Undergraduate Research and Creative Work

9 December 2022 – 9:30am to 12:30pm
Virtual Showcase
Honolulu, Hawai‘i

SCHEDULE & MEETING INFORMATION

TIME	ACTIVITY	LOCATION
9:30-9:40a	Welcome	Main Room
9:45-11:15a	Showcase Oral Sessions • Kalo • Olonā • ʻIwaʻiwa • Kukui • Limu Kala • ʻIlima	Kalo Room Olonā Room ʻIwaʻiwa Room Kukui Room Limu Kala Room ʻIlima Room
Please join us for the release reception of volume VII of the Horizons *undergraduate journal*		
11:30a-12:15p	*Horizons* Student Author Panel	Main Room
12:15-12:30p	Closing	Main Room

SESSION	ZOOM LINK	MEETING ID
Main	https://go.hawaii.edu/M4x	910 2258 7603
Kalo	https://go.hawaii.edu/XNx	920 2181 7039
Olonā	https://go.hawaii.edu/C4x	998 1963 8583
ʻIwaʻiwa	https://go.hawaii.edu/q4x	941 3481 1836
Kukui	https://go.hawaii.edu/Y4x	931 3610 7100
Limu Kala	https://go.hawaii.edu/xNy	986 3830 4444
ʻIlima	https://go.hawaii.edu/E4x	917 5418 2568
Password for all rooms: showcase22		

Oral Session
9:45 - 11:15a

Kalo Room

Alena Albertson	Poinsettia Anthocyanin Analysis
Shion Aou	Transformation of Papaya with RUBY:35S Plasmid
Kathy Ho	The Ultimate Relationship between King Tides and Watercress Yield
Thanh Nguyen, Haixin Ruan	Harvesting Knowledge: Using a Rickshaw to Spread Awareness of Campus Resources
Stephen Harvey	The Effect of GRF4-GIF1 Transcription Factor on Papaya Regeneration
Ju-Ling Chen, Sally Do	Designing Cost-Efficient and Environmental Bioreactors for Algal Research

Oral Session
9:45 - 11:15a

Olonā Room

Hassam Alhajaji, Jenna Lidua	Developing a Mobile Laser Scanning System to Assess Precise Tree Mapping in GNSS-denied Environments
Simao Alves, Jennifer Chinen, Dalton Holt, Patrick Ng, Arsany Sokar	Unmanned Aerial Vehicles for Marine Environmental Monitoring
Airon Castaneda, Dean Matsumura, Joy Edades, Logan Shiroma	Pocket Green: Public Parklets
Elijah Davidson, Kylie Takai, Qipeng Zhong	The Future of Halawa in Dense and Green
Deborah Higa	Research and Development of a Rover for Simulated Mars Missions
Nicholas Beydler	Hubble Tension

Oral Session
9:45 - 11:15a

ʻIwaʻiwa Room

Tanner Okamura	Enhancing Detection of Infectious Hypodermal and Hematopoietic Necrosis Virus in Shrimp
Lou Guionnet	Microplastic Ingestion Does Not Affect Larval Development and Metamorphosis of Hydroides elegans and Phestilla sibogae
Madison Kim	The Effects of Environmental Enrichment on Laboratory Mice
Jaymie Bilog-Mina	Deletion of Zinc Independent Alternative Ribosomal Proteins in Mycobacterium smegmatis
Ana Velasquez	High Lipid Diets, Both Ketogenic and High Fat Diet, Induce Osteoporosis Yet Affect Somatic Growth Differently in a Developmental Disorder Model, the Mexican cavefish
Barbara Grigsby	Measuring the Effect of Protein Scaffolding on Mouse Immune Responses to HIV GP120

Oral Session
9:45 - 11:15a

Kukui Room

Kylie Noelani Akiona	What Does It Mean to Decarcerate Wāhine?: Centering Returning Wāhine and Indigenizing Reentry Solutions
Chelsea Jiang	Analyzing Consumer Perceptions Towards the Honolulu Disposable Food Ware Ordinance
Aydya Espinoza	Addressing Food Insecurity in Hawai‘i to Prevent Type 2 Diabetes
Cameron Nishida	Human Genome Editing with Large Serine Integrases
Theodore Huo	CPAP Adherence Among Obstructive Sleep Apnea Patients in Hawaii
Anna Fan	Approaches to Increase Native Hawaiian and Other Pacific Islanders Participation in Cardiometabolic-related Trials from Past Recruiters' Perspectives

Oral Session
9:45 - 11:15a

Limu Kala Room

Sophia Hernandez	Monitoring Seismic Noise in Mānoa during Covid-19 and Beyond
Laura Daclison	Studying Stressors: COVID, Confinement, and Cheating Evolved
Jake Imanaka	Personality Traits as Predictors for Social Engineering Vulnerability
Michela Kennon	Reducing Maternal Mortality among African American Woman in the US
Haley Zahnd	Why Representation in Children's Literature is Important: Psychological Perspectives on Multicultural Representation in the Classroom
Jalen-Rose Condes, Nathan Roberts	Directing a Short Film About the Artform of Rap

Oral Session
9:45 - 11:15a

ʻIlima Room

Lisa Lowe	Properties of Air Nanobubbles Generated using a Ceramic Membrane
Keanu Rochette-Yu Tsuen	Using Phenology Data to Investigate Linkages between Ecosystem Services in Great Lakes Coastal Wetlands
Caleb Olaso	A Peptidoglycan Recognition Protein Orchestrates Symbiont Recruitment in the Squid-Vibrio Symbiosis
Edward Weldon	Impact of Return-to-Exercise on Traumatic Brain Injury Recovery in a Community Setting
Donovan Roy	Psychiatric Disorders Associated with Comorbid Autoimmune Diseases in Multiple Sclerosis
Jobert Teppang	Understanding the Effects of SARS-CoV 2 Proteins Independent of Active Replication in Lung Microvascular Endothelial Cells

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. If appropriate, the faculty mentor's name, as given by the student, is listed below the abstract.

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

Hassam Alhajaji, Jenna Lidua
Simao Alves, Jennifer Chinen, Dalton Holt, Patrick Ng, Arsany Sokar
Airon Castaneda, Dean Matsumura, Joy Edades, Logan Shiroma
Ju-Ling Chen, Sally Do
Jalen-Rose Condes, Nathan Roberts
Elijah Davidson, Kylie Takai, Qipeng Zhong
Thanh Nguyen, Haixin Ruan

Kylie Noelani Akiona
Political Science
Minor in American Studies
Social Sciences
Honors
Oral Presentation Room: Kukui

What Does It Mean to Decarcerate Wāhine?: Centering Returning Wāhine and Indigenizing Reentry Solutions

Kānaka Maoli (Native Hawaiians) today suffer from continuing legacies of American imperialism and Western colonialism on our ancestral land. One of the many ways in which Kānaka Maoli are intentionally and violently exploited as Indigenous peoples is our gross overrepresentation in prisons and jails under the Hawai‘i Department of Public Safety’s jurisdiction, despite being a minority in the fake state. As one of the top 25 incarcerators in the world, Hawai‘i is also the number one incarcerator of women across the United States. In Hawai‘i, Kanaka Maoli wāhine (Native Hawaiian women) in particular are incarcerated at more disproportionate rates than Kanaka Maoli kāne (Native Hawaiian men). Ongoing community work and countless research demonstrate the effectiveness of incorporating Indigenous epistemologies into reentry programs. One reentry group for returning Kanaka Maoli wāhine on Moku O Keawe (Hawai‘i Island) called Wāhine O PA‘A which incorporates Kanaka Maoli (Native Hawaiian) epistemologies. This paper was intended to evaluate the effectiveness of Wāhine O PA‘A in its work through a series of interviews and literary analyses, but instead explores the carceral constraints placed on the research process, champions the incorporation of Indigenous epistemologies and values into reentry methods welcoming back incarcerated loved ones, critically examines mass incarceration in Hawai‘i, and echoes the demand for prison industrial complex (PIC) abolition, Land Back, and Bodies Back.

