Virtual Showcase
Honolulu, Hawai‘i

Undergraduate Research and Creative Work

29 April 2022 – 9:15am to 1:00pm
Virtual Showcase
Honolulu, Hawai‘i
# SCHEDULE & MEETING INFORMATION

**(Sessions 1 & 2)**

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:15-9:30a</td>
<td>Opening Ceremony</td>
<td>ʻĒkaha (Main)</td>
</tr>
<tr>
<td>9:30-10:30a</td>
<td>Oral Session 1</td>
<td>Hau</td>
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<tr>
<td></td>
<td>• Animal Science</td>
<td>ʻIlima</td>
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<tr>
<td></td>
<td>• Ethnic Studies</td>
<td>ʻIwaʻiwa</td>
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<td></td>
<td>• Psychology</td>
<td>Kukui</td>
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<td></td>
<td>• Social Sciences</td>
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<td>• Natural Sciences</td>
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<td>• Computer Science</td>
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<td></td>
<td>Poster Session 1</td>
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<tr>
<td>10:30-10:40a</td>
<td>Break</td>
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<tr>
<td>10:40-11:40a</td>
<td>Oral Session 2</td>
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<td></td>
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<td>• Ethnic Studies</td>
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<tr>
<td></td>
<td>• Psychology</td>
<td>Hāpuʻu</td>
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<tr>
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<td>• Chemistry</td>
<td>Koa</td>
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<td></td>
<td>• Engineering</td>
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<td></td>
<td>• Cognitive Science</td>
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<td>• Marine Biology</td>
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<td></td>
<td>• Computer Science</td>
<td>Olonā</td>
</tr>
<tr>
<td></td>
<td>• Cell &amp; Molecular Biology</td>
<td>Pua Kala</td>
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<tr>
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<td>Poster Session 2</td>
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<td>• Social Sciences</td>
<td>Limu Kala</td>
</tr>
<tr>
<td>10:40-10:50a</td>
<td>Break</td>
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## SCHEDULE & MEETING INFORMATION
**(Session 3)**

<table>
<thead>
<tr>
<th>TIME</th>
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</table>
| 11:50a-12:50p | Oral Session 3  
  • Animal Science  
  • Creative  
  • Environmental Science  
  • Biology  
  • Informatics/Policy Development  
  • Marine Biology  
  • Engineering & Computer Science  
  • Medicine  
  Poster Session 3  
  • Natural Sciences  
  • Social Sciences | Hau  
  ‘Ilima  
  Hāpuʻu  
  Koa  
  Kukui  
  Naupaka  
  Olonā  
  Pua Kala  
  Kalo  
  Limu Kala |
| 12:50-1:00p   | Closing                                 | ‘Ēkaha (Main) Room        |
# PRESENTATION ROOM SCHEDULE
(BY ROOM)

<table>
<thead>
<tr>
<th>ROOM</th>
<th>SESSION 1</th>
<th>SESSION 2</th>
<th>SESSION 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9:30-10:30a</td>
<td>10:40-11:40a</td>
<td>11:50a-12:50p</td>
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</table>

## ORAL PRESENTATIONS

<table>
<thead>
<tr>
<th>ROOM</th>
<th>Session 1</th>
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<th>Session 3</th>
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<tbody>
<tr>
<td>Hau</td>
<td>Animal Science</td>
<td>Biology</td>
<td>Animal Science</td>
</tr>
<tr>
<td>‘Ilima</td>
<td>Ethnic Studies</td>
<td>Ethnic Studies</td>
<td>Creative</td>
</tr>
<tr>
<td>‘Iwa’iwa</td>
<td>Psychology</td>
<td>Psychology</td>
<td>(No session scheduled)</td>
</tr>
<tr>
<td>Hāpuʻu</td>
<td>(No session scheduled)</td>
<td>Chemistry</td>
<td>Environmental Science</td>
</tr>
<tr>
<td>Koa</td>
<td>(No session scheduled)</td>
<td>Engineering</td>
<td>Biology</td>
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<td>Kukui</td>
<td>Social Sciences</td>
<td>Cognitive Science</td>
<td>Informatics/Policy Development</td>
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<td>Naupaka</td>
<td>Natural Sciences</td>
<td>Marine Biology</td>
<td>Marine Biology</td>
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<tr>
<td>Olonā</td>
<td>Computer Science</td>
<td>Computer Science</td>
<td>Engineering &amp; Computer Science</td>
</tr>
<tr>
<td>Pua Kala</td>
<td>(No session scheduled)</td>
<td>Cell and Molecular Biology</td>
<td>Medicine</td>
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## POSTER PRESENTATIONS

<table>
<thead>
<tr>
<th>ROOM</th>
<th>Session 1</th>
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<th>Session 3</th>
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</thead>
<tbody>
<tr>
<td>Kalo</td>
<td>Natural Sciences</td>
<td>Natural Sciences</td>
<td>Natural Sciences</td>
</tr>
<tr>
<td>Limu Kala</td>
<td>Social Sciences</td>
<td>Social Sciences</td>
<td>Social Sciences</td>
</tr>
</tbody>
</table>

## CLOSING CEREMONY
in ‘Ekaha (Main) Room from 12:50-1:00p
**Note: URLs are case-sensitive.**

<table>
<thead>
<tr>
<th>ROOM</th>
<th>ZOOM LINK</th>
<th>MEETING ID</th>
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<tbody>
<tr>
<td>ʻĒkaha (Main)</td>
<td><a href="http://go.hawaii.edu/M4x">http://go.hawaii.edu/M4x</a></td>
<td>910 2258 7603</td>
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<tr>
<td>Hau</td>
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<tr>
<td>ʻIlīma</td>
<td><a href="http://go.hawaii.edu/E4x">http://go.hawaii.edu/E4x</a></td>
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<td>ʻIwaʻiwa</td>
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<td>Hāpuʻu</td>
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<td>Koa</td>
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<tr>
<td>Kukui</td>
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<td>Naupaka</td>
<td><a href="http://go.hawaii.edu/x4W">http://go.hawaii.edu/x4W</a></td>
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<td>Olonā</td>
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<tr>
<td>Limu Kala</td>
<td><a href="http://go.hawaii.edu/xNy">http://go.hawaii.edu/xNy</a></td>
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</table>

**FOR ALL SESSIONS:**

*Dial in by phone:* Check number at https://hawaii.zoom.us/u/adAw0iORPX

*Password for all rooms:* showcase22
<table>
<thead>
<tr>
<th><strong>Hau Room</strong></th>
<th><strong>Animal Science</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kylie Ebisuya</td>
<td>The Effect of In Ovo Injection of Xylooligosaccharide on the Immune Response of Broilers</td>
</tr>
<tr>
<td>Sara Bower</td>
<td>Rate of DNA Degradation in Pygmy Killer Whales for The Estimation of Post-Mortem Interval</td>
</tr>
<tr>
<td>Jia Cashon</td>
<td>Metabolic Shift by a New Compound, Ketone-ester, Provides the Molecular Link between the Ketosis and Multigenic (evolved) Asocial Condition in the Mexican Cavefish</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ʻIlima Room</strong></th>
<th><strong>Ethnic Studies</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Julianna Davis</td>
<td>Between East and West: An Investigation of Greek Ethnic Identity Formation, European Geopolitics, and Migration</td>
</tr>
<tr>
<td>Erika P. Johnson</td>
<td>A Narrative Inquiry of Nikkei Peruvian Return Migration to Japan</td>
</tr>
<tr>
<td>Kealoha Scullion</td>
<td>How can Intersectional &amp; Multicultural Pedagogies Contribute to Hawaiʻi High School Students’ Self-awareness and School Belonging?</td>
</tr>
<tr>
<td>Room</td>
<td>Topic</td>
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<tr>
<td>‘Iwa’iwa Room</td>
<td>The Role of Worry and Secondary Stressors on Maladaptive Grief Responses</td>
</tr>
<tr>
<td>Kyani Uchimura</td>
<td>Dad Talk: Prevalence of Decontextualized Language and Wh-questions in Father-Child Dyads in Hawai‘i</td>
</tr>
<tr>
<td>Robert Marc Macasieb</td>
<td>Evaluations of Student Psyche, Based on Geographic Locale</td>
</tr>
<tr>
<td>Manu Moreira</td>
<td>Effects of Food Insecurity on Mental Health and Academic Performance of College Students</td>
</tr>
<tr>
<td>Noa Brenner</td>
<td>Evaluations of Student Psyche, Based on Geographic Locale</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Kukui Room</th>
<th>Social Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paige Thomason</td>
<td>Empowering Students Through Inclusive Mathematics Pedagogy</td>
</tr>
<tr>
<td>Sara Mutzenberg</td>
<td>Sustainability in the Fashion Industry: Leaders in Sustainable Business Model Innovation</td>
</tr>
<tr>
<td>Dingyi Liu</td>
<td>Aging and Sea Level Rise: Exploring Future Elderly Population’s Accessibility to Essential Services in Honolulu, Hawaii</td>
</tr>
<tr>
<td><strong>Naupaka Room</strong></td>
<td><strong>Natural Sciences</strong></td>
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<tr>
<td>Sofia Suesue</td>
<td>Microbial Community Response to Contaminants of Emerging Concern in the Kāneʻohe Watershed</td>
</tr>
<tr>
<td>Mona Hirose,</td>
<td>Characterization of Hypothetical Protein, Michaela Kop</td>
</tr>
<tr>
<td>Rayna McClintock</td>
<td>Physiological Performance of Two Distinct Color Phenotypes of Porites <em>compressa</em> Fragments Under Thermal Stress</td>
</tr>
<tr>
<td>Ronja Steinbach</td>
<td>An Examination of Marine Fungi’s Ability to Degrade Plastic Pollution</td>
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<table>
<thead>
<tr>
<th><strong>Olonā Room</strong></th>
<th><strong>Computer Science</strong></th>
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</thead>
<tbody>
<tr>
<td>Riku Omata, Amy Shell</td>
<td>Seed Analysis with Multispectral Imaging</td>
</tr>
<tr>
<td>Xiaolin Mai</td>
<td>Non-target Computer Vision-based Structural Deflection Assessment with Machine Learning</td>
</tr>
<tr>
<td>Anna Gardner</td>
<td>Detecting Debris Disks near Bright White Dwarf Stars</td>
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**Poster Session I**
9:30 - 10:30a

