metabolic dysfunction compared to animals on moderate Se diets. Adaptive thermogenesis of mice was affected; mice with low Se-diets did not produce as much heat or maintained average body temperatures compared to moderate Se-diet-fed mice. Observing the KO of Scly in brown fat can provide information on the significant role of Se in energy expenditure and thermoregulation.

Mentor: Dr. Lucia A. Seale

Yousef Jad Sarameh
Molecular Cell Biology (B.S.)
Natural Sciences
Honors, UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 302 (Zoom: ‘Ulu)

Characterization of Potential Domestication Candidate Genes in the Tropical Yam *Dioscorea alata*

The domestication of cultivable crops from their wild ancestors has enabled modern agriculture to feed our population. But in many tropical regions, people depend on staple crops whose agronomic traits have not been improved by domestication and traditional breeding. Domestication of these “orphan crops” will require newer genetic improvement technologies, like gene editing. The tropical yam species *Dioscorea alata* is a staple crop for millions of people and is a great candidate for gene editing. This requires two main components, the Cas9 enzyme that cuts DNA and a short guide RNA (gRNA) that guides the Cas9 enzyme to a precise gene sequence in the genome. Designing optimized and efficient sgRNAs requires identification of the exact DNA sequences of the target genes in the crop’s genome. My research project was to (1) determine the sequence variation for four different genes in *D. alta*, and (2) to characterize the transcriptome in three different tissues in *D. alata* where the candidate genes are expected to function. The genes are *phytoene desaturase* (PDS), *gibberellin 20-oxidase* 20 (GAox20), *abscisic aldehyde oxidase* (AAO), and *terminal flower1* (TFL1). Analysis of the sequences for these four genes revealed that the *D. alata* accession I was using was triploid, which is an important consideration when designing efficient sgRNAs. I will also present my current analysis of the genes differentially expressed in the three tissues analyzed. This project is the first step of a longer term project to improve the agronomic performance of yam using gene editing.

Mentor: Dr. Michael Muszynski

Brenton Sasaoka
Civil and Environmental Engineering
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 213 (Zoom: Kukui)

Hidden Geometry of the Kōkō Net

To improve the transportation of valuable resources, Ancient Hawaiians developed kōkō nets. These nets were bags of netted cords in the shape of an elongated cone above the lower hemisphere composed of natural fibrous materials. The proposed work analyzes the various lengths, structures, and connections of cord segments between knots in the net. Tensile strength will be measured experimentally using structural stress measurements. The distributed weight load on segments will be calculated using engineering mechanics principles. The developed mathematical models will explain how the net, consisting of 1D string made in the 2D plane, can carry 3D volumetric heavy objects without geometrical mismatches between dimensions in proper balances of forces and torques. After matching the experimental and theoretical results, the proposed work will provide an in-depth understanding of the engineering aspects of the KoKo nets as an essential component of the (ancient) Native Hawaiian lifestyle being inherited to the present. The convergence of modern engineering principles and the Native Hawaiians' cultural living methods will provide a holistic insight into designing more nature-friendly engineering practices.

Mentor: Dr. Albert Kim

Aja Tani
English
Arts & Humanities - Creative
Honors
Oral Presentation: Session 1 (9:30-10:20a) in KUY 309 (Zoom: ‘Ilima)

Daughter of Fyre and Blood

For my creative project, I’ve written a Young Adult Fantasy book titled *The Daughter of Fyre and Blood*. The story is about a faery who ventures beyond her kingdom to find the murderer of her friend. However along the way, she ends up getting caught in the middle of an ancient hunting game played amongst the royal fae.

In my first semester of my fourth year, I took a Studies in Creative Writing course with Professor Kristiana Kahakauwila. She taught me various crafts that I’ve worked towards implementing within my writing. For example, one of the most important forms of craft I took away from that class is characterization. Characterization is formed through desire and how there would be no story or drive to the plot if a character did not have desire. I used this craft to further concentrate on the characterization of my main character.

A huge inspiration for my story plot is Sarah J Maas’s *House of Earth and Blood*. While I deeply respect Sarah J Maas’s work and writing style, her habit of killing off characters of colour doesn’t sit right with me, which brings me to the purpose of my project.

The aim of my project is to create inclusive fantastical works where all readers can find themselves in the media. Furthermore, I wish to write stories based on many different cultures to honor them without culturally appropriating them. Overall, I want people of colour to be represented more in books and stories.