Mentor: Dr. Jamaica Heolimeleikalani Osorio

Alena Albertson
Molecular Biosciences & Biotechnology
Natural Sciences
MARC
Oral Presentation Room: Kalo

Poinsettia Analysis

The first objective of this work is to conduct comprehensive profiling of poinsettia pigments. We have analyzed 14 different cultivars at key developmental stages to identify and quantify anthocyanin content. Three cultivars in our study are newly developed and have not been analyzed. A second objective is to understand how heat delay affects poinsettias' pigmentation. In general, lower temperatures promote more anthocyanin development but research is limited on this phenomenon. Samples have been collected under differential growing temperatures and light intensities to gather a deeper understanding of this occurrence.

During pigment profiling experiments, poinsettias were grown with identical materials, using standard commercial production practices in Honolulu, Hawaii, under natural environmental conditions. The poinsettias in the heat delay experiment were grown under the same protocol until their sixth week of growth. The plants were then split up into two growth chambers, one to experience colder conditions and the other to warmed conditions for a two-week period, then temperature conditions were alike for the rest of development. This project was set up as a completely randomized design.

Anthocyanins were isolated from the plant material and the content was analyzed using High-Performance Liquid Chromatography. A multipoint calibration curve using external anthocyanin standards was used to quantify the anthocyanins in the unknown samples.

The results of this experiment are a modern analysis of anthocyanin quantities during plant development for a variety of cultivars and insight into how heat exposure disrupts pigmentation.

Mentor: Dr. Daniel Owens

Co-Author: Emily Teng

Hassam Alhajaji, Physics (B.S.)
Jenna Lidua, Physics (B.S.)
Natural Sciences
UROP
Oral Presentation Room: Olonā

Developing a Mobile Laser Scanning System to Assess Precise Tree Mapping in GNSS-denied Environments

In the field of geography, particularly in GPS & Global Navigation Satellite System (GNSS) denied regions, 3D-mapping dense forestry has proven difficult. We propose a mobile and affordable method of under-tree-canopy mapping by integrating a laser sensor, LiDAR, with an Inertial Measurement Unit (IMU) to solve errors in orientation movement and rotational data. We constructed and integrated a compact and closed system of LiDAR, GPS, and IMU sensors. The system was tested by collecting data from trails in the University of Hawaii Lyon Arboretum. The raw data was processed using a Kalman filter and a Simultaneous Localization And Mapping (SLAM) algorithm to generate a dense point cloud. To assess the precision of our data's point cloud, we used the Diameter at Breast Height (DBH) of trees around the trail. Mobile and inexpensive mapping tools will prove useful for sustainable construction and wildlife preservation efforts.

Mentor: Dr. Qi Chen

Co-Authors: Mohamed Sherif, Amr Ghanem, Ibraheem Insanally

Simao Alves, Mechanical Engineering
Jennifer Chinen, Mechanical Engineering
Dalton Holt, Mechanical Engineering
Patrick Ng, Mechanical Engineering
Arsany Sokar, Mechanical Engineering
Engineering & Computer Sciences
UROP
Oral Presentation Room: Olonā

Unmanned Aerial Vehicles for Marine Environmental Monitoring

Comprehensive monitoring of marine environments for environmental and security purposes can be both intrusive and costly. Moreover, there is currently no established methodology to make rapid, accurate measurements of salinity, temperature and acoustics over extensive shallow water regions such those which coral reefs inhabit. Unmanned aerial vehicles (UAV) have shown potential to facilitate ocean measurement and monitoring in near shore and coastal environments. Our goal is to integrate sensors onto a waterproof drone for temperature, salinity, and acoustic real-time measurements to access environmental impact and monitor coral reef health. A novel aspect is the incorporation of ambient acoustic measurements as level of snapping shrimp sounds has been related to overall coral health. We integrate acoustic recorders and a combined salinity and temperature sensor using a Raspberry Pi and mount it onto a water-proof UAV capable of water landing. A waterproof servo winch is used to deploy and retrieve the sensor package. A complementary infrared (IR) drone will be used to preliminary scan of temperature anomalies on the ocean surface (pollution, coral reef bleaching, etc.) and coordinate with the water-proof drone for locations in which more accurate temperature, salinity and acoustic measurements are needed. Preliminary labs tests of the sensors are promising and field tests are planned for the end of the semester. Future challenges for this project include developing sensor fusion, autonomous operations and enhanced data streaming.

Mentor: Dr. John Allen

Shion Aou
Biochemistry
Natural Sciences
UROP, REEU
Oral Presentation Room: Kalo

Transformation of Papaya with RUBY:35S Plasmid

The papaya (*Carica papaya)* is a diploid (2n=18) flowering plant, which is economically important to and widely grown in Hawai'i. Not only is it's fruit high in nutrients, but papaya is also commonly used in cosmetics and pharmaceuticals as well. Therefore, developing a fundamental understanding of papaya genes is important to reduce the damaging effects of oomycete, viral and fungal pathogens that often threaten these plants, thus bettering the production and utilization of papaya products in industry. There is currently no effective system in place for genomic editing in papaya, making it a challenge to obtain further knowledge. Ongoing research at the University of Hawaii has been working to develop and establish effective genome editing methods in papaya using the Cas9 and Cas12 CRISPR systems. Our particular project is to provide supplementary information that can help to fine-tune and improve the research process being used in the ongoing papaya research at the University. Reporter gene *RUBY* converts tyrosine to betalain in plants, resulting in a bright red colour that can be seen with the naked eye. The reporter has previously used as a selection marker for rice and Arabidopsis, but has never been tested on papaya. This project tests whether or not the *RUBY* reporter can also be used as a selection marker for transformation of papaya cultures. If successful, this visual marker can be used to expedite and reduce the cost of research to developing the papaya genome editing system.

Mentors: Dr. Miaoying Tian, Dr. Pratibha Nerurkar

Co-Author: Jeremieh Hasley

Nicholas Beydler
Physics and Computer Science
Natural Sciences
UROP
Oral Presentation Room: Olonā

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. Rubin

Jaymie Bilog-Mina
Microbiology (B.A.)
Minor in Psychology
Certificate in Spanish
Natural Sciences
Honors, UROP
Oral Presentation Room: ʻIwaʻiwa

Deletion of Zinc Independent Alternative Ribosomal Proteins in Mycobacterium smegmatis

Mycobacterium tuberculosis (*Mtb*) is responsible for causing tuberculosis (TB). In 2021 about 10.6 million people were infected with TB, claiming the lives of 1.6 million. *Mycobacterium smegmatis* (*Msm*) is a non-pathogenic mycobacterium that serves as a nonvirulent model for *Mtb*. Zinc-independent alternative ribosomal proteins (AltRPs) and zinc-binding primary ribosomal proteins are paralogs thought to have similar function in building ribosomes, with the former replacing the latter when zinc is limited.