<table>
<thead>
<tr>
<th>Kalo Room</th>
<th>Natural Sciences</th>
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<tbody>
<tr>
<td>Vanessa Alarcon Salgado</td>
<td>Social-like Behavior and its Dietary Effect in Surface- and Cave-dwelling Populations of the Mexican Tetra</td>
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<tr>
<td>Kimberly Martin</td>
<td>Developing InSAR Deformation Models and Coulomb Stress Change Simulations of the 2018 Kilauea Eruption</td>
</tr>
<tr>
<td>Gloria Santos</td>
<td>The Organization and Enzymology of the Flavonoid Biosynthetic Pathway in <em>Citrus Sinensis</em></td>
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<thead>
<tr>
<th>Limu Kala Room</th>
<th>Social Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faris Hasan</td>
<td>The Assessment of Bilingualism on Spatial Attention</td>
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<tr>
<td>Anna Fan</td>
<td>An Examination of Mental Health Practices in Community-Based Residential Care for Youth and Adolescents</td>
</tr>
<tr>
<td>YooJin Oh</td>
<td>Investigation of Cognitive Flexibility in Bilinguals Modulated by L2 Proficiency and Age of Acquisition</td>
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<tr>
<td>Hau Room</td>
<td>Biology</td>
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<tr>
<td>McKenna Bonn-Savage</td>
<td>Genetic Variation in Ontogenetic Patterns in Leaf Anatomical Traits in a Long-Term Field Experiment</td>
</tr>
<tr>
<td>Cuyler Yafuso</td>
<td>Genome Size Estimation for a Threatened Endemic Flora</td>
</tr>
<tr>
<td>Tiana Hughes</td>
<td>Using Nitrogen Stable Isotope Values to Track Nitrogen Cycling Over the Last 4000 Years at Cape Tuxen, Antarctic Peninsula</td>
</tr>
<tr>
<td>Hunter DeTurk</td>
<td>Flashes of Light during the Polar Night: Gene Expression and Diversity of Zooplankton around the Bioluminescence Compensation Depth</td>
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<table>
<thead>
<tr>
<th>‘Ilima Room</th>
<th>Ethnic Studies</th>
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<tbody>
<tr>
<td>Justin Yee</td>
<td>1980s Taiwan: Democratic Reforms, the AIDS Pandemic, and Sexual Morality</td>
</tr>
<tr>
<td>Joel Nicolow</td>
<td>Using World Integrated Trade Solution Database to Monitor Sugar-Sweetened Beverage Tax effect in Pacific Island Countries and Territories</td>
</tr>
<tr>
<td>Sarah Michal Hamid</td>
<td>The Stolen Wombs of the Territory of Hawai‘i: An Examination of Reproductive Violence</td>
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<td>Room</td>
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<tr>
<td>ʻIwaiwa Room</td>
<td>Psychology</td>
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<td>Hāpuʻu Room</td>
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<td><strong>Koa Room</strong></td>
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<td><strong>Kukui Room</strong></td>
<td><strong>Cognitive Science</strong></td>
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<td>Naupaka Room</td>
<td>Marine Biology</td>
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<td>Computer Science</td>
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<tr>
<td>Pua Kala Room</td>
<td>Cell and Molecular Biology</td>
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</tr>
<tr>
<td>Kaleigh Ramil</td>
<td>The Role of Trophoblast Lat1 in the Regulation of Placental Function and Fetal Growth: Plasmid Construction and <em>in vitro</em> Testing</td>
</tr>
<tr>
<td>Geetika Y. Patwardhan</td>
<td>The Exocyst Complex is an Insulin-sensitive Regulator of Amyloid Precursor Protein (APP) Trafficking and Amyloid-beta Generation in Neurons</td>
</tr>
<tr>
<td>Kirra Borrello</td>
<td>Dietary Intake Mediates Ethnic Differences in Gut Microbial Composition</td>
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<tr>
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<td>Natural Sciences</td>
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<tr>
<td>Kalo Room</td>
<td>Kathy Ho: The Ultimate Relationship Between King Tides and Watercress Yield</td>
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<td>Kiriana Anderson: Real-time Geologic Hazard Monitoring of Kilauea Volcano with InSAR</td>
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# Oral Session III

**Hau Room**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>Max Gatlin</td>
<td>Understanding the Pollen Foraging Ecology of Hawaii’s Yellow-Faced Bees</td>
</tr>
<tr>
<td>Quinn Moon</td>
<td>Molecular Evidence for Possible Cryptic Species in the South American Fruit Fly</td>
</tr>
<tr>
<td>Mitchell Marabella</td>
<td>Induced Spawning of ‘Opihi Using Novel Peptide and a Phosphodiesterase-5 (PDE5) Inhibitor</td>
</tr>
<tr>
<td>Duyen Dinh, Delaney Singletary</td>
<td>Characterization and Comparative Analysis of the Parasite-microbial Community in the American crocodile <em>Crocodylus acutus</em></td>
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**ʻIlima Room**

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Makenzie McCarthy</td>
<td>Starting a Conversation about Social and Climate Issues through Children's Literature</td>
</tr>
<tr>
<td>Azlynn Brandenburg</td>
<td>Scum: An Auto-theoretical and Phenomenological Exploration into Feminist Rage</td>
</tr>
<tr>
<td>Aramis Davis</td>
<td><em>Sick Building</em></td>
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<tr>
<td>Room</td>
<td>Topic</td>
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<tr>
<td>Hāpuʻu Room</td>
<td>Environmental Science</td>
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<tr>
<td>Shannon Murphy</td>
<td>Assessing Human-Induced Coral Reef Disturbances from Visitors at Hanauma Bay Nature Preserve</td>
</tr>
<tr>
<td>Ruby Anne Polintang, April Vidad</td>
<td>Improving the Waste Management and Resource Recovery at the University of Hawai'i</td>
</tr>
<tr>
<td>Nicole Cluff, Risa Scott-Smith</td>
<td>What Prevents Farmers from Implementing and Continuing the Use of Soil Health Practices?</td>
</tr>
<tr>
<td>Faith Smith</td>
<td>Determination of Soil Moisture Content Through Infrared Imagery</td>
</tr>
<tr>
<td>Koa Room</td>
<td>Biology</td>
</tr>
<tr>
<td>Chloe Moore</td>
<td>Consequences of Marine Heatwaves to Hawaiian Herbivorous Reef Fishes</td>
</tr>
<tr>
<td>Ana Velasquez</td>
<td>Hyperlipidemia and Bone Density in Astyanax mexicanus on the Ketogenic Diet</td>
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<tr>
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<td>Topic</td>
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<tr>
<td><strong>Kukui Room</strong></td>
<td>Informatics/Policy Development</td>
</tr>
<tr>
<td>Jake Franco</td>
<td>DOCARE Enforcement Chain Analysis, Understanding how Natural Resource Violations are Handled in the Hawaiʻi Environmental Court</td>
</tr>
<tr>
<td>Krista Rados</td>
<td>How to Survive in a News Desert: Ways that Local News Gets Made and Spread with Mobile Technologies on Molokai</td>
</tr>
<tr>
<td>Jazelle Tylani Goring</td>
<td>From World Titles to Legal Titles: Re Imagining Gender Discrimination Policy in Women's Sports</td>
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<td>Julia Finn</td>
<td>Barriers and Facilitators to Implementation of Digital Health Interventions for Priority Populations</td>
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<td><strong>Naupaka Room</strong></td>
<td>Marine Biology</td>
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<td>Camryn Dunekack</td>
<td>Telomere Length in <em>Montipora capitata</em> Corals with Varying Symbiont Communities and their Utility as Biomarkers of Coral Resilience</td>
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<td>Jacquelyn Simpson</td>
<td>Mottled Coloration of Encrusting <em>Montipora Capitata</em> in Kailua Bay, O'ahu, HI</td>
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<td>Delaney Cole</td>
<td>Morphology-based Taxonomy to Pair Sipunculan larvae to Sipuncula Adults within Oahu</td>
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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:

Zac Bailey, Ben Weiss  
Noa Brenner, Kylah Slane, Tiare Sabellano-Tsutsui  
Preston Ching, Nicolas Gottero, Adam Hu, Shawn Iwane,  
Kenny Son, Evan Takushi, Christianne Young  
Yejean Chung, Shaina Young  
Nicole Cluff, Risa Scott-Smith  
Duyen Dinh, Delaney Singletary  
Mona Hirose, Michaela Kop  
Riku Omata, Amy Shell  
Ruby Anne Polintang, April Vidad

Abstracts are direct from presenters; wording and content are the authors’ responsibility.
Kiriana Anderson  
Earth Science  
Natural Sciences  
Presentation Practice  
Poster Presentation: Session 2 (10:40-11:40) in Kalo Room

Real-time Geologic Hazard Monitoring of Kīlauea Volcano with InSAR

In the event of major eruptions in Hawai‘i, volcano data processing and sharing are critical activities that the public rely on for timely understanding of hazards. Interferometric Synthetic Aperture Radar (InSAR) data from satellites, is one type of data used to measure and map deformation of volcanoes in near-real time. Using InSAR data, we can create a time-series of ground deformation to see how much movement has occurred within a certain time period. Sentinel-1 SAR data, provided by the European Space Agency (ESA), are free to use, however require access to specialized processing tools, along with a devoted time commitment, to generate useful deformation products for the public to access.

We processed descending Sentinel-1 SAR data from May 11th and May 17th, 2018 to construct an interferogram showing the deformation changes that took place during the 2018 Kīlauea eruption. We used freeware SAR processing algorithm and plotting code, Generic Mapping Tools (GMT), to construct preliminary interferograms. Preliminary results yield a deformation map that reflects substantial subsidence at the summit crater from May 11th-May 17th, 2018. Next steps in this work are to apply this technique to present-day SAR acquisitions of Kīlauea. Kīlauea is currently erupting (as of September 29, 2021) and the floor of its summit crater, Halema‘uma‘u, has risen ~96 meters and erupted about 65 million m$^3$ of lava. Remote deformation data can be used to assess the current hazard conditions of Kīlauea and to maintain a real-time deformation database of the volcano to better prepare for future eruptions.