Mentor: Professor Shawna Ryan

Jolie Tosten
Marine Biology
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 305 (Zoom: Makaloa)

Zooplankton Diversity, Community Composition, and Migratory Behavior in a Region of the Ocean at Near-term Risk of Deep-sea Mining Impacts

Deep-sea mining is an emerging industry that aims to extract polymetallic nodules from the deep-sea floor as a new commercial source of metals for renewable battery production[1]. With a growing interest in deep-sea mining, it is critical to know what organisms inhabit these ocean regions and how they will potentially be affected if deep-sea mining becomes widespread. It's crucial to understand how deep-sea mining may impact zooplankton, because zooplankton are the dominant secondary producers that are important for moving carbon[4], nitrogen, and phosphorus vertically through the water column and exporting bioelements into the deep-sea which support microbial biogeochemical cycling at depth[5]. Deep-sea mining is expected to release a midwater sediment plume at 1200 meters, while the Oxygen Minimum Zone (OMZ) in this region is at 500-700 meters.The main objectives of this project were to assess zooplankton diversity, community composition and structure, and diel vertical migratory behavior across the mid-water column (0-1500 m) in the southeastern Clarion Clipperton Zone (CCZ) which is located in the Eastern Tropical Pacific Ocean using a whole community DNA Metabarcoding approach. Samples were collected over the NORI-D exploration mining contract area in the spring and fall of 2021 at two sites, a Preservation Reference Zone (PRZ) that is protected from mining, and a Collector Test Area (CTA) that will be impacted during experimental mining. We discuss how zooplankton vertical distributions and movement of zooplankton across the pronounced OMZ may interact with the effects of deep-sea mining.

Mentor: Dr. Erica Goetze

Genevieve Triplett
Botany
Minor in Art
Natural Sciences
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 302 (Zoom: ʻUlu)

Quantifying Leaf Traits in Coastal and Montane Populations of ʻIlima

When natural selection optimizes traits to increase a plant's fitness in an environment it is called adaptation. The Hawaiian Islands are great for studying how plants adapt to differing landscapes because of their extreme environmental gradients. Many plants vary along with these gradients, which makes them great candidates to study adaptation. This project aims to answer three questions: 1) Do leaf traits differ significantly between plants from coastal and montane populations? 2) If so, do varying leaf traits correlate with environmental factors? 3) Does the anatomical leaf trait variation correlate with changes to the maximum photosynthetic rate and gas exchange? To test these questions, we sampled 13 populations of the native Hawaiian plant ʻIlima (*Sida fallax*) across Oʻahu and Hawaiʻi and quantified the stomatal ratio, density and size, leaf thickness, photosynthetic rate, stomatal conductance, and amphistomy advantage. Some leaf traits varied significantly between the populations while some did not, and there was little to no correlation to the tested environmental factors. Likewise, we found that some of the trait variation correlated with photosynthetic and gas exchange rates, while some did not. Finally, the photosynthetic rate and amphistomy advantage was significantly higher in coastal populations than montane populations. Overall, since some of the leaf traits varied consistently between coastal and montane populations across both islands, and they were found to benefit the function of the leaves, I argue that the results support the conclusion that coastal and montane populations of ʻIlima support an adaptive hypothesis.

Mentor: Dr. Chris Muir

Dennis Trotter
Atmospheric Science
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 303 (Zoom: Kalo)

Water Isotope Analysis in Hawai‘i

Tropical islands are among the most bio-diverse and vulnerable places on Earth, and water resources are vital to their ecosystems and the population. Hydrogen and oxygen isotope analyses are an important tool in studying the hydrological cycle on tropical islands, such as the Hawaiian archipelago. However, for such locations, there are limited datasets that consist of long-term and high-frequency data, which makes interpretation challenging. In this project, a novel dataset is presented and analyzed based on the weekly collection of rainfall hydrogen and oxygen isotopic composition on O‘ahu beginning in July 2019 and still ongoing. This dataset allows the spatial and temporal variability of hydrogen and oxygen isotopic composition on O‘ahu to be quantified and examined in greater detail than past data collection on the island. The data show considerable differences in deuterium (δ^2 H) and oxygen-18 (δ^{18}O) ratios produced by different weather systems. The data is also characterized by noticeable spatial variability, with some sites characterized by higher isotope ratios than others. Deuterium excess shows a seasonal cycle, which is attributed to the different weather system origins. The negative correlation between rain rate and isotopic abundance varies regionally, but could potentially be useful in determining rain rates in past climates. The local linear relationship between δ^2H and δ^{18}O shows a strong correlation, except at higher abundances. These results emphasize the importance of maintaining the dataset, as it can prove useful in future climate studies of similar regions.