A previous study showed that the *altRP* operon encoding four AltRPs is required for *Msm* to exhibit its unique cell morphology and grow under zinc limitation. Under zinc limitation, it was unexpected for *Msm* cells to be elongated. This was possibly due to AltRPs-containing ribosomes being built instead of PrimRPs. This study aims to determine which AltRP out of the four AltRPs in the operon (L28-2, L33-2, S14-2, and S18-2) is responsible for growth under zinc limitation and morphogenesis when grown in a zinc-limited environment. Plasmids were created to replace the gene of interest with an antibiotic resistant cassette for each individual AltRP gene and electroporated into *Msm*, resulting in four deletion mutants.

The deletion mutants are currently being grown in parallel with wild type (WT) and Δ*altRP* strains under zinc limitation and depletion with a zinc-specific chelator. Results will be observed under a light microscope to measure the cell length and compare the growth to the WT and deletion strains to assess which AltRP is responsible for morphogenesis and growth under zinc limitation and depletion.

Mentor: Dr. Sladjana Prišić

Airon Castaneda, Architecture
Dean Matsumura, Architecture
Joy Edades, Architecture
Logan Shiroma, Architecture
Arts & Humanities - Creative
UROP
Oral Presentation Room: Olonā

Pocket Green: Public Parklets

In reviving small businesses that were fatally affected from the COVID 19 pandemic, our research focused on how we can celebrate Hawaii's communities through the design of public space. This further intends to attract business for local shops through the construction of public seating and landscape. Partnership with Cafe Kopi, a small business located in Kailua specializing in coffee and food along with Better Block Hawaii (BBH) allowed us to explore public parklets as a medium for community gathering and public engagement design. The development of a design that includes native landscaping as well as sculptural and engaging seating has promoted a stronger developing community for a small, but busy avenue in Kailua Town. In that, our group has engaged in multiple client and collaborative design critiques, as well as provided schematic and design development services to BBH and Cafe Kopi.

Site Analysis, concept development, schematic design, and design development have been explored and achieved throughout the project. Research on Kailua Town, the culture, neighborhood and its history were first covered. Next, exploration and integrations of public seating and native plants that would best thrive in the area were researched through consultation with advisor, Dr. Andrew Kaufman, while also reading and learning about the best practices pertaining to climate and environment of each plant. Then, a series of site visits followed by schematic design development was completed, under further direction of BBH and Dr. Kaufman. Finally, schematic design and design development stages were submitted to BBH for construction.

Mentor: Dr. Andrew Kaufman

Ju-Ling Chen, Biochemistry
Sally Do, Molecular Biosciences & Biotechnology
Natural Sciences
UROP, MBBE 499
Oral Presentation Room: Kalo

Designing Cost-Efficient and Environmental Bioreactors for Algal Research

The success of algae production is largely dependent on growth conditions. Outdoor cultivation systems, while large, introduce a variety of extraneous variables that impede continuous growth. With algal photobioreactors (PBR), aspects of culturing platforms are customizable, thus can be designed to be favorable for research and production. However, current PBRs are not accessible, expensive, and have small volume capacity. Therefore, our research project focused on designing a PBR using low-cost, durable materials to optimize modules of light, temperature, pH, optical sensors, and visual monitoring systems. Using a preliminary sketch on AutoDesk360, the PBR components were assembled with customized designs on CAD software. For real-time algae monitoring, we developed source codes on Raspberry Pi cameras and controlled temperature using Arduino boards. The light modules allowed us to test the response of algae strains, *cw15* and *sta6*, under different lighting conditions, including low, regular, and high-light conditions, with confocal microscopy for cell morphology changes and GC analyses for metabolites. The impact of light intensity on the algae strains were monitored using a growth curve with 750 nm optical density, confocal microscope imaging, and lipid analysis. The resulting PBR design has high potential for a vast array of algal research studies. With further development of each module, the PBR will be used to supplement growth conditions for other algal projects, such as improving the yield of important bioproducts from algae in the research for sustainable nutraceuticals and biofuels.

Mentor: Dr. Zhi-Yan (Rock) Du

Co-Authors: Antonia Barela, Cade Kane, Ty Shitanaka

Jalen-Rose Condes, Creative Media - Digital Cinema
Nathan Roberts, Creative Media - Digital Cinema
Arts & Humanities - Creative
UROP
Oral Presentation Room: Limu Kala

Directing a Short Film About the Artform of Rap

The McCully Boyz started with a single idea — what if the local neighborhood of McCully in urban Honolulu was transformed into the epicenter of hip-hop? *The McCully Boyz* is a short film about a young adult who hides underneath a flashy alter-ego of a rapper due to his fear of being rejected as his true self by others. After entering a rap competition in an attempt to find fortune and fame, he realizes the importance of being himself — as this is what truly allows him to become closer with his friends.

This script was adapted into a short film by 11 talented senior film students from the University of Hawai'i at Mānoa's Academy for Creative Media program. The filmmaking process was broken into three segments — the planning, the filming, and the editing phase. Made possible by UROP, costumes, props, and decor were purchased to build the world of the story.

Over a few months, 13 actors were casted and directed. They each brought their own talents and personalities to make the characters their own. Actors in rapper roles were coached on how to rap rhythmically and in-character in order to highlight the artform of rap.

This story aims to satirize mainstream rap trends, such as mumble rap and lyrics saturated with vulgarity. At its core, this story is a heartfelt romcom made with the intent to entertain an audience. The film is expected to be screened at the ACM Student Showcase and HIFF in 2023.

Mentor: Professor Lisette Flanary

Laura Daclison
Secondary Education, General Science
Social Sciences
UROP
Oral Presentation Room: Limu Kala

Studying Stressors: COVID, Confinement, and Cheating Evolved

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 of 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 online to in-person courses based on our findings.

Mentor: Dr. Michael-Brian Ogawa

Elijah Davidson, Architecture
Minor in Business Finance
Kylie Takai, Architecture
Qipeng Zhong, Architecture
Arts & Humanities - Research
UROP
Oral Presentation Room: Olonā

The Future of Halawa in Dense and Green

The future of Halawa in Dense and Green is a proposal looking into the impact of large-scale multi-family housing projects in the Halawa district around Aloha Stadium to maximize the quality of living within high-density building prototypes. Through Evidence-Based Design (EBD) we will perform comparative studies on the high-density buildings with decent living conditions in areas that have similar site contexts such as Greenwich New York, Ginza Tokyo, Hongkong, and Singapore for investigating how they have responded to Dense and Green issues. We will provide diagrammatic representations such as 3D models using AR of future scenarios of the Halawa area. All the research outcomes will be compiled into a report and shared with the public to shed some light on the impacts of high-density housing with green in the future of Hawaii. Furthermore, we hope that the outcome of this research should be the basis for better design decision-making for future housing developments in Hawaii.