Mentor: Dr. Bridget Smith-Konter
GAPSoluteReality: An AR App for the Communication of the GAPS Low Energy Cosmic Ray Measurements

Our project is to create a more accurate and accessible application to showcase the research being conducted by the General Anti-Particle Spectrometer (GAPS) research team. The GAPS particle detector will conduct a high-altitude survey over Antarctica to detect cosmic rays. GAPS is designed to detect the lowest energy antideuterons ever recorded for the purpose of understanding dark matter interactions.

In order to communicate these results to the general public, we improved upon the work of a past project which visualizes the GAPS detector and its detections using the 3D modeling software Blender and the augmented reality functionality of the software Unity. First, we have updated the geometry of the detector and the particle tracks to reflect the most current version. To do this, the model for the detector and each interaction event was processed in Blender, then imported into Unity. The particle tracks were also animated in order to convey the temporal data recorded in each interaction. Finally, the process by which new detector geometry and detection events are imported into Blender was also revamped for easier development in the future.

With this complete, we published the application to the Google Play Store and imported the project to Xcode to publish it on the Apple App Store to increase accessibility. As we finish the project by importing this application to the two stores, we hope to share with people of all backgrounds the scientific importance of the GAPS project.

Mentor: Dr. Philip von Doetinchem
Seasonal Variability of Initial Biofilm Development

Corals provide ecosystem services in excess of $75.2 trillion per year but are in global decline, in part due to a lack of available substrate for coral settlement and widespread phase shifts towards algal dominance. Biofilms, made up predominantly of bacteria and algae, form the foundation of coral reefs by influencing early ecological processes, such as the settlement of coral larvae. To better understand seasonal variability in biofilms, we studied the bacterial communities on ceramic tiles deployed and recovered every 30 days, for a period of one year.

Our analysis demonstrated that bacterial communities are predominantly influenced by season, with the greatest diversity and richness occurring in the early winter months. Settlement tiles were dominated by primary colonizers such as Bacteroidia and Alphaproteobacteria with a reduced abundance of secondary colonizers, indicating early successional biofilm development in the first 30 days. We identified 12 foundational taxa spanning 11 taxonomic classes that were present in 99% of samples and persistent regardless of the season in which a tile was deployed. In this study, we demonstrate that while bacterial communities colonizing virgin benthic surfaces are highly influenced by seasonality, there exist core bacterial groups that are present regardless of season, such as Rhizobiaceae. We encourage further research into these high-prevalence taxa and their function as foundational biofilm species.

Mentor: Dr. Megan Donahue

Co-Author: PhD Candidate Austin Greene
Genetic Variation in Ontogenetic Patterns in Leaf Anatomical Traits in a Long-Term Field Experiment

Ontogeny refers to the genetically regulated shifts in phenotypic traits across developmental phases. While ontogenetic variation is well documented for some plant traits, there is a lack of research investigating the potential of these developmental trajectories to evolve. I investigated genetic variation in ontogenetic trait trajectories by studying leaf stomatal traits in Betula pendula, from a long-term field experiment in Finland. Stomata are major regulators of photosynthetic rate, which in turn drives patterns of growth and ecosystem productivity. Epidermal peels were made from leaves collected for 8 birch genotypes at two ontogenetic stages, and replication within genotypes included a total of 263 trees sampled at both stages. The stomatal traits were digitized and analyzed using ImageJ, and density and stomatal size estimates were collected from 3 sub-samples per peel. Genetic variation in ontogenetic trait trajectories is detected as the interaction between genotype and ontogeny in stomatal traits. Results indicate considerable variation in stomatal traits both within and among genotypes, with complex patterns across ontogeny. This study provides the first test for genetic variation in ontogenetic trait trajectories in long-lived woody plants, providing key insights into the evolvability of these trajectories.

Mentor: Dr. Kasey Barton, Dr. Chris Muir
Dietary Intake Mediates Ethnic Differences in Gut Microbial Composition

Introduction: The human gut microbiome (GM) has been observed to vary by race/ethnicity. This paper assesses whether racial/ethnic GM variation is mediated by differences in diet.

Methods: Stool samples collected from 2013-2016 from 5267 healthy Multiethnic Cohort participants (age 59-98) were analyzed using 16S rRNA gene sequencing to estimate the relative abundance of 152 bacterial genera. For 63 prevalent genera (>50% in each ethnic group), we analyzed the mediation of GM differences among African Americans, Japanese Americans, Latinos, Native Hawaiians, and Whites by overall diet quality and intake amounts of 14 component foods/nutrients assessed from 2003-2008. For each significant mediation (p < 1.3 × 10^-5), we determined the percent of total ethnicity effect on genus abundance mediated by dietary factor.

Results: Ethnic differences in the abundance of 12 genera were significantly mediated by one or more of eight dietary factors, most frequently by overall diet quality and intakes of vegetables and red meat. Lower vegetable intake mediated differences in Lachnospira (36% in African Americans, 39% in Latinos) and Ruminococcus-1 (−35% in African Americans, −43% in Latinos) compared to Native Hawaiians who consumed the highest amount. Higher red meat intake mediated differences in Lachnospira (−41%) and Ruminococcus-1 (36%) in Native Hawaiians over African Americans, who consumed the least. Dairy and alcohol intakes appeared to mediate and counterbalance the difference in Bifidobacterium between Whites and Japanese Americans.

Conclusion: Overall diet quality and component food intakes may contribute to ethnic differences in GM composition and to GM-related racial/ethnic health disparities.

Mentor: Dr. Unhee Lim
Rate of DNA Degradation In Pygmy Killer Whales For The Estimation Of Post-Mortem Interval

Marine mammals are vital to the health of ocean ecosystems. To protect these animals, it is important to understand the threats they face. The University of Hawai‘i Health and Stranding Lab (HSL) maintains an archive of tissues from stranded cetaceans and conducts research examining health related metrics of these animals. For much of this research, having an estimation of the post-mortem interval (PMI), or the time between death of an animal and the recovery of its carcass, can be useful for identifying the cause of death. However, there is currently no quantitative method to determine the PMI in marine mammals. Forensic research has utilized the degradation of DNA post-mortem to establish a quantitative tool for estimating PMI. Measuring DNA concentration over time, thereby evaluating DNA degradation rate, could be used to develop a model for estimation of the PMI. Archived tissues from two pygmy killer whales (*Feresa attenuata*) that were euthanized in a mass stranding event were selected to represent freshly dead animals for this study. From each cetacean, seven tissue types were left to degrade in both a replicated land and water stranding. Tissues were sampled over a period of 28-days and DNA concentrations were measured. The DNA concentrations were evaluated against two intervals of degradation time. The most significant relationships were seen in liver and lung tissues ($R^2 = 0.877$ and $0.81$) in the shorter time interval indicating they would be most useful in future estimations of PMI in animals.

Mentor: Dr. Kristi West
Azlynn Brandenburg  
English, Philosophy, and Women, Gender, & Sexuality Studies  
Arts & Humanities - Creative  
Honors  
Oral Presentation: Session 3 (11:50-12:50) in ʻIlima Room

Scum: An Auto-theoretical and Phenomenological  
Exploration into Feminist Rage

The following thesis effectuates an auto-theoretical, mixed-genre approach in  
exploration of embodied forms of knowledge and pursuance of theoretical  
justification for embodied expression. By adopting the phenomenological  
frameworks evoked by Sarah Ahmed and Simone de Beauvoir, I analyze the  
ways in which I occupy space, as well as who or what I occupy space with;  
starting with my relational orientation towards Valerie Solanas’s 1971 SCUM  
Manifesto.

The primary phenomenological question underpinning my research goes as  
follows: what does it mean to embody woman?. This experimental revision of  
Beauvoir’s famed inquisition, “what is woman?”, allows me to reflect on the  
affectual experiences causal to the gendering of my body. Additionally, in  
drawing on various 20th century feminist writers such as Audre Lorde and Eve  
Kosofsky Sedgwick, my research moves forward with an interdisciplinary  
analytic of feeling.

Mentors: Hannah Manshel and Cynthia Franklin
Effects of Food Insecurity on Mental Health and Academic Performance of College Students

Objective: The objective of this study is to identify the effects of food insecurity on the mental health and academic performance of college students at UH Manoa. Studies have shown that college students are a subpopulation that is heavily affected by food insecurity. The high cost of living in Hawai‘i being significantly higher than the national average also puts UH Manoa students at a higher risk of food insecurity.

Methods: A USDA food insecurity questionnaire was used to screen participants (n=21) prior to online one-on-one interviews. Using directed content analysis, transcripts were coded in NVivo11 using a codebook based on previous literature. Final code counts were used to identify numerous themes regarding effects of food insecurity on mental health and academic performance.

Results: In total, there were six major themes related to mental health described during participant interviews. The themes of stress, sadness, and discomfort in social situations were prominent in many interviews. In addition, students stated that they experienced frustration and anger, fear, and feeling hopelessness or undeserving of help as a result of their food insecurity. Participants also explained three major effects of food insecurity on their academic performance.

Conclusion: These findings contribute to knowledge of how food insecurity impacts the lives of college students and the future development of interventions at the university level. Interventions such as providing healthier food options at the UH Manoa cafeteria and informing students of food resources at college orientations may be considered.

Mentor: Dr. Jinan Banna
Greenhouse Cooling through Infrared Solar Radiation Reduction

Increased greenhouse temperatures cause a reduced butterhead lettuce crop yield due to nutrient lockout, enzyme damage, and a lack of water evaporation from the leaves pores at a Oahu farm, Mari’s Garden. Higher production of high-demand vegetable produce at local farms could reduce food imports and help pave a path to food self-sustainability in Hawaii. Reflective films were installed on the roof of a small scaled greenhouse made of plexiglass to passively reject excess infrared light from entering and heating the greenhouse while also maintaining light for active photosynthesis plants (daily light integral of 12-14 mol/m²/day). An UltraCool-IR8360 film allowed the highest visible light transmission at 80.88% and reduced infrared transmission by 52.47%. Below the roof, a retractable 50% Aluminet shade cloth further reduced infrared light transmission and controlled the greenhouse air temperature with real time data collection on light levels and temperature. The system is able to fully open and retract within the greenhouse boundaries with a maximum repeatability of +/- 0.57 inches. Underneath the greenhouse roof and automated shade cloth, an insulated barrier was designed to isolate the vegetation to reduce the heat transfer from the surrounding greenhouse air. A combination of these methods ensures the greenhouse will transmit a sufficient amount of visible light while reducing infrared light by a total of 67% to improve growth conditions and production yields.