Mentor: Giuseppe Torri, Alison Nugent

Paul Ulanowicz
Business Management
Arts & Humanities - Research
Honors
Oral Presentation: Session 2 (10:30-11:20a) in KUY 310 (Zoom: Wauke)

NIL: The Mega Quake that Hit College Sports

College football players are the face of one of the biggest industries in sports, college football. Despite bringing in billions of dollars, college football players received no financial compensation. This changed when state and federal governments approved new Name, Image, and Likeness (NIL) policies that allowed college athletes to be compensated based on their celebrity. College football players are recruited from a young age as both big and small football programs try to recruit them to join their teams. Football programs nationwide vary in size, funding, and popularity, giving larger programs an upper hand in recruiting. NIL further increases the gap between small and large programs in recruiting, which often dictates success on the field—which further increases the gap. Large programs benefit from NIL in ways smaller programs can only dream of. This forces smaller programs to find innovative ways to stay competitive in an ever-more-difficult environment. For players, NIL represents an opportunity to be compensated for their hard work and dedication. For teams, NIL represents yet another competitive tool [to differentiate and elevate their program above others]. Despite its positives, future regulation surrounding NIL must be factored into the NCAA's business model to maintain a competitive product moving forward.

Mentors: Thane Messinger, Milomir Ognjanovic

Tatum Umiamaka
Astrophysics (B.S.), Information and Computer Sciences (B.A.)
Natural Sciences
UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 213 (Zoom: Kukui)

Machine Learning to Discover First Supernovae with the James Webb Space Telescope

Supernovae are luminous explosions of stars that can be seen billions of light years away. Scientists study these events to learn more about the history and expansion of the universe. The James Webb Space Telescope (JWST) was launched on December 25, 2021 and with its large 6.5-meter mirror and ability to measure longer wavelengths of infrared light, we can see farther into the universe than ever before.

Here we trained a convolutional neural network (CNN) to spot supernovae on mock JWST data from Vela Cosmological Simulations. We generated two nearly identical sets of mock images, with and without noise. For every image in each set, we created four copies with different NIRCam bandpass filters (F115W, F150W, F277W, F444W). The presence and positions of the planted supernovae were randomly chosen, but consistent between each copy. For a sanity check, we use the set without noise as an idealized test. With the noise set, we found that the neural network identified planted supernovae with a 0.98 accuracy, identified a supernova when one was not planted with a 0.2 accuracy, did not identify a planted supernova with a 0.2 accuracy, and did not identify a supernova when one was not planted with a 0.98 accuracy. The results suggest the network is efficient, with little inaccuracies. We plan to succeed this project and use the network on real data from the COSMOS survey by JWST, to streamline our ability to spot the most distant supernovae.

Mentor: Dr. David Rubin

Kian Viernes
Mechanical Engineering
Engineering & Computer Sciences - Research
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 209 (Zoom: Olonā)

Low-Cost Fabrication of Flexible, High-Resolution Laser-Induced Graphene Sensors via Metal Stencils

The benefits of wearable sensors are vast, including real-time environmental monitoring and increased access to life-saving medical information that would otherwise require specialized facilities. Laser Induced Graphene (LIG) has emerged as a promising method for producing flexible electrodes for wearable biosensors. LIG is robust, inexpensive, and easy to manufacture, which increases the accessibility of this technology. However, achieving high resolution electrodes is challenging with LIG based sensors. This project utilizes metal stencils to increase the achievable resolution. The electrodes are produced by rastering an Epilog Mini CO_2 laser engraver over a sheet of American Durafilm polyimide (PI) tape. By placing a metal stencil in between the laser and the PI tape, only the portions of tape exposed to the laser through stencil are converted to graphene, meaning a resolution that is finer than the laser spot size can be achieved. Without the stencil, the laser can only achieve features above 100 µm. Using the stencil, 50-60 µm lines have been achieved. These electrodes were tested for functionality using cyclic voltammetry. Preliminary results indicate feasibility for use as electrodes and future work will focus on further sensor characterization and implementation as flexible wearable sensors.