Mentor: Hyoung-June Park, Ph.D., MArch

Aydya Espinoza
Public Health
Certificate in Spanish
Social Sciences
Honors
Oral Presentation Room: Kukui

Addressing Food Insecurity in Hawai‘i to Prevent Type 2 Diabetes

Type 2 diabetes has become one of the leading chronic diseases in Hawai‘i. One way that the State of Hawai‘i can address the rising rates of type 2 diabetes is by reducing the high rates of food insecurity across the islands. A risk factor for type 2 diabetes is not having access to healthy food options. Food access has become a big problem since the COVID-19 pandemic across the country. It has specifically affected Hawai‘i because of the lack of food sustainability. There are practices in place that are addressing food insecurity, but it is not enough. Policies should be enacted that make food more accessible to the people that need it. Federal nutrition programs have too many eligibility requirements and their application processes are not accessible.

I conducted a policy analysis of proposed policies that could be enacted by the Biden-Harris administration to address food insecurity in the United States. I examined three proposed policies: 1) expanding the eligibility for SNAP to populations that did not have access before, 2) ensuring SNAP participants receive enough benefits to follow the *Dietary Guidelines for Americans*, and 3) adding a monthly fruit and vegetable benefit for SNAP participants. The policy that I recommend is expanding the eligibility for SNAP to populations that did not have access to SNAP before because it would show the greatest outcome of changing the rates of food insecurity in the United States. Enacting this policy would make SNAP available to more people in Hawai‘i.

Mentor: Dr. Denise Nelson-Hurwitz

Anna Fan
Biology and Psychology
Social Sciences
MHRT Program
Oral Presentation Room: Kukui

Approaches to Increase Native Hawaiian and Other Pacific Islanders Participation in Cardiometabolic-related Trials from Past Recruiters' Perspectives

Introduction: Native Hawaiians and Other Pacific Islanders (NHOPI) have higher rates of cardiometabolic disorders and stroke than non-Hispanic Whites in the nation. Yet, NHOPIs are underrepresented in clinical trials aimed at addressing these cardiometabolic disorders. The objective of this study is to gain a better understanding of the key factors that may contribute to NHOPIs' decision to enroll (recruitment) and actively participate (retention) in clinical trials from the perspective of past clinical trial recruiters.

Methods: Audio-recorded semi-structured interviews with ten (10) previous clinical trial recruiters were conducted via Zoom and phone calls. Interviews were guided by 10 open-ended questions and unlinked demographic information was collected. A thematic analysis of the interview data determined recruiters' ideas and experiences organized under the domains of barriers and facilitators.

Results: A key recruitment barrier involved participants being involved in clinical trial phases for an extended time and participants not being eligible for the clinical study. An important recruitment facilitator is providing incentives and participants wanting to be a part of the study. A key retention barrier is personal life situations where something came up last minute. An important retention facilitator is having engaging activities promoting participation and sharing of experiences among participants.

Conclusions: Approaches to increase NHOPI participation in clinical trials involve community participants' drive to seek knowledge; the goal to have healthier outcomes for generations beyond; be involved in communities and build relationships with each other. Overall themes included an engaging community, knowledge seeking, and relationship building were interpreted from the interview.

Mentors: Claire Ing, Dr.P.H. and Joseph Keaweʻaimoku Kaholokula, Ph.D.

Barbara Grigsby
Molecular Biosciences & Biotechnology
Natural Sciences
Major Requirement
Oral Presentation Room: ʻIwaʻiwa

Measuring the Effect of Protein Scaffolding on Mouse Immune Responses to HIV GP120

Introduction: Human immunodeficiency virus (HIV) vaccine development has been ongoing for nearly 4 decades; however, the high mutation rate of the virus makes it exceptionally capable of evading vaccine-induced immune responses. A commonly studied HIV vaccine target is gp120, a glycoprotein exposed on the surface of the enveloped virus, however the intrinsic properties of gp120 inhibit a potent immune response upon vaccination.

Objectives: The goal of this project is to determine if conjugating a gp120 immune complex to a nanoparticle protein scaffold will elicit an enhanced immune response in mice.

Methods: Four groups, each consisting of five mice, were immunized with different antigens: wild-type gp120 immune complex, either alone or bound to a protein scaffold, or a core gp120 (with multiple loops removed) immune complex, either alone or bound to a protein scaffold. A bead-based titer assay was performed to measure the antibody response of each individual against a wild-type gp120 antigen, a core gp120 antigen, the antibody used in the immune complex and the protein scaffold nanoparticle.

Results: Consistently, there is shown to be an increase in antibody response among the mice immunized with the nanoparticle-conjugated gp120 immune complex, for both core and wild-type.

Conclusion: The data supports the hypothesis that conjugation to a protein nanoparticle positivity affects immune response; however, since the response to the nanoparticle scaffold itself is so predominant, further experimentation would be required to determine whether nanoparticle immunodominance ultimately detracts from the potential immune response to gp120.

Mentor: Dr. Iain MacPherson

Lou Guionnet
Marine Biology
Natural Sciences
UROP
Oral Presentation Room: ʻIwaʻiwa

Microplastic Ingestion Does Not Affect Larval Development and Metamorphosis of Hydroides elegans and Phestilla sibogae

Microplastics (MP) (>500 µm), formed from the degradation of larger pieces of plastic or introduced into the environment through cosmetics or toothpaste, have been found in the ocean and even living organisms. Due to the relatively new existence of MP particles, understanding their effects on said organisms is limited. In addition, the variation in size and the type of plastic creates a large range in the observed concentration of MP (0.03 to 50,000 MP pr m3) in the ocean. Most marine benthic organisms have a larval stage, a state which also falls within that size range. Consequently, they have a high probability of encountering plastic particles the same size as their food, with unknown consequences. To examine the outcome of these encounters, larvae of the nudibranch *Phestilla sibogae* and the tubeworm *Hydroides elegans* with different feeding strategies, were exposed to two different concentrations of MP (2,500 and 25,000 MP/L) throughout their development. While determining larval growth of *H. elegans* for each day of larval development through confocal microscopy small differences in larval length of pre-competent larvae were observed, however larvae in the control and both MP treatments were the same size at competence. Further, exposure to MP did not affect metamorphosis of either *H. elegans* or *P. sibogae*, which was the only variable observed for that species. This suggests that even at the higher estimates of MP concentrations predicted for the end of the century, larvae may only have infrequent, benign interactions with MP.

Mentors: Dr. Michael Hadfield, Dr. Brian Nedved, Dr. Marnie Freckleton, Amy Knowles

Stephen Harvey
Molecular Biosciences & Biotechnology
Natural Sciences
MBB Requirement
Oral Presentation Room: Kalo

The Effect of GRF4-GIF1 Transcription Factor on Papaya Regeneration

Papaya has been a key export and staple local fruit of Hawaii, but its production is challenged by a suite of plant pathogens. If the resiliency and papaya regeneration rate can be improved upon, many involved parties across multiple sectors will benefit. The objective of this research is to investigate the effect a chimera transcription factor protein has on papaya transformation efficiency and regeneration rate. *Agrobacterium* strain GV3101 was transformed using electroporation with pJD639, a plant binary vector engineered for expression of a highly conserved plant-specific transcription factor called *GROWTH REGULATING FACTOR 4 (GRF4)* and its co-factor *GIF-INTERACTING FACTOR 1 (GIF1)*. *Agrobacterium* has an inherent mechanism that inserts the T-DNA portion of its TI (tumor-inducing) plasmid into a host genome. This inherent mechanism has been exploited and executed on papaya cell suspensions. The transformed papaya cells were cultivated using favorable mediums and diligently examined for signs of embryogenesis. Information involving this *GRF4-GIF1* chimera construct and how it pertains to dicots is still in its infancy. My current research is ongoing but I aim to identity the effect the *GRF4-GIF1* chimera transcription factor has on the rate of regeneration and transformation efficiency in Papaya. This advancement can potentially facilitate the production of new cultivars for commercial use and breeding programs while also expanding scientist's genetic toolbox for one of Hawaii's most important crops.