Mentor: Ryan Kurasaki
Metabolic Shift by a New Compound, Ketone-ester, Provides the Molecular Link between the Ketosis and Multigenic (evolved) Asocial Condition in the Mexican Cavefish

Although many animals demonstrate collective behaviors, some species have evolutionarily decreased them during adaptation. How did these social populations become asocial through evolution? As for their genetic bases, ~1,000 risk genes have been listed in the studies of human psychiatric disorders associated with asocialness. Surprisingly, 62% of the top 281 human risk genes are dysregulated in an evolutionarily asocial fish species (no disorder), suggesting that the conserved molecular pathway can be involved in asocialness. However, key gene(s) that promoted the asocialness evolution are still unknown. A hint could be from an environmental intervention (ex., diet) because many animals change behavior strategies according to their metabolic states. The teleost model, Astyanax mexicanus, has two forms, cave-adapted (cavefish) and surface-dwelling forms (surface fish). Cavefish shows substantially reduced social-like behavior compared with surface fish. Previous transcriptomic analysis indicated 62% overlap, as mentioned above. To reveal the genes promoting asocialness evolution, we induced a metabolic shift, from glycolytic to ketogenic, by supplying a new compound, ketone ester. Ketone ester induces ketosis by directly supplying the major metabolite (ketone bodies) of the ketogenic diet, whose treatment could increase social-like interactions but attenuate somatic growth in cavefish. The ketone ester treatment in this study indeed induced social-like behavior in the cavefish without decreasing the growth rate, suggesting that the metabolic state certainly influences social tendency. In the future, using ketone ester, we will address which of the 'human risk genes' drive asocialness evolution regardless of the metabolic state, highlighting the master gene(s) for asocialness.

Mentor: Dr. Masato Yoshizawa
Ke Ao: A Low-Cost 1U CubeSat for Aerospace Education and Research in Hawai‘i

A CubeSat is a miniaturized satellite composed of 10 cm cubed modular units slightly bigger than a Rubix cube. CubeSats provide a cost-effective platform for scientific research, technology demonstrations, and advanced mission concepts but they remain inaccessible to most undergraduate research groups. The project’s primary goal is to create a functional and inexpensive satellite capable of taking a picture of the Hawaiian Islands from space. Due to the COVID pandemic our group had to slow the development of Ke Ao. As a result, the project will be split into two missions, Ke Ao-1 and Ke Ao-2. The first is designed to validate the core technologies and components used by the satellite and the second will combine these technologies with artificial intelligence. The updated timeline provides a more flexible schedule for the development of artificial intelligence and will improve the likelihood of mission success. Ke Ao-1 is planned to launch in October 2022 with the SpaceX Transporter vehicle. Ke Ao-2 will launch no earlier than Fall 2023.

Mentor: Dr. Miguel Nunes
Using Sustainable Fungal Filters to Harvest Microalgae for Valuable Bioproducts

Microalgae are unicellular photosynthetic organisms that inhabit a wide range of habitats from various aquatic ecosystems to soil environments. Microalgae contain essential nutrients such as polyunsaturated fatty acids, neutral lipids, proteins, pigments, and antioxidants that can be harvested for a variety of purposes. Although microalgae are easy to incubate in large-scale bioreactors and open ponds, they are challenging to harvest because of their small size. Using current methods, the harvesting cost can account for up to 15% of the total cost. This study combats these issues by developing a highly efficient fungal filter that uses the fungi to harvest microalgae.

*Mortierella*, the fungi being used, is a family of fast-growing oil-producing soil fungi that is generally safe for plants, animals, and humans. Many *Mortierella* species are used for human nutraceuticals such as arachidonic acid, an omega-6 polyunsaturated fatty acid used in medicinal/pharmaceutical, cosmetic, infant nutrition, and food industries. Previous research has shown that the mycelium of *Mortierella* is efficient at capturing a green microalga, *Chlamydomonas*, by forming large bio-aggregates that flocculate out of solution to be easily harvested with mesh or simple filtration. These inspired the development of fungal incubation methods to obtain quality fungal filters optimized for harvesting microalgae.

This project designs and tests prototypes of the BioFiltration system, named BioCube, using CAD design and 3D printing. Design of the biocube prototype has improved to the latest 3.0, in which we have made a commercial prototype using economic and durable polycarbonate materials for further filtration tests and nutrition analyses.

Mentor: Dr. Zhiyan "Rock" Du

Co-Author: Kanak Pal
What Prevents Farmers from Implementing and Continuing the Use of Soil Health Practices?

The purpose of our research project is to identify factors that inhibit farmers in Hawai’i from implementing and continuing the use of soil health practices. Soil health practices are important for reducing soil erosion, increasing food security, and enhancing biodiversity. Hawai’i is at high risk for food insecurity due to the isolation of the islands in the Pacific and the populations’ dependency on food imports. We hypothesize that research on this topic is missing from the Asia-Pacific region, specifically the Hawaiian Islands. We began by reviewing existing literature and coding for factors regarding barriers to adoption of conservation practices. In addition to the literature, we conducted interviews with local farmers and agricultural professionals to gain their insight on inhibiting factors specific to Hawai’i. We took both an objective and subjective study approach and used reflexive thematic analysis, a method that focuses on the researchers own interpretations, for analyzing our data. Results from the literature and interviews include a set of themes that draws relationships between factors and a producers' likelihood of adopting soil health practices in Hawai’i. We built a framework with the intent to give farmers a clear visual representation of the connections between factors and themes that may pertain to them. Our hope is that the framework will help farmers, agricultural professionals, and policy makers understand these barriers to make adoption of soil health practices more realistic and accessible.

Mentors: Dr. Jonathan Deenik, Sebastian Church
Morphology-based Taxonomy to Pair Sipunculan larvae to Sipuncula Adults within Oahu

Sipuncula were once thought to be their own phylum, but are now considered to be a part of the phylum Annelida with new molecular science. This proves the importance of taxonomy and fully understanding a group of organisms. In Hawaii, as in most places, Sipunculan larvae have not been fully characterized. Here I aimed to characterize and tentatively categorize larvae to species of their adult forms found in Hawaii. I have also explored methods to successfully metamorphose larvae in the lab. Using multiple horizontal plankton tows off Honolulu Harbor, larvae were captured, sorted, and photographed. I have found 14 presumptive species of Sipunculan larvae in twenty plankton tows over the past 14 months and have prepared a library of photos, taxonomic descriptions, and characteristics of these larvae. One larva has metamorphosed and 22 larvae have been preserved in ethanol for genetic analysis.

Mentor: Dr. Cindy Hunter
Understanding Humans’ Cognitive Processes during Computational Thinking through Cognitive Science

Human-computer interaction is a diverse field covering disciplines such as computer technology, human factors, and cognitive science to name a few. Computational thinking, a subfield of HCI, explores the way humans process problems, and use problem-solving skills and analogies to solve complex or seemingly difficult problems. This research project was conducted in order to understand computational thinking in people, along with determine the existing relationship between cognitive science and HCI.

The goal of the ICS 101 and 111 participants, chosen by their introductory level in computer science, was to analyze and comprehend the problem and select the most accurate result in a series of multiple-choice questions. The problem sets were created using Microsoft Excel, pseudocode, and natural language, presented in a quiz format on Google Forms for the participants, and the data were analyzed using analysis of variance (ANOVA).

Throughout the data collection and analysis, there were two realizations found that support the determination of the students’ computer literacy and cognitive science abilities to solve problems. Firstly, students performed worse on problems they took longer on, and secondly, Microsoft Excel was the hardest program to comprehend even though the participants had the most experience with it. That being said, not only is it essential for students to learn the material, but also to go through a process of understanding what they learned and how they were able to obtain the information matter.

Mentors: Dr. Martha E. Crosby, Dr. Michael-Brian Ogawa
Sick Building

*Sick Building* is a creative non-fiction memoir composed of three stories: “Whateva’,” “House Trap,” and “Broken Home.” Together, they focus on the increasingly deteriorating condition of my Kahului home, the unhealthy relationships on my mother’s side of the family, and the preservation of my nuclear family’s core values, which kept us together throughout the years. With a background in creative writing during my time in the University of Hawaiʻi system, I decided to pursue this creative non-fiction project to explore my own connections to Hawaiʻi, and share a personal story with whomever might be willing to read it. After discussions with my family about my specific memories featured in *Sick Building*, I grounded the thesis in what I understand to be the facts about the events, but then drew upon my creative writing skills to weave together a narrative that is closely tied to Hawaiʻi. Throughout the past year, I’ve written this collection under the mentorship of Professor Craig Howes to ensure my work would remain tightly written and authentic to my vision. *Sick Building* was written as a contribution to the larger field of local and native Hawaiian literature, which I hope I will contribute further to in the coming years.

Mentor: Dr. Craig Howes
Between East and West: An Investigation of Greek Ethnic Identity Formation, European Geopolitics, and Migration

In recent years, Greece has been shaped by the 2008 economic crisis and the Mediterranean refugee crisis. Compounded with Greece’s historical place as a crypto-colony of Europe, the Ottoman occupation (1453-1821), and neglect from the European Union (EU) in times of crises, has put the nation in a precarious geopolitical situation. This may contribute to the many negative stereotypes of ethnic Greeks and Greece itself evident in EU media. My research investigates Greek ethnic formation in young adults who grew up experiencing or witnessing these crises. I conducted qualitative semi-structured interviews with young adults from Athens, Greece between the ages of 18 and 30. A total of 11 interview participants were selected via a snowball sampling procedure and grounded theory methodology was applied for data analysis using the qualitative data analysis software NVivo. Through interviews, I identified distinct relationships to terms such as ‘European’ and ‘white.’ Also explored were aspects of Greek identity. Such as culture, language, and religion and how it impacts their connection with Greek identity. A major finding of the interview data is the acute awareness of the negative stereotyping of ethnic Greek people. Participants most notably expressed that Northern Europeans view Greeks as ‘inferior’, ‘lazy’, and ‘exotic’. Overall, this research adds to the existing literature regarding ethnic identity formation in Greece and Europe. It specifically aims to understand the impacts of Greece’s geopolitical crises on how young ethnic Greeks perceive themselves within the EU and identifies how geopolitical circumstances inform the persistence of negative stereotypes.