Mentor: Dr. Tyler Ray
Co-Authors: Dr. Kaylee Clark, Deylen Nekoba

Megan Cerio Wettlaufer
Marine Biology
Certificate in Marine Option Program
Natural Sciences
Honors
Oral Presentation: Session 1 (9:30-10:20a) in KUY 304 (Zoom: Moa)

Dorsal Fin Scarring as an Indicator of Fisheries Interactions with Pantropical Spotted Dolphins (*Stenella attenuata*) in O‘ahu and Hawai ’i Island

The pantropical spotted dolphin (*Stenella attenuata*) is found throughout the tropical Pacific, including around the Hawaiian archipelago where multiple populations occur. They feed on a variety of species including squid, crustaceans, and other organisms of the deep-sea scattering layer. In the pelagic waters of the eastern tropical Pacific, these dolphins are found to associate closely with yellowfin tuna. Due to their close association to a species heavily commercially fished, there has been enormous amounts of bycatch as a result. This has led to an estimated 80% reduction of the initial population size. However, limited information is available regarding the extent to which pantropical spotted dolphins interact with fisheries in Hawaiian waters. Our study uses opportunistically collected images of pantropical spotted dolphin dorsal fins to quantify the number of individuals with scars indicative of interaction with fishing gear. Images were obtained between October 2021 to September 2022 during small boat surveys conducted by the Marine Mammal Research Program of the Hawai’i Institute of Marine Biology. My analysis of the data suggests that over 90% of scarring found on the dorsal fins of identified pantropical spotted dolphins from both O’ahu and Hawai’i Island can be attributed to fisheries-related interactions. Only limited numbers of animals were available for analysis, particularly from Hawai’i Island, and additional images would be valuable information in enhancing this work in the future.

Mentors: Dr. Cynthia Hunter; Dr. Claire Lacey

Jessica Wielgus
Entrepreneurship and Marketing
Certificate in French
Arts & Humanities - Research
Honors
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 310 (Zoom: Wauke)

Exploring the Effects of Bilingualism Through Entrepreneurship

Entrepreneurship promotes market value by launching new innovations thus generating wealth and advancement in society. However, reaching success as an entrepreneur is difficult. If failure rates are high what makes for an effective entrepreneur? As researchers study variables such as education and gender, this research considers language as a factor influencing entrepreneurial capacity. It is well established that bilinguals, or those who know two languages, show increased proficiency in communication and multitasking among other cognitive processes. This paper hypothesized that bilingualism improves communication and cognition of entrepreneurs, and ultimately, entrepreneurial success. The methodological approach of this research consisted of open-ended interviews with semi-structured questions. Interviewees are three bilingual entrepreneurs and three monolingual entrepreneurs all in real estate and located in Colorado. Results indicated that business profitability was lower on average for bilinguals. Mixing of languages and negative accent impressions were shown. Although, bilingual entrepreneurs did in fact show advantages in greater multitasking and idea development as well as communication and networking.

Mentors: Dr. Caroline Fry and Dr. Jayme Scally

Anneke Wirth-Yap
Marine Biology
Certificate in Queer Studies
Natural Sciences
UROP
Oral Presentation: Session 2 (10:30-11:20a) in KUY 305 (Zoom: Makaloa)

Transcriptomic Analysis of Sea Cucumber Vision

Echinoderms' evolutionary proximity to early vertebrates makes their sensory capabilities particularly interesting. Opheodesoma spectabilis is one of few sea cucumbers with eyespots. Despite the morphological and behavioral evidence of their eyespots, little is known about their vision on a molecular level. Vision is a lens through which to understand evolution, and well understood in a variety of animals. Light perception begins with opsins, a kind of protein. To investigate sea cucumber vision we will assemble and analyze transcriptomes of O. spectabilis, focusing on opsins. We will perform differential analysis between their skin and eyes, and compare the opsins present in O. spectabilis to other organisms to understand their evolutionary relationships. We collected eye and skin tissue from 7 O. spectabilis specimens, and extracted and sequenced their RNA. Sea cucumbers are “reef janitors'', as they are voracious eaters, consuming sand for detritus, playing a huge role in ecosystem health, which is vital as coral reefs become more and more threatened. Understanding their vision is important for understanding their behavior, ecosystem role, and place in evolutionary history.