Mentors: Dr. Miaoying Tian, Jeremieh Hasley

Sophia Hernandez
Earth Science
Minor in History
Natural Sciences
UROP
Oral Presentation Room: Limu Kala

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
UROP
Oral Presentation Room: Olonā

Research and Development of a Rover for Simulated Mars Missions

Organizations like the Mars Society have developed competitions such as the University Rover Challenge (URC) to foster students in the fields of Science, Technology, Engineering, and Mathematics (STEM). The URC is targeted at undergraduate students and challenges them to develop a remotely operated rover that can accomplish a variety of tasks and will one day contribute to the scientific effort on Mars and beyond. The URC consists of four missions: Science Mission, Extreme Delivery Mission, Equipment Servicing Mission, and Autonomous Navigation Mission. Team RoSE (Robotic Space Exploration) is developing the 2022-2023 RoSE rover to compete in the 2023 URC. This year's rover consists of four systems: the Mechanical System, the Payload System, the Guidance Navigation and Control (GNC) System, and the Avionics System. The Mechanical System is the rover's external structure and consists of the arm, end-effector, chassis, and suspension subsystems. These mechanisms are designed to traverse Mars' rough terrain, assist astronauts, and maintain equipment systems. The Payload System consists of the payload soil analysis subsystem and must be able to analyze soil samples for signs or absence of life. The GNC System is the software behind the rover controls and autonomous navigation capabilities. The Avionics System consists of the electrical power subsystem, which provides power to all electronics onboard the rover, and the communications subsystem, which establishes protocols to send data between the rover and ground station. With these proposed systems the 2022-2023 RoSE rover will complete shall achieve the objectives set forth by the 2023 URC guideline.

Mentor: Frances Zhu

Kathy Ho
Environmental Earth Science
Natural Sciences
Honors, UROP
Oral Presentation Room: Kalo

The Ultimate Relationship between King Tides and Watercress Yield

Watercress (*Nasturtium officinale*) is of great importance in the Hawaiian Islands from perspective of local food production, due to limited supply and popular demand. The watercress fields at Sumida Farm, located on the island of O'ahu in the Pu'uloa aquifer, require the freshwater supply that comes from the Kalauao Springs for cultivation. King tides push seawater into the aquifer in the subsurface as well as through surface water drainage channels onto the farm. A resulting potential change in the salinity of Sumida Farm's freshwater supply may negatively impact watercress growth. The objective of this study is to monitor spatial and temporal distribution of salinity at the farm over a 12-month period and relate it to its drivers such as precipitation, tides and groundwater levels, as well as to nutrient levels and watercress harvest yields.

The study focuses on 12 watercress plots along the discharge canal connected to Pearl Harbor. Two measurement sites are located at opposite ends of each watercress plot. Additionally, 3 sample collection sites were established in the first, sixth, and twelfth watercress plot. The samples collected were analyzed for inorganic and organic nutrients. These quantifications allow for identification of correlations between fluctuations in salinity, the appearance of king tides and whether these tie into lower watercress crop yield.

Measurements taken along the discharge canal with a multiparameter sonde (YSI) revealed that the salinity decreased during low tides and increased during high tides. Future data analysis will include relationships with other observed parameters (precipitation, temperature, groundwater level).

Mentor: Dr. Henrietta Dulai

Theodore Huo
Natural Sciences
Oral Presentation Room: Kukui

CPAP Adherence Among Obstructive Sleep Apnea Patients in Hawaii

Obstructive sleep apnea (OSA) is the obstruction or collapse of the upper airway while still maintaining respiratory effort during sleep. Implementing continuous positive airway pressure (CPAP) therapy is commonly used to treat patients with OSA and improve respiration. This study evaluates the CPAP adherence of patients diagnosed with OSA in Hawaii to understand and improve current therapeutic approaches.

Methods

A retrospective chart review was conducted on patients identified using the ICD 10 code for OSA (G47.33) in the (HPN) *eClinicalWorks* database. Data was collected from the most recent chart with a compliance rating by Dr. Sriharsha Vajjala between January 1, 2021 - December 31, 2021. Patients with coexisting diagnoses and ICD 10 codes for central sleep apnea (G47.37) and insomnia due to a medical condition (G47.01) were excluded. Compliance was determined by CPAP use for at least 4 hours a night for at least 70% of the time. Alpha = 0.05 determined statistical significance.

Results

Of the 126 patients observed, 40.5% of patients showed excellent adherence to CPAP therapy. CPAP adherence was also significantly associated with OSA severity ($p = 0.02$). 49% of patients with severe OSA were compliant while 85.7% of patients with mild/moderate OSA were not compliant to CPAP.

Conclusions

Our main finding showed that OSA severity was directly associated with improved adherence to CPAP therapy. Likewise, previous studies have reported that having a higher frequency of observed interrupted breathing correlated with better adherence to CPAP therapy.

Mentor:

Co-Authors:

Jake Imanaka
Computer Science
Natural Sciences
UROP
Oral Presentation Room: Limu Kala

Personality Traits as Predictors for Social Engineering Vulnerability

As systems implement an increasing amount of security features to protect against cyberattacks, hackers have begun to target the weakest link in the cybersecurity chain—people. Such attacks are categorized as Social Engineering and rely on the manipulation and deception of people rather than technical security flaws. This study attempts to examine the relationship between people and their vulnerability to such attacks by posing the following questions: 1) What relationship, if any, exists between personality traits and Social Engineering Vulnerability, and 2) what relationship, if any, exists between personality traits and the speed at which an individual makes cybersecurity decisions? To answer these questions, 80 undergraduate students at the University of Hawaii were surveyed to measure their personality and their level of cybersecurity awareness. The set of subjects were chosen due to their ease of accessibility, and continuation of this study may include a larger and more diverse subject group. The data returned from the survey consisted of 3 measurements: a personality score for each of the Big Five personality traits, a security vulnerability score, and the time taken to complete sections of the survey. The survey results indicated that there is no significant correlation between the measured personality traits and measured vulnerability. The relationship between different personality traits and the elapsed time to complete the survey was slightly more significant; however, it was still statistically insignificant overall.

Mentors: Dr. Michael-Brian Ogawa, Dr. Martha Crosby

Chelsea Jiang
Global Environmental Science
Social Sciences
UROP
Oral Presentation Room: Kukui

Analyzing Consumer Perceptions Towards the Honolulu Disposable Food Ware Ordinance

As the destructive effects of plastic pollution gain ever-increasing presence in the public awareness, many regions in the world introduced plastic regulation laws to combat the production, distribution, and disposal of single-use plastic, met with varying levels of success. This thesis investigates consumers' perception of the Disposable Food Ware Ordinance (DFWO), which was introduced by the city and county of Honolulu in 2019, and designed to take effect in Sept. 2022. The methodology of this study consists of distributing anonymous online surveys to Honolulu residents, which include questions related to the frequency of plastic usage, awareness of plastic pollution, and willingness to contribute financially to sustainable food ware options. Survey results were plotted and analyzed to formulate an understanding of the capacity at which consumers are willing to support the plastic ban. Findings show a negative correlation between age and willingness to pay for sustainable food ware. A negative correlation was also discovered between income and willingness to pay. Bioplastic was the preferred choice of sustainable food ware, according to survey responders, which may lead to the growth of bioplastic as the most prevalent food ware post-DFWO.