Mentor: Dr. Marina Karides
Flashes of Light during the Polar Night: Gene Expression and Diversity of Zooplankton around the Bioluminescence Compensation Depth

Light and vision play a critical role in the ecology of most zooplankton species that inhabit the oceanic waters of Svalbard, an archipelago in the Arctic Ocean. Polar Night occurs when the sun remains below the horizon for 24 hour periods and the only source of light in the ocean is the moon, stars, and bioluminescence. Currently, no research has revealed how the Polar Night affects zooplankton on a genetic level. When light is limited zooplankton rely on bioluminescence. This ability consists of either a secreted glowing mucus or an emission of light from specialized organs. Bioluminescence is produced by luciferase oxidizing a luciferin molecule and it is detected by opsins, light-sensitive proteins found within animal eyes. Bioluminescence is used for offense, defense, and communication. In this study, I have sequenced and will analyze metatranscriptomes of zooplankton at different depths and times during Polar Night to measure opsin and luciferase gene expression. We will compare expression with in situ light measurements, silhouette camera quantifications of community structure, and other local oceanographic conditions. The analysis of metatranscriptomes will reveal the entire profile of gene expression of diverse zooplankton communities (e.g., copepods, krill, amphipods). Furthermore, light structures zooplankton in all oceanic communities, typically to much greater depths (1000s of meters). The ambient light during Polar Night allows us to study how different photic zones affect zooplankton communities. The dark ocean conditions allow us to study zooplankton in meso and aphotic light environments usually found at greater depths in incomparably shallower waters.

Mentor: Dr. Megan Porter
Characterization and Comparative Analysis of the Parasite-microbial Community in the American crocodile *Crocodylus acutus*

We propose to examine and characterize the bacterial microbiome and genetic 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 upon 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. This gap also includes the morphology and genetic barcoding necessary for possible global identification of a species. The goal of our study is to 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 are therefore to: (1) use morphological characteristics – using both Light microscopy and SEM – and genetic barcoding to first identify the nematode species collected from *C. acutus* hosts; (2) characterize the microbiome composition of collected nematodes; and (3) analyze the compositional diversity between the host species.

Mentor: Dr. Floyd Reed

Co-Author: Helen Sung
Telomere Length in *Montipora capitata* Corals with Varying Symbiont Communities and their Utility as Biomarkers of Coral Resilience

Corals are experiencing increasing levels of environmental stress which may be possible to monitor using molecular methods. Coral bleaching patterns have been shown to correlate with the composition of symbiont communities the corals host: colonies dominated with Clade D representing more resilient corals and colonies dominated with symbiont C representing less resilient corals. We aimed to examine the impact of environmental stress on telomere length in one of Hawai’i’s major reef-building corals, *Montipora capitata*. Telomeres are repetitive nucleotide sequences that protect linear chromosome ends from DNA degradation. Telomeres have been shown to shorten overtime by natural processes and in times of environmental and metabolic stress. Using corals from a previous experiment in the Coral Resilience Lab with known symbiont community compositions, we hoped to understand whether telomere length could be a biomarker of accumulated environmental stress in heat-susceptible reef-building corals. Utilizing quantitative PCR, we measured the relative length of telomeres in 24 coral colonies (n = 323) with varying symbiont communities reflecting their thermal resilience. Preliminary results show branch samples dominated with Clade D have significantly shorter telomeres than those dominated by Clade C, and branch samples with mixed symbiont communities have shorter telomeres than either samples of Clade D or Clade C. There was no noticeable difference in telomere length between samples from basal locations on the colony. Variations in relative telomere length between colonies suggest there are possible genotypic effects important in regulating the amount of environmental stress corals endure. Further analysis may illuminate answers to our remaining questions.

Mentors: Dr. Crawford Drury, Dr. Eva Majerova

Co-Author: Shayle Matsuda
The Effect of In Ovo Injection of Xylooligosaccharide on the Immune Response of Broilers

The ban of growth-promoting antibiotics and shifting consumer preferences have forced the production industry to seek new methods of protecting poultry health while maintaining adequate finishing weight. To fulfill this apparent need, prebiotics in diets and early feeding programs, particularly in ovo feeding, have been proposed due to the expanding knowledge of their positive effects on the gastrointestinal tract and the overall health of poultry. However, despite promising results, there is still a large degree of variation present, especially between different prebiotics and their methods of deliverance. The present study seeks to understand the effect of in ovo supplementation of a relatively new prebiotic, xylooligosaccharide, on broiler growth and immune function. Through a comparison of immune gene expression in a 35-day trial, the impact of early prebiotic feeding will be measured. Results may confer a potential commercial application of xylooligosaccharide as a prebiotic to the broiler industry and suggest improvements to the current understanding and recommendations of poultry nutrition.

Mentor: Dr. Rajesh Jha
An Examination of Mental Health Practices in Community-Based Residential Care for Youth and Adolescents

Community-based residential (CBR) care provides mental health treatment in a group-home environment for youth with severe emotional and behavioral concerns (Becker et al., 2011). Depressed mood is a common concern seen in CBR, and the presence of internalizing concerns predicts return to residential services (Izmirian, 2018; Wyatt et al., 2015). The current study examines individual intervention practices for youth treated for depressed mood in CBR to better understand what does and does not work for youth in residential treatment. Data for youth in CBR who had depressed mood targeted (N = 220) were collected from the Monthly Treatment and Progress Summary, a report of treatment focus, treatment progress (7-point scale; 0 = deterioration and 6 = complete improvement), and practices (CAMHD, 2016). The relationship between practices and depressed mood progress at six months was examined using multi-level analyses. The most frequently utilized practices related to emotional regulation (emotional processing, catharsis, relaxation), behavior management (tangible rewards, commands), and family involvement (family therapy, family visit). Consistent with the evidence-base, youth psychoeducation ($\beta = 0.96$, $p<0.05$) significantly predicted higher progress. Other evidence-based practices for depressed mood (relaxation and activity scheduling) also related to higher progress on depressed mood but did not reach statistical significance. Interestingly, practices commonly associated with externalizing concerns (commands, praise, tangible rewards, differential reinforcement) significantly predicted higher progress on depressed mood ($\beta = 0.26 – 0.7$, $p<0.05$). Our findings suggest that practices from the evidence-base for both internalizing and externalizing concerns predicted higher depressed mood progress in CBR settings.

Mentor: Dr. Charles Mueller

Co-Author: Kalyn Holmes
Barriers and Facilitators to Implementation of Digital Health Interventions for Priority Populations

Introduction: Understanding barriers and facilitators to implementation of digital health interventions for priority populations can enhance future efforts and improve the likelihood of the intervention meeting the priority population’s needs. This scoping review identified barriers and facilitators described in existing scientific literature to promote understanding of the challenges facing and best practices for implementation.

Methods: Data was collected through systematic searching and screening of literature available through PubMed from 2016-2021 for studies on the implementation of digital interventions for priority populations. Repeated data, out of scope data, data with inconclusive results, and ongoing studies without results were excluded. 46 out of 1607 studies were eligible for inclusion and were coded and synthesized according to the CFIR framework.

Results: Important factors to consider in intervention implementation include the adaptable periphery; tailoring to the target population and local context; simplicity of participation, implementation, and content; flexibility; community collaboration and partnerships; addressing political, economic, regulatory, professional, and sociocultural context; organizational support; implementation climate; planning and implementation readiness; positive attitudes and perceptions about the intervention; differentiation between surface and deep structure adaptation; ongoing engagement efforts; provider and participant training and education; the presence of an implementation champion; use of tracking tools; and ongoing reflection and evaluation.

Conclusion: Successful implementation involves consideration of both the core components of the intervention and its adaptable periphery. Consideration of the adaptable periphery involves tailoring core components of the intervention to meet the needs of its target population and of those engaged in its delivery.
DOCARE Enforcement Chain Analysis, Understanding how Natural Resource Violations are Handled in the Hawai‘i Environmental Court

Enforcement and prosecution are critical tools in natural resource management, alongside research, policy, and direct conservation management actions. The Division of Conservation and Resources Enforcement (DOCARE), a division of the Department of Land and Natural Resources (DLNR), is responsible for enforcing rules and regulations that serve to protect, conserve, and manage the natural, cultural, and historic resources of Hawai‘i. There is a major knowledge gap regarding patterns in how natural resource violations are handled during enforcement and prosecution activities. Historically, only two analyses have been done on state enforcement data in Hawai‘i, despite the importance of natural resources. Further, no study has been published regarding the relationship between enforcement citations and the prosecution outcomes. Evaluation of the relationship between enforcement and prosecution regarding natural resource management is critical to improve natural resource management in the state. In this study we obtained 2,319 records on resource violations for the Division of Conservation and Resources Enforcement from Hawai‘i’s Judiciary Electronic Filing and Service System. We then categorized violations (e.g., poaching, boating, fishing) and their outcome (e.g., type and degree of penalty) identifying areas where enforcement and/or prosecution may not be adequate to meet current resource protection needs. For the majority of the citations, penalties were reduced or dismissed without fines. Among these citations, repeat offenders were common. The results collected raise alarms regarding the need for increased communication between enforcement and prosecution to improve the effectiveness of citations as deterrents to crime.

Mentor: Dr. Melissa Price
Synthesis of Monoaryl Bismuth Dicarboxylates and Evaluation of their Reactivity and Biological Activity

Bismuth compounds have potential applications in the pharmaceutical industry due to its low toxicity. Most notably is bismuth subsalicylate, commercially known as Pepto-Bismol, a common, over-the-counter drug for diarrhea treatment. One major setback with organobismuth chemistry is its susceptibility to dismutation, a substituent scrambling process. Our research group recently developed a protocol for the synthesis of unsymmetrical triaryl bismuthanes (Ar$_1^2$Ar$_2^2$Bi) from diaryl bismuth salts (Ar$_1^1$BiX) without this undesired process. However, these diaryl bismuth salts are limited in scope, therefore this project worked to address this issue by synthesizing an alternative intermediate, a monoaryl bismuth dicarboxylate salt from triaryl bismuthanes and dicarboxylic acids. This project focuses on the synthesis and characterization of ten monoaryl bismuth dicarboxylate salts.