Mentor: Dr. Megan Porter

Maile Kuuleilani Wong
Botany; Hawaiian Language
Natural Sciences
Honors, UROP
Oral Presentation: Session 3 (11:30a-12:30p) in KUY 302 (Zoom: ʻUlu)

E Paʻa I Ke Kahua: Building Foundational Skills for Engaging in Community Driven Research

The complex issues that we face today call for applied and community informed science. Hawaiʻi is facing ecological and social issues driven by impacts of climate change, colonization, and poor land management practices. This portfolio compiles and community resources I have produced throughout my undergraduate career to serve my community and to cultivate diverse skills across disciplines and expertise. The objective of this portfolio was to engage applied work for to Hawaiʻiʻs diverse ecological communities (humans included) and cultivate skills to engage with indigenous and western sciences methodologies to address the challenges we face in Hawaiʻi. In this portfolio I showcase the outcomes the work forming the kahua or foundation upon which I will continue to build. I highlight a UROP study investigating the effect of coastal seawater inundation on Native Hawaiian Coastal dune plants. Hawaiʻiʼs coastal dune ecosystems are threatened by global sea-level rise. Coastal flooding events are emerging as the most significant drivers of coastal salinity stress because they have the most significant fitness effects, thus characterizing tolerance to seawater inundation across species could aid in conservation, highlighting tolerant species useful for the restoration and vulnerable species needing intensive management to conserve. This research investigates the effects of seawater inundation on coastal dune plants both in field conditions and in a controlled greenhouse setting. We measure and metrics of tolerance as well as photosynthetic performance. Our results for these experiments indicate plants were strongly affected by sea water inundation, but this varied dramatically across species.

Mentor: Dr. Tamara Ticktin, Dr. Kasey Barton

Santiago Yanez
Marine Biology
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 305 (Zoom: Makaloa)

Assessing the Efficacy of Marine Fish Survey Methods

This presentation will summarize the findings of my work over the summer and extended project deadline for AESM-5813. This project has two components. The first is a period of fieldwork and database aggregation, between the months of may and july. During this time I carried out two distinct methods of snorkel survey, focusing on species and frequency numbers of the fish I encountered within specific times and distances. I compared counts from belt transect surveys to stationary point count surveys at four sites in Honolulu. The second period involves data aggregation and organization. A data frame is constructed that contains all data collected, and is imported into an R project. The goal of this R project is to draw conclusions from the final dataset, such as by calculating species-level correlation between stationary point counts and transect counts at each site and calculating data calibration factors. This study is important because it takes steps towards understanding the reliability and accuracy of the Stationary Point Count and Belt Transect Survey methods.

Mentor: Professor Jake Ferguson

Nicholas Yos
Global Environmental Science
Minor in Geography and Environment
Natural Sciences
UROP
Oral Presentation: Session 1 (9:30-10:20a) in KUY 210 (Zoom: Naio)

Studying the Effects of Climate Change on the Growth of Mānoa Lettuce (*Lactuca sativa*)

Environmental conditions like temperature, rainfall, and atmospheric carbon dioxide (CO_2) concentration have significant effects on the growth of plants. Because climate change can alter these conditions, it has the potential to significantly impact plant health. Some scientists have hypothesized that the beneficial effects of increased CO_2 concentrations could counteract the harmful effects of climate change-induced droughts and heat waves, but others argue that elevated CO_2 levels are not enough to negate the threats climate change poses to plants. Many experiments have tested the effects of CO_2 and temperature or CO_2 and water availability, but few have studied all three. This is problematic, as temperature, water, and CO_2 have interacting effects on plant health and excluding one can produce an inaccurate picture of the impacts of climate change on plants. To study the combined effects of these three conditions, I am in the process of growing 350 Mānoa lettuce plants under different levels of water availability, temperature, and CO_2 concentration. After these plants are fully grown, I will measure their weight, height, and nutrient content to see how climate change might affect plant growth. Although this experiment remains in progress, I expect that elevated CO_2 concentrations will increase plant growth but will not not fully negate the negative effects of high temperatures and low water availability. My findings have the potential to shed light on the way plants will grow in the future, something that will become increasingly important as the rate of climate change accelerates in the decades to come.

Mentor: Dr. Camilo Mora

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