Mentor: Dr. Catherine Chan

Michela Kennon
Public Health (B.A.)
Social Sciences
Honors
Oral Presentation Room: Limu Kala

Reducing Maternal Mortality among African American Woman in the US

Maternal mortality among African American women has been a health issue in the US for years. Currently, African American women are three times more likely to die from pregnancy and birth complications compared to white women. Disparities in maternal health in the country have led to poorer maternal care outcomes for these group of women. The disparities also cause higher maternal mortality among African American women, compared to other demographic groups in the country.

Using the Centers of Disease Control and Prevention policy analytic framework, I analyzed three existing policies aimed to reduce maternal mortality. First, my research evaluated the midwifery led care model in maternal care. Next, I examined home visiting care services for postpartum and prenatal periods. Then, I looked at enabling telemedicine for pregnancy related care. Afterwards, I compared the three policy options to establish which policy could inspire effective change in maternal mortality for African American woman. This analysis allowed me to generate a firm policy recommendation.

Ultimately, I discovered three fundamental policies that could directly reduce maternal mortality. Moreover, it was found that the midwife-led care is essential for enhancing maternal and newborn health and achieving global development. Through this model, women receive antenatal care tailored to their individual needs, as well as education, counseling, and continuous care during labor, delivery, and the immediate postpartum period.

Overall, implementing midwifery led care models can reduce maternal mortality for African American women in the United States.

Mentor: Dr. Denise Nelson-Hurwitz

Madison Kim
Animal Science
Natural Sciences
Honors, UROP
Oral Presentation Room: ʻIwaʻiwa

The Effects of Environmental Enrichment on Laboratory Mice

The mouse has long served as the model for biomedical research, but there is little known about the effects environmental enrichment (E.E.) has on their physiology. Twenty four eight-week-old CD-1 Swiss Webster mice were randomly divided into three enriched treatment groups and one control group. The groups consisted of gummy bones, wood gnaw blocks, crumbled feed mixed in the bedding for foraging opportunities, and for the control, cages with bedding only. Body weight, feed, and fasting blood glucose were recorded throughout the study. After 12 weeks, all mice were euthanized and the spleen, kidney, and liver of each mouse were harvested and sent for histology. After statistical analysis, a significance can be seen between the increase in weight within all enriched groups compared to the control group, with the crumbled feed group showing the greatest body weight gain. The amount of feed consumed between all groups was not significant, which shows the effects that E.E. had on weight gain. Statistical significance was also found in the histological analysis of the megakaryocytes in the spleen, glycogen in the liver, and inflammation of the kidney compared to the control group. Statistical significance was also seen in the fasting blood glucose of the gnawing block group compared to the control. The study concludes that E.E. has an impact at the metabolic and physiological level on laboratory mice, and should be taken into consideration when designing studies of this nature.

Mentor: Dr. Sylvia Kondo

Lisa Lowe
Biological Engineering
Engineering & Computer Sciences
MARC
Oral Presentation Room: ‘Ilima

Properties of Air Nanobubbles Generated using a Ceramic Membrane

Nanobubbles (NB) are small bubbles in aqueous solutions with diameters between 50 - 200 nm. Because of their nano-scale size, they exhibit dominant Brownian motion over buoyancy forces, resulting in a longer retention time in solutions. NB have many unique physicochemical characteristics, including a highly negative zeta potential and surface charge. Therefore, NB are stable in solutions, and can last from days to weeks after generation. NB increase gas-liquid mass transfer compared to conventional aeration, which can be harnessed in biological processes such as microbial cultivation and bioprocessing. Due to its inherent merits of *in-situ* NB generation, ceramic membranes have gained research and development interest. There is a significant research gap in this area, so elucidating the physicochemical properties of ceramic membrane NB is necessary for its wider application.

In this study, air-NB were generated through a custom-made ceramic membrane design. Varying pressures, mixing conditions, and hydrophobicity of the membrane were tested to determine optimal conditions to generate air-NB. It was hypothesized that increased pressure would allow for a greater flow rate, leading to greater air-NB formation and faster air-NB saturation times. To quantify air-NB, dissolved oxygen was continually monitored, and their concentration and sizes determined through nanoparticle tracking analysis. Stability of air-NB were evaluated through the zeta potential changes. The data from this study brings insight into the optimal operating conditions for generating air-NB through a ceramic membrane and expands applications of NB technology.

Mentor: Dr. Samir Khanal

Co-Authors: Ty Shitanaka, Kyle Marcelino

Thanh Nguyen, Environmental Design
Haixin Ruan, Environmental Design
Social Sciences
UROP
Oral Presentation Room: Kalo

Harvesting Knowledge: Using a Rickshaw to Spread Awareness of Campus Resources

About 85-90% of food is imported from overseas and we seem to ignore a lot of food that is locally produced. Hawaii has the potential to be a self-sufficient state in terms of food production. Our project intends to evoke people's interest in the edible plants on the Manoa campus in a fun and eye-catching manner instead of these resources being wasted.

We began the process by reaching out to Eating in Public (EIP), a local anarchist group, about their project WEEDS. EIP's guiding principle, "TAKE = act without shame, LEAVE = share without condition, WHATEVAS = trust without apology," has similarities with ours as we are aiming to research more and spread out the knowledge of eating the plants that are available around us and help contribute to reducing the food waste problems. We work with Professor Bundit Kanisthakhon and Gaye Chan and decided to study the tree name "Tamarind." The tamarind cart (rickshaw) will be a place to spread the knowledge of what we have researched, we will be sharing samples with students and show them how to utilize the food resources we have around us to create delicious meals. The cart design has different features of showing the process of how we can harvest to create meals and still be able to contribute to minimizing waste.

We were able to create a cart design that can showcase different activities surrounding the Tamarind tree, from picking fruits, sun-drying, growing trees from seeds, or giving out samples/recipes.

Our project is not only limited to us in the design field. People in any field can help in different ways to reach our goal, to ensure that we can spread awareness to UH Manoa students about the benefits of fruits and plants around us in cooking. The most significant aspect of this rickshaw will be its visual and practical, it can create a "signature" to apply to any of the other plants. Everyone can see it and talk about it!

Mentors: Professor Bundit Kanisthakhon, Professor Gaye Chan

Cameron Nishida
Biology
Natural Sciences
UROP
Oral Presentation Room: Kukui

Human Genome Editing with Large Serine Integrases

Large serine integrases (LSI) may serve as a useful tool to treat genetic based disorders. The site-specific ability to insert sequences into safe portions of the human genome could prove useful in gene therapy. The Owens lab has primarily used *phiC31* integrase to achieve this goal. However, *phiC31* has a relatively low efficiency when integrating into its target site. The purpose of this project is to identify and compare various LSIs with increased baseline efficiency.