The target compounds will be tested as intermediates for the synthesis of unsymmetrical triaryl bismuthanes. Additionally, the compounds will be evaluated for biological activity to determine their possible medicinal relevance.

Mentor: Dr. Jakub Hyvl
Detecting Debris Disks near Bright White Dwarf Stars

White dwarf stars are the evolutionary endpoints for low and intermediate mass stars including the Sun. Existence of debris disks around some white dwarfs reveals that some of the original planetary system survives the transition from main sequence stars to white dwarfs. Dust disks are originally created from collisions between planetesimals. Debris disks can be identified by searching for infrared excess since they absorb the stellar radiation and re-radiate it at infrared wavelengths. We use optical, infrared, and ultraviolet photometry including proprietary access to K-band photometry of the United Kingdom Infrared Telescope (UKIRT) located on Maunakea, Hawai‘i, in our search for debris disks around white dwarfs. Out of our initial sample of 1348 targets, we find 92 white dwarfs with infrared excess that show the existence of debris disks. Of the 92 white dwarfs with a detected infrared excess, 37 are previously-known systems and 55 are new discoveries. These systems add to the growing list of white dwarfs with post-main sequence planetary systems, providing a unique view into the coevolution of stars and planets.

Mentors: Dr. Benjamin Shappee, Michael Tucker
Understanding the Pollen Foraging Ecology of Hawaii’s Yellow-Faced Bees

Hawaiian yellow-faced bees are among Hawaii's most important endemic pollinators, and many species have experienced mass population declines and now risk extinction. The purpose of this project was to study the larval pollen provisions of a coastal species, *Hylaeus anthracinus*, to gain an unprecedented understanding of which plant species are preferred for pollen collection. The pollen provisions were collected from artificial nesting blocks by Dr. Paul Krushelnycky from James Campbell Refuge at Kahuku, Oahu throughout 2019. Each pollen sample was scored by identifying 1000 random pollen grains using microscopy and examining pollen morphology at 1000x magnification. A total of 153 pollen provisions were scored and sixteen different plant species were identified throughout all the samples. The most abundant species found throughout all samples was *Heliotropium foertherianum*, a non-native, which on average made up almost 40% of the total abundance of provisions, followed by the native plants *Scaevola taccada* (29%), *Sesuvium portulacastrum* (16%), and *Euphorbia degeneri* (10%). By volume, however, *S. taccada* made up the largest fraction (52%) due to the large size of its pollen grains. Relative abundance of pollen species in larval provisions varied throughout the year, depending in large part on seasonal fluctuations in plant flowering. However, certain species, like *S. portulacastrum*, were collected at certain times of year in greater proportion than their availability in the environment, suggesting outsized importance. This data can be used in the restoration of *H. anthracinus* habitat by guiding which plant species are most likely to enhance the larval food resource base.

Mentor: Dr. Paul Krushelnycky
In 2019, the US Women's National Soccer Team (USWNT) filed a gender discrimination lawsuit against US Soccer regarding pay and working conditions. Their case highlighted the ineffectiveness of existing workplace gender discrimination policy (primarily Title VII). Thus, my research aims to develop a policy recommendation for Title VII by analyzing another statute of gender discrimination policy with proven effectiveness in closing the gap between men's and women's sports: Title IX.

First, my research evaluates the USWNT's lawsuit and the existing impact of Title VII on professional athletics. Next, I analyze Title IX's impact through various monumental cases regarding the policy's application to collegiate athletics. Then, I compare both statutes to establish how Title IX could inspire effective change in Title VII. This analysis and comparison will allow me to generate a sound policy recommendation.

Ultimately, I discovered two fundamental policy changes that could elevate the impact of Title VII in professional athletics. Structurally, an additional Policy Interpretation of Title VII in Professional Athletics would provide much-needed specificity and account for the unique challenges of establishing equity in a sports environment. Functionally, integrating third-party regulation for Title VII compliance would help increase accountability among sports governing bodies.

With Title IX's proven monumental impact on increasing equity in collegiate athletics, there is no need to look outside existing frameworks for implementing equity in professional sports. Simply re-imagining, rather than re-inventing, how we use gender discrimination policy could help solve issues of inequitable distribution of investment and resources that persists in professional athletics.

Mentors: Dr. Debora Halbert, Dr. Katharina Heyer
Do Benzazaphospholes Behave as Aromatics? Potential Supporting Ligands to Enhance Catalysis

The unexpected discovery that the cyclopentadienyl anion \((\text{C}_5\text{H}_5^-\), \(\text{Cp}\)), a 6\(\pi\)-electron aromatic hydrocarbon coordinated to an \(\text{Fe}^{2+}\) center via all five of its carbon atoms to give ferrocene led to the birth of modern organometallic chemistry. Shortly after, synthesis of the indenyl \((\text{C}_9\text{H}_7^-\), \(\text{Ind}\)) analogue and bis(benzene)chromium revealed that this type of bonding mode was common for aromatics, and since, thousands of these so-called “sandwich compounds” have been isolated. Recently, the Cain Lab prepared new benzazaphospholes (PN), neutral derivatives of the 10\(\pi\)-electron indenyl anion with calculations predicting these PN-substituted heterocycles should be more aromatic than benzene. We proposed to determine if these PN heterocycles coordinate to transition metal (TM) centers and if these TM complexes demonstrate enhanced catalytic activity.

Air- and water-sensitive organometallic reactions were conducted using proper Schlenk techniques and in an inert nitrogen atmosphere glove box. Resulting compounds from experiments performed were synthesized from the PN heterocycle prepared beforehand and ruthenium (Ru) complexes, then characterized using NMR spectroscopy. Analysis confirmed the synthesis of TM complexes indicating that the PN can act as a ligand and coordinate to TM. Preliminary data provided insight that the PN heterocycle was bound to the Ru TM centers via \(\eta^4\) rather than \(\eta^6\) as hypothesized. Further research investigating the use of alternative starting complexes will be essential to development of the targeted Ru(II) PN-ligated catalysts.

Mentor: Dr. Matthew Cain
The Stolen Wombs of the Territory of Hawaiʻi: An Examination of Reproductive Violence

The management of birthing and reproductive health during the territorial period of Hawaiʻi (1900-1959) was directly shaped by its colonial and imperial context. The wombs of women of color became sites of extreme medical intervention, experimentation, and control. I mapped the reproductive healthcare trends during the territorial period of Hawaiʻi and examined them in the context of larger health trends. First I show how the institution of obstetrics and gynecology, as the primary mode through which reproductive health care was delivered, was inherently violent as it stripped bodily autonomy from patients and instituted the physician as the arbiter of reproduction. Then I show how the institution of obstetrics and gynecology considerably worsened reproductive health outcomes for women of color in Hawaiʻi, which in turn served the interests of the settler state and colonial plantation economy. Finally, I examine the role of a key physician at the time who intentionally instituted a system of western obstetrics to facilitate control of reproduction in Hawaiʻi amongst the colonial subjects, on the basis of white supremacy and patriarchy. Based on this examination, I found that maternal and infant health outcomes were very poor amongst women of color in Hawaiʻi when compared to the outcomes of those on the continental United States. I show how this was intentional, and in fact facilitated through the practice of obstetrics and gynecology on the plantations.

Mentors: Dr. Stephanie "Lani" Teves, Dr. Jamaica Heolimeleikalani Osorio
Bilingualism is considered advantageous for many reasons, including increased communication, networking, professional and social opportunities. Beyond these practical advantages, recent research assessed the cognitive influence of bilingualism. For such an endeavor, a growing body of work has largely employed paradigms to measure executive function (EF), a system associated with goal maintenance, distractor-inhibition, and task-switching. In this investigation, we examined cognitive performance at the attentional level of both bilingual and monolingual participants using a visual-attention-based paradigm that measures attentional capture. In each trial participants searched for a unique color target, and, in half of the trials, an additional non-target distractor abruptly appeared in the display that captured their attention. Based on previous literature that showed that bilinguals have greater inhibitory control, we predicted that the distracting abrupt onset would distract monolinguals to a greater extent than bilinguals. In addition to a measure of inhibitory control, this paradigm allows us to answer a key question, whether the bilingual advantage allows for a faster disengagement (i.e., enhanced top-down guidance) from the distractor after their attention was captured by the distractor stimulus. Bilinguals were on average 31ms faster to detect the target when compared to monolinguals. However, the findings failed to reach statistical significance. Limitations and future extensions will be discussed with the consideration of more homogenized bilingual and monolingual groups and extending the study to measure oculomotor movements (saccades and fixations) to assess additional indexes of spatial awareness and visual search behavior.

Mentor: Dr. Jonas Vibell
Influence of Video Game Playing on Change Detection: An Eye Tracking Study

Extensive video gameplay has been associated with enhanced cognitive abilities, specifically with respect to mechanisms of perception and attention. However, it is unclear if these enhancements are specific to video games, or if instead can be applied broadly. Furthermore, the underpinning reasons for these effects are unclear. The present experiment focused on determining; (1) if video game players (VGPs) outperform non-video game players (NVGPs) in a non-video game based task (i.e., change detection), and (2) if superior oculomotor behavior is present in VGPs, to determine if eye-movement patterns might be a possible reason for the associated behavioral enhancements. To that end, 36 participants (9 VGPs and 27 NVGPs) were recruited from the University of Hawaii at Manoa with the VGP criterion as someone who plays four or more hours of video games per week. Participants were presented with a stream of visual events where one target item changes in the scene while having their oculomotor movements tracked by a web-based eye-tracker. Participants were tasked with detecting the changing target item as quickly and accurately as possible. Interestingly, both behavioral and oculomotor measurements provided marginal differences with medium effects, where VGPs on average produced fewer eye movements but with longer fixation latencies, arguably indicating more efficient oculomotor behavior. Limitations and future extensions will be discussed in context with the notion that differences from the video game experience could modulate spatial awareness and visual search strategies, as well as oculomotor behavior.