Two-hundred integrases were gathered through literature review and collaboration with a bioinformatics specialist. A molecular reporter was developed and optimized in which successful recombination by an LSI is linked to the expression of green fluorescent protein (GFP). Ninety pairs of linear synthetic DNA (gblocks) were designed and generated through collaboration with Integrated DNA Technologies. These substrates were transfected into cultured human (HEK293) cells. Flow cytometry was then used to screen these candidates and measure their activity.

Optimization of our reporter system revealed that the combination of the H1 promoter, ZsGreen fluorophore, and compact BG polyA successfully reported a dynamic range of integrase activity while maintaining a minimal sequence required for gblock synthesis. Comparison of 90 pairs of integrases cotransfected with their cognate substrate revealed that majority of them were more active than *phiC31*.

This project developed a high throughput method of screening protein activity in situ. A number of LSIs were identified with varying degrees of efficiency. Incorporating these novel integrases into molecular tools has therapeutic potential for the advancement of gene integration.

Mentor: Dr. Jesse Owens, Dr. Brian Hew

Tanner Okamura
Biology
Natural Sciences
UROP
Oral Presentation Room: ʻIwaʻiwa

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-Author: Taylor Peterson

Caleb Olaso
Marine Biology (B.S.) & Chemistry (B.A.)
Natural Sciences
MARC
Oral Presentation Room: ‘Ilima

A Peptidoglycan Recognition Protein Orchestrates Symbiont Recruitment in the Squid-*Vibrio* Symbiosis

Symbioses, interactions between living organisms, demonstrate immense diversity. In horizontally-attained symbioses, hosts employ mechanisms that select environmental microbes to be recruited to host tissues. In this study, we explored the first step of horizontal transmission through the mutualistic association of the Hawaiian bobtail squid, *Euprymna scolopes*, and its microbial partner, *Vibrio fischeri*, which is housed in the light organ of the squid. Earlier studies of the system had shown that, within minutes of hatching in natural seawater, the epithelia of the host’s nascent light organ secrete a layer of mucus that entrains *V. fischeri* in the first step of recruitment. We hypothesized that a peptidoglycan recognition protein, EsPGRP4, mediates this mucus secretion in response to the bacterial cell-wall biomolecule, peptidoglycan. We sought to investigate the regulation and function of EsPGRP4. Immunocytochemistry localized EsPGRP4 to the superficial ciliated fields of the juvenile light organ. We found that production of EsPGRP4 increased over the first 48 h after hatching if the light organ remained uncolonized. When colonized by *V. fischeri*, the levels of the protein in light-organ tissue remained similar to that of hatchling organs. Pharmacologically curing the initially colonized light organ with antibiotics resulted in return of EsPGRP4 production to levels similar to light organs that had remained uncolonized since hatching. Furthermore, we found that preincubation of the tissues with an EsPGRP4 antibody decreased light organ mucus production and colonization. These findings provide evidence of an innate mechanism that underlies a crucial first step in the horizontal recruitment of bacterial symbionts.

Mentor: Professor Margaret McFall-Ngai

Co-Author: Joani Viliunas

Keanu Rochette-Yu Tsuen
Global Environmental Science
Natural Sciences
MARC
Oral Presentation Room: ‘Ilima

Using Phenology Data to Investigate Linkages between Ecosystem Services in Great Lakes Coastal Wetlands

Phenological datasets have the capacity to inform multiple applications, due to diverse parameters collected over time. The Old Woman Creek National Estuarine Research Reserve (NERR) Phenological Monitoring Program focuses on wildlife species critical to Great Lakes coastal wetlands. One initiative involves monitoring the vegetation manipulation of common muskrats (*Ondatra zibethicus*), a keystone species that drastically changes vegetated areas that serve as habitat for a diversity of species.

Wetlands and their vegetation provide crucial ecosystem functions, including filtration of excess nutrients flowing from upland areas into large bodies of water. It is possible that muskrat manipulation of vegetation can potentially inform the nutrient filtering that influences water quality in the Old Woman Creek estuary. This study aims to find a possible correlation between muskrat vegetation manipulation, water depth, and water quality, specifically the total phosphorus concentration in the estuary.

Nutrient data were retrieved from the System Wide Monitoring Program (SWMP) database which monitors water passing through the estuary into Lake Erie. Preliminary analyses and interviews with coastal wetland managers suggest that while there may be no significant relationship between muskrat activity and phosphorus concentration due to influence of other environmental factors (e.g., significant storm events, agricultural activity, and seasonal conditions), there seems to be compatibility between muskrat activity and general biodiversity. This could indicate a management preference for maintaining water depths in favor of native vegetation and wildlife indicator species without impact to water quality. This project shows that phenological data can potentially inform management strategies while maintaining water quality goals.

Mentor: Emily Kuzmick

Donovan Roy
Natural Sciences
Oral Presentation Room: ʻIlima

Psychiatric Disorders Associated with Comorbid Autoimmune Diseases in Multiple Sclerosis

INTRODUCTION: Multiple Sclerosis (MS) is an autoimmune disease of the Central Nervous System (CNS) that has a high prevalence of autoimmune and psychiatric comorbidities. Previous studies have not addressed how these comorbidities relate to each other.

OBJECTIVE: To assess the relationship between comorbid autoimmune diseases and psychiatric disorders in MS, and to elucidate possible environmental factors or health disparities within this relationship.

METHODS: A retrospective case-control study was conducted using patient records at the Hawaii Pacific Neuroscience in Honolulu, Hawaii. Sociodemographic variables, clinical characteristics, and medical comorbidities were collected. Variables between the autoimmune disease status groups were compared using the Wilcoxon rank sum test for continuous variables and Pearson's Chi-squared test or Fisher's exact test for categorical variables. A p-value less than 0.05 was considered statistically significant.

RESULTS: Of the 109 patients analyzed, 30 (27.5%) patients with MS were found with comorbid autoimmune diseases (ADs). They had a significantly higher prevalence of depression (50% vs. 25%; p = 0.0075) and, although not significant, anxiety (30.0% vs. 21.5%; p=0.35). Comorbid ADs in MS did not seem to be associated with sociodemographic factors, but did appear to be associated with a significantly higher prevalence of health disparities, such as asthma (26.7% vs. 10.1%; p=0.038) and coronary artery diseases (13.3% vs. 2.5%; p=0.048).

CONCLUSIONS: Our findings suggest that comorbid ADs in MS are associated with increased risks of depression and other debilitating health disparities. This result can influence treatment options and inter-specialty care management to improve the outcomes in MS patients with comorbid ADs.

Mentor:

Co-Authors:

Jobert Teppang
Natural Sciences
MARC
Oral Presentation Room: ‘Ilima

Understanding the Effects of SARS-CoV-2 Proteins Independent of Active Replication in Lung Microvascular Endothelial Cells

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the virus responsible for the coronavirus (COVID-19) pandemic. Making up the virus particles are four crucial structural proteins: spike (S), envelope (E), membrane (M), and nucleocapsid (N). SARS-CoV-2 virus infection of lung airway epithelial cells leads to severe cytopathicity and causes activation of lung microvascular endothelial cells to secrete cytokines. Whether viruses can infect these endothelial cells is still not very clear. Recent studies and our lab’s preliminary data have shown that the S1, E, and N proteins alone can cause cytotoxic effects in cells independent of the virus itself. However, it is not known if these proteins affect lung endothelial cells independent of active viral replication. Our goal is to understand this mechanism by exposing lung cells to these proteins, measuring cell death, and identifying key inflammatory cytokines involved in injury. Cell viability results show that E proteins are more cytotoxic than S1 and N proteins.

Mentors: Dr. Saguna Verma, Stefanos Giannakopoulos, Mallory Wilson

Ana Velasquez
Marine Biology (B.S.)
Certificate in MOP
Natural Sciences
Honors, UROP
Oral Presentation Room: ʻIwaʻiwa

High Lipid Diets, Both Ketogenic and High Fat Diet, Induce Osteoporosis Yet Affect Somatic Growth Differently in a Developmental Disorder Model, the Mexican cavefish

Current research demonstrates that the ketogenic diet is a powerful and potentially life-saving tool that has applications to a wide range of health problems such as seizures, Autism Spectrum Disorder (ASD), Amyotrophic Lateral Sclerosis (ALS), Alzheimer, and Parkinson's disease. Since the ketogenic diet consists of a high fat, adequate protein, and low carbohydrate intakes, one concern is that the diet may result in high blood lipid levels (Babaei et al. 2013; Carnovali et al. 2018; Falcinelli et al. 2017; Tencerova et al. 2018). It is known that high blood lipid levels can be found in organisms with obesity, hyperlipidemia, and high glucose level which in humans results in bone weakening or osteoporosis (Carnovali et al. 2018; Falcinelli et al. 2017; Groesbeck et al. 2006; Hsu et al. 2006; Tencerova et al. 2018). In order to best analyze the long-term effects of the ketogenic diet within a reasonable time scale, a model system of Mexican tetra known as *Astyanax mexicanus.* Upon completion of a six week study, it was determined that both a high fat diet consisting of lard and a ketogenic diet consisting of a commercially available ketogenic supplement formula induced osteoporosis compared to control fish. The study found that despite bone weakening occurring in both high fat diet fish and ketogenic fish, those placed on the high fat diet experienced significantly greater growth which was also reflected in their behaviors.

Mentors: Dr. Masato Yoshizawa, Dr. Joanne Yew

Edward Weldon
Hawaii Pacific Neuroscience Research
Natural Sciences
Oral Presentation Room: ‘Ilima

Impact of Return-to-Exercise on Traumatic Brain Injury Recovery in a Community Setting

Introduction: Recommendations on return-to-exercise post-traumatic brain injury (TBI) remain controversial. This study surveys Hawaii’s diverse population to identify trends in exercise and recovery for TBI patients to shape recommendations on return-to-exercise. This study also aims to identify health inequities and factors that may negatively impact recovery.

Methods: Retrospective review was performed on 100 patients diagnosed with TBI in Hawaii between January 2020 and January 2022. Variables collected include demographics, etiologies, and symptoms at diagnosis. Self-generated phone surveys were completed to evaluate exercise patterns post-TBI and barriers to recovery. Statistical analysis was performed using RStudio.

Results: Patients who recovered within two years displayed similar exercise patterns to patients who took longer. Exercise frequency, intensity, and duration did not differ significantly ($p=0.75$, $p=0.51$, $p=0.80$, respectively). Hiking/walking for exercise was more common in the long recovery group ($p=0.018$) than the short recovery group ($p=0.003$), likely reflecting advanced age (50 vs. 39 years). Otherwise, exercise modalities did not differ significantly. No correlation exists between exercise intensity and symptom change ($p=0.920$), suggesting patients exhibit exercise patterns suitable for their specific situations. Finally, Caucasian patients and those with private insurance utilized the most TBI recovery resources ($p=0.032$).

Conclusions: Return-to-exercise does not appear to be a predictor for TBI recovery. If encouraged to exercise post-TBI, patients will self-regulate and not exacerbate their symptoms or recovery time, thus it may be suitable to recommend return-to-exercise as tolerated. The study also identified worrying inequitable trends in TBI recovery resources accessed, which should be further investigated to rectify this issue.

Mentor: Dr. Kore Liow

Co-Authors: Ryan Nakamura, Tracy Van, Ana Nakamura, Chancen Law, Meliza Roman, Connor Goo, Enrique Carrazana, Jason Viereck

Haley Zahnd
Psychology
Minor in Education, Sociology
Social Sciences
Honors
Oral Presentation Room: Limu Kala

Why Representation in Children's Literature is Important: Psychological Perspectives on Multicultural Representation in the Classroom

Multicultural education involves educational equity across all aspects of culture and ethnicity by integrating cultural values into standardized curricula to ensure understanding of lesson topics.

The components of my portfolio project act as three parts to a comprehensive whole, thus encapsulating the multi-step process of implementing multicultural practices in the classroom. The goal of my Portfolio Project is to connect my experiences with the development and implementation of the skills and resources needed to properly educate elementary-aged children in a way that promotes inclusivity, celebrates diversity, and above all, promotes the success of all students—regardless of race, ethnicity, sexual orientation, and/or gender orientation.

The first component is a comprehensive literature review—a summary, synthesis, and critique—of children's books from various diverse subgenres/classifications that deviate from heteronormative and Eurocentric norms.

The second component builds on insights from the literature review in the form of a fully developed, creative children's book that is ready to publish.
The third component combined insights from prior components, my personal observations, and experiences, as well as previous projects, experiments, and knowledge gained through coursework to create lesson plans that utilize multicultural resources and psychological theories to enhance state-imposed standards for learning.

Multicultural content and diverse representation in the classroom are closely linked to the psychological need to belong and to feel validated in a social environment; students are more likely to be engaged in coursework when it is supported by a culturally relevant curriculum.

Mentor: Dr. Ashley Maynard

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STAFF

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Frances Zhu

Horizons Vol VII Release Reception

11:30-12:15 student panel

PROGRAM SCHEDULE

Welcome & Introduction……Dr. Vernadette Gonzalez, Honors Director
Panel Discussion……Volume VII Student Authors
Moderator: Dr. Siobhán Ní Dhonacha, Editor
Closing……Moderator: Dr. Siobhán Ní Dhonacha, Editor

ABOUT THE JOURNAL

Horizons is a peer-reviewed academic journal dedicated to high-quality creativity, innovation, and research created, conducted, and synthesized by undergraduate students at the University of Hawai'i at Mānoa (UHM) in all academic fields represented by the UHM campus community.

Each annual issue, released in the fall, is published with simultaneous print and online versions. See the full version on our website at: https://manoa.hawaii.edu/horizons/

CALL FOR SUBMISSIONS

We invite students enrolled at UHM during the Spring 2021 through Spring 2023 semesters to submit work produced within this time frame to be considered for the Fall 2023 issue (Volume VIII). We encourage submissions from any undergraduate academic discipline.

For specific deadlines and detailed instructions on how to submit works for consideration, please visit our website listed above.

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Faculty serving on the journal's advisory and editorial boards
Honors Program
Undergraduate Research Opportunities Program
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Student Authors and their Faculty Mentors

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The Honors Program provides opportunities for talented and motivated undergraduates to excel in their academic studies. Students complete a challenging enquiry-based curriculum that encourages independent research and creative expression. They enjoy intimate and personalized educational experiences within the setting of a large research university through small classes, dedicated advising, peer mentorship and faculty-guided projects. The Honors Program promotes critical thinking and oral, written and audio-visual communication skills; respect for diversity and commitment to social justice; and civic participation and capacity for leadership. It fosters among its students and faculty a sense of identity and a joy in scholarship, which it communicates to the university and the community.
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