Mentors: Dr. Scott Sinnett, Isak Kim
Using High-Definition Video Analysis on 2018 Eruption of the Lower East Rift Zone of Kīlauea

The motivation of this research is to understand what drives changes in the style and intensity of basaltic explosive eruptions using phases of the great 2018 eruption of Kīlauea. Basaltic explosive eruptions at Kīlauea, and elsewhere, are amongst the most dynamic of natural processes. They are highly variable and show transitions in eruption style and intensity that cannot yet be predicted. High frame rate footage was collected on May 27th, 2018 from fissure 7 and captured an 11-minute sequence of three closely spaced fountains. From the video, I am working to analyze the co-dependency of the fountaining behavior using the following in-flight parameters: frequency and duration of explosions; ejecta heights; pyroclast exit velocities; in-flight total mass and estimated mass eruption rates; and the in-flight total grain size distributions. Following the completion of video analysis, I will develop conceptual models for the interplay between the flows of gas and magma beneath the group of vents that account for the observed patterns of activity. Results are only preliminary at this stage and my research will be ongoing until the end of 2022.

Mentor: Dr. Bruce Houghton
Characterization of Hypothetical Protein, MSMEG_0370

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* (*Mtb*). In 2020, approximately 10,000,000 people contracted TB worldwide. *Mycobacterium smegmatis* (*Msm*) serves as a non-pathogenic model for *Mtb*. *Msm* ribosomal proteins (RPs) are incorporated into ribosomes in varying zinc conditions. Primary RPs (PrimRPs) are incorporated when zinc is abundant, while alternative RPs (AltRPs) are incorporated when zinc is scarce. *Msm* mutants lacking the AltRP operon phenotypically differ from the wild-type (WT), possibly due to ribosome-associated proteins (RAP).

A previous study showed that certain RAP candidates (including the protein product of *MSMEG_0370*) were overrepresented in the presence of AltRPs. This study aims to determine if *MSMEG_0370* is involved in AltRP-dependent phenotypes, specifically cell elongation and DNA condensation. The upstream and downstream regions of *MSMEG_0370* were amplified with PacI sites. Then a PacI digestion and ligation was done to connect the regions. The Gateway system was used to clone the ligation product and a hygromycin cassette was inserted. This resulted in a plasmid containing genes for selection and counter selection which was then electroporated into *Msm*. The gene of interest was replaced with the hygromycin cassette through recombination, creating the Δ*MSMEG_0370* mutant.

Colony PCR and sequencing were used to confirm the deletion of *MSMEG_0370*. Δ*MSMEG_0370* is currently being grown in parallel with the WT and Δ*altRP* strains and will be assessed for AltRP-dependent phenotypes using fluorescence microscopy. Findings from this study could improve current understandings of bacterial ribosome function, potentially providing new drug targets to treat TB and other bacterial diseases.

Mentor: Dr. Sladjana Prišić
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
Using Nitrogen Stable Isotope Values to Track Nitrogen Cycling Over the Last 4000 Years at Cape Tuxen, Antarctic Peninsula

The western Antarctic Peninsula (AP) is currently one of the most rapidly warming regions on Earth. Retreating ice has promoted the colonization of terrestrial plant communities, including Antarctic mossbank ecosystems. Modern plants and mossbank cores were collected at multiple study sites across the western AP to characterize nitrogen abundance in Antarctic ecosystems. This includes the longest (202 cm) and oldest (~4000 years old) organic sediment core ever collected from the western AP, which is from a study site at Cape Tuxen (TUX1). Mossbank cores were measured for bulk density and organic matter, as well as total nitrogen (TN%) and carbon (TC%) by Elemental Analysis Isotope Ratio Mass Spectrometry (EA-IRMS). A species-specific approach was taken to measuring foliar nitrogen and δ15N in modern and subfossil leaves by EA-IRMS.

All mossbank cores returned similar N values, with TN% ranging from 0.17 ± 0.04 and 2.34 ± 0.50 %N. TUX1 fossil leaf samples showed a significant relationship with a positive correlation between foliar δ15N and foliar nitrogen (P<0.001). TUX1 data supports empirical evidence that suggests that Antarctic terrestrial N cycling is linked to animal-derived sources. The observed decline in δ15N values in modern years may be primarily attributed to declining animal populations.

Mentor: Dr. David W. Beilman
Erika P. Johnson  
Japanese (with Honors) and Spanish  
Arts & Humanities - Research 
Honors  
Oral Presentation: Session 1 (9:30-10:30) in ‘Ilima Room

A Narrative Inquiry of Nikkei Peruvian Return Migration to Japan

This study follows the life stories of two Nikkei Peruvian migrants who returned to Japan during the early 1990’s and discusses how their identities have been constructed over the course of thirty years and how their investment in the Japanese language has been affected by various conditions as they navigated their lives in Japan. To understand the construction of their identities regarding their language development the author made use of Bonny Norton’s theoretical framework of investment, identity, and language learning. The data for this study was collected through semi-structured interviews and analyzed qualitatively using the narrative inquiry methodology. The life stories of these two Nikkei Peruvian return migrants provide an opportunity to see from their subjective perspectives the challenges that Nikkei Peruvians face in Japan as well as the challenges related to raising children in a foreign country with a different language and culture. This research reveals the complex relationship between ideology, investment, language, and identity.

Mentors: Dr. Atsushi Hasegawa (Chair), Dr. Caroline Torres, and Dr. Andre Haag
Self-Organization and Phase Separation of Copper Flakes in Confined Geometries

Self-driven microparticles, or microswimmers, can self-propel in a liquid environment. Biological examples include sperm cells and bacteria. Recently, there is growing interest in creating synthetic microswimmers. Inspired by the work of Squires and Bazant, we construct a microfluidic system in which we subject copper micro flakes to an alternating electric (AC) field. We observe self-propulsion, driven by induced-charge electrophoresis (ICEP), under an optical microscope. Previous studies indicate the significance of asymmetry to particle motion; however, the vast majority use spherical particles which are uniform in size. In contrast, our copper flakes are of varying dimensions and asymmetries. We seek to determine whether our system of microswimmers can exhibit self-organization and phase separation effects, much like biological microswimmers.

To that end, we sandwich a spacer of known depth between two conductive glass slides coated with thin layers of indium-titanium oxide. Copper flakes are put into suspension with deionized water and the surfactant Tween-20, the latter of which prevents aggregation and surface pinning. A droplet of this suspension is confined within the spacer. We use a function generator to create an alternating electric field with known frequency and voltage. Particle motion is recorded with a camera and tracked via computer software. Preliminary results indicate significant crowding and phase separation at low frequencies (~1 Hz), and scattering at higher frequencies (~100 Hz). These promising results indicate that metallic particles of varying shapes and sizes self-organize under an AC field, and may have notable applications in nanoengineering.

Mentor: Dr. William Uspal
Determining the Neurodevelopmental Intervention Needs of Premature Infants Born at 27-30 Weeks Gestation

Neurodevelopmental impairment is a significant long-term adverse outcome associated with prematurity, commonly inversely related to gestational age (GA) at birth. Extremely premature infants ≤26 weeks GA is considered a high biological risk factor, which alone will qualify for the Early Intervention Services (EIS) after discharge from the Neonatal Intensive Care Unit (NICU). However, infants born > 26 weeks GA must demonstrate significant delays at discharge or later to qualify for EIS. The primary goal of this study is to assess the need for the EIS for all very preterm infants born ≤30 weeks GA. We hypothesize that preterm infants born > 26 weeks GA are also at high risk for neurodevelopmental deficits. Therefore, neurodevelopmental follow-up and EIS may also be needed.

This is a retrospective study to examine and compare the neurodevelopmental outcomes of extremely and very preterm infant groups. Demographic information, medical history, and inpatient and outpatient developmental evaluation data will be collected by chart review. The Battelle Developmental Inventory 2nd Edition (BDI-2) is a standardized test used to evaluate infant developmental outcomes. The BDI-2 consists of five subdomains. Raw scores for each subdomain are converted to z-scores. Gestational age group (22-26 weeks vs. 27-30 weeks) BDI-2 subdomain z-scores will be compared using parametric analyses.

Preliminary results from z-score analysis have shown similar outcomes between the 22-26 and 27-30 weeks GA groups. In addition, select subdomains show a noticeable upward trend in outcomes across increasing weeks GA.

Mentors: Lynn Iwamoto, MD; Pattaraporn Chun, MD

Co-Author: Matthew Lim, MD
Introduction of Tryptophan to Chemokine CXCL5 for Biophysical Characterization

The chemokine CXC Ligand 5 (CXCL5) is expressed in many cell types to navigate neutrophil chemotaxis during infection. The ligand binds the G-protein Coupled membrane bound receptor CXCR2 both as a monomer or a dimer to activate signal transduction. In addition, CXCL5 contains a Pierced Lasso Topology (PLT) in which a covalent loop is formed by one disulfide bond and pierced by the protein backbone. It is hypothesized that PLTs can act as a molecular switch and prove integral to biological function. Despite CXCL5’s important biological role and involvement in inflammation, obesity, and cancer, its biophysical properties remain elusive.

Initial thermodynamic studies using Circular Dichroism (CD) show that CXCL5 has a global stability of $\Delta G = 4.04 \text{ kcal}$ under oxidizing conditions. Breaking the disulfide(s) changes the stability to $\Delta G = 4.51 \text{ kcal}$ indicating that the disulfides play a significant role in the CXC chemokines. To obtain information about the folding event of CXCL5, kinetic experiments will be conducted using tryptophan (Trp) fluorescence. Unfortunately, wild-type CXCL5 lacks Trp residues. Sequence alignments between chemokines revealed that position F62 may be a suitable position to perform an amino acid substitution with Trp. An overlay between the CD spectrum of F62W and the wild-type protein indicates that they have a similar 3D-structure. Furthermore, thermodynamic and kinetic experiments were conducted of the wild-type and F62W variant at different pH (4, 6.3, and 7.4) to obtain monomeric and dimeric conditions for future experiments.

Mentor: Dr. Ellinor Haglund
Project KUALIMA: Identifying and Supporting K-12 Students Within the Context of Three-Tiered Models of Prevention 2021-2022

This poster describes and compares the preliminary results of the professional development (PD) course to Hawai‘i DOE (HIDOE) faculty and staff, Project KUALIMA. Project KUALIMA teaches educators how to manage and prevent students’ challenging behavior using the Comprehensive Integrated Three-Tiered Model of Prevention framework, an expanded approach to the multi-tiered systems of supports (MTSS). The five-session course emphasizes the importance of data-based decision making and integration of behavior strategies (e.g., through low-intensity strategies) in the classroom.

Previously conducted as a publicly-available synchronous course last year, Project KUALIMA was an asynchronous course limited to individuals in the HIDOE PD system for the 2021-2022 school year. We compared pre- and mid-project data collected for both years including participant data, session feedback, and interviews to understand how participants perceived the different course format. Participant data was collected through Qualtrics and specifically looked at the shift in educator social validity from pre- to mid-project. Session feedback collected via Google Forms provided suggestions for future improvements to the asynchronous course. Lastly, 30-minute semi-structured mid-project interviews conducted over Zoom provided detailed qualitative data and analysis of participant successes, challenges, and suggested course improvements. All interview data were examined using a constant comparative analysis.

The results we found informs our current and future offerings of Project KUALIMA, helping us better understand how we can support HIDOE’s shift toward the implementation of MTSS. Additionally, our data on Project KUALIMA’s asynchronous course offering informs the feasibility of expanding and supporting schools outside of Hawai‘i.

Mentor: Dr. Marija Čolić

Co-Authors: Dr. David Royer, Roxanne Bristol, Kristina Brown, Dr. Wendy Oakes, Vanessa Liang, Tristan Setzer
The Impact of the Coronavirus Pandemic on Students’ Educational Goals and Attainment

In the past, economic downturns have been attributed to the rise of undergraduate degree seekers. During the financial crisis of 2008, many laid off workers chose to return to higher education, because people wanted to invest their time and money into degrees that would hopefully make them more competitive on the job market (Barr and Turner, 2013). The Great Recession was the last large financial downturn preceding 2020. During the Great Recession, many students benefitted from the federal government’s American Recovery and Reinvestment Act, which doubled Pell Grant payments in just a few short years, as well as loosened eligibility requirements. Because the eligibility of the Pell Grant is based off students’ household income, many people became qualified for the Pell Grant when they lost their jobs during the Great Recession. The COVID-19 pandemic threw the world into a financial tailspin in 2020, which has affected many peoples’ post-secondary education plans. This study examined the factors that have led undergraduate students at the University of Hawaii at Manoa to pursue higher education in the context of COVID-19, as well as why continuing students are choosing to stay at UH Manoa. Students were given the opportunity to complete a survey for extra credit in their classes. This survey asked questions relating to their household finances to gauge how intensely they have felt the economic effects of COVID-19, and what factors have affected their educational decisions. Results will be discussed in terms of the impact of the coronavirus pandemic on various groups of students at UH Manoa.

Mentor: Dr. Emily Daubert
PEA-15 as a Therapeutic Target in Melanoma

Cancer is a disease characterized by the uncontrollable cell growth and division of abnormal cells. Phosphoprotein enriched in astrocytes (PEA-15) is a 15kDA protein shown to have proliferative or anti-proliferative effects depending on the cancer type. Based on an analysis of publicly available databases, PEA-15 is required for the survival of some melanoma cells. Melanoma is the most deadly form of skin cancer, and this information suggests that PEA-15 is potentially new therapeutic target in melanoma.

Melanoma cell lines were chosen based on data from DEPMAP and cBioPortal. The cells were cultured in a sterile environment and treated with PEA-15 siRNA to knockdown gene expression. The cells were incubated for 48 and 72 hours after siRNA transfection. Western blot analysis assessed PEA-15 knockdown and cell viability was determined using an XTT assay.

Preliminary results point to some melanoma cells being dependent on PEA-15 for survival. The dependent cells also appear to be less viable at 48 and 72 hours when compared to treatment with a non-target (control) siRNA. Further analysis is being conducted to identify the impacts of PEA-15 expression on proliferation, apoptosis, and cell migration. Therefore, identifying the mechanisms by which PEA-15 promotes melanoma survival at the protein level may reveal new ways to target PEA-15 function and the related signaling mechanisms in these cancers.

Mentors: Dr. Joe Ramos, Dr. Howard Shen
Aging and Sea Level Rise: Exploring Future Elderly Population’s Accessibility to Essential Services in Honolulu, Hawaii

Demographic studies have shown two trends: (1) elderly population is growing as a consequence of longer life expectancy; (2) population in low elevation coastal zones will significantly increase. One of the potential risks of living in low elevation coastal zones is the projected sea level rise. Seniors could be especially vulnerable to such disruptions given their need for emergency services and essential services. This study aims to investigate the impacts of sea-level rise on the aging population’s accessibility to essential services and its implication for long term adaptation planning using Honolulu, Hawaii as a case study. Using Cohort Change Ratio (CCR), the study projects the elderly population in each Traffic Analysis Zones (TAZs) in future decades. Network connectivities from each TAZs to nearest essential services under different sea-level rise scenarios (1.1 feet, 2.0 feet, and 3.2 feet) are analyzed. The results show that while the physical impacts on infrastructures are mild, some vulnerable communities’ access to emergency services and essential services will be greatly affected even under 1.1 feet sea-level rise scenarios. Especially some areas with a high projected density of the elderly population will be cut off to essential services due to transportation bottlenecks. The results not only urge transportation network planners to take actions to make sure transportation connectivities to vulnerable elder population at-risk are protected, but also suggest that over the long term land use planning would be one of a key factors to adapt to climate change.

Mentors: Dr. Suwan Shen, Dr. Jiwnath Ghimire
Analyzing Online Learning Experiences During the COVID-19 Pandemic

This study analyzed the effectiveness of COVID-19 online learning environments based on three research questions:

1. What student behavioral differences in sleeping patterns and study habits occurred between the pandemic learning environment and the pre-pandemic environment?
2. What student online learning perceptions emerged and are categorized by: quality, difficulty, pace, and social interaction?
3. What is the relationship between student perception and course performance of online learning?

A piloted online survey utilizing Likert scaling collected information about class standing, grade point average, semester credit hours, major, gender, and perceived sleep and study behaviors from a convenience sample of 133 students from the University of Hawai‘i at Mānoa. Analysis of variance determined the main effects among the categorical data based on 601 courses. Content analysis was performed on 204 comments from 103 students.

Comparisons between COVID-19 and pre-pandemic sleep and study hours indicated a reduction for 13 majors and an increase of hours for 5 majors; overall class standing averaged a decrease of 17.8 minutes of sleep and 3.19 hours of study. Student online experiences resulted in 52 positive, 108 mixed, and 80 negative statements classified by adaption, communication, convenience, difficulty, easiness, flexibility, pace, mental and physical health, quality, and safety. Performance measures of grades A to F based on 601 courses suggest that learning perception is related to course performance, and therefore, the study’s null hypothesis was rejected.

This study examined cognitive-based design methods for learning and perception. Future research in remote environments and interaction has the potential to increase motivation.

Mentors: Dr. Martha Crosby, Dr. Michael-Brian Ogawa
Cardiomyocyte GLUT4 Trafficking is Dependent on the Exocyst Complex

**Background:** Increased myocardial glycolysis in ischemia improves cardiomyocyte survival, but it is limited by the glucose uptake rate via the GLUT4 glucose transporter. Insulin or increased ATP-demand via the AMP-activated protein kinase (AMPK) triggers GLUT4 plasma membrane delivery. The exocyst complex is essential for insulin-induced GLUT4 membrane-delivery in adipocytes and skeletal myoblasts. We don’t know if this mechanism is conserved in cardiomyocytes nor if the exocyst controls AMPK-induced cardiac glucose uptake via GLUT4 translocation.

**Objective:** Determine if in cardiomyocytes the exocyst regulates GLUT4 delivery thus contributing to glucose uptake and glycolysis that could improve cell-survival following ischemia.

**Methods:** The subcellular localization of the exocyst and GLUT4 in response to insulin and AMPK activation was determined using proximity ligation assay on H9C2 cardiomyoblasts. Absorbed fluorescent 2-deoxy-D-glucose was measured in glucose uptake assays in response to insulin and ionomycin. Using endosidin-2 (ES2), an exocyst inhibitor, we tested how exocyst inhibition affects its recruitment to GLUT4 vesicles and glucose uptake in H9C2 cardiomyoblasts. With real-time quantitative-PCR and Western analysis we measured exocyst subunit mRNA and protein expression in an *in vitro* model of simulated ischemia.

**Results:** In H9C2 cardiomyoblasts, the exocyst subunit Exoc5 was recruited to GLUT4 vesicles following insulin and AMPK activation, and this recruitment was interrupted by ES2. Insulin and ionomycin treatment stimulated H9C2 glucose uptake, but ES2 impeded this augmentation. Under simulated ischemia, expression of exocyst subunits increased, suggesting higher demand for exocyst activity. Ongoing work will further investigate the exocyst’s role in cardiac metabolism and function under ischemic conditions.

Mentor: Dr. Noemi Polgar

Co-Authors: Herena Y. Ha, Nicole K. Nakamura, Lamar Carter, Darcy S. Tokunaga
Microfluidic Biosensor for Airborne Pathogen Surveillance

Currently, development of robust environmental monitoring systems for airborne pathogens is still emerging. In the midst of the COVID-19 pandemic, there is a pressing need for this resource. The prototype presented here possesses detect-to-warn capability by integrating microfluidic and biosensing technologies. A microfluidic chip was fabricated by 3D printing resins with microscale channels (1.40 mm width and 0.80 mm height) to cast polydimethylsiloxane (PDMS). The biosensing mechanism takes after a whole-cell ELISA-based assay, which eliminates the high costs to purify and isolate antibodies and antigens. A protocol for this assay has been developed to be suitable for continuous flow conditions in a PDMS-glass microfluidic chip. Cyclic reagent loading of reagents was automated by the assembly of inexpensive syringe pumps reaching flow rates as low as 1.59 mL/min. A single reagent loading to analysis sequence was completed in 60.41 minutes, thus seven complete tests could be run in an 8-hour operational period--a typical work or school day. The optical sensor to detect model pathogens was sensitive towards a range of sample dilutions, in which a graphical representation of detected cell concentrations over time may be viewed in real time on a separate electronic device so individuals can effectively monitor the evolution of the pathogen’s presence. Furthermore, a notification sequence was designed to activate when a threshold amount of detection cells has been detected so that those in proximity of the device can be alerted of their exposure and responsible parties can swiftly enact mitigation measures.

Mentor: Dr. Wei Wen Su
Child-directed speech is crucial for children’s language development. More recent research indicates that important qualities of child-directed speech, in particular, decontextualized language and *wh*-questions, are strongly linked to children’s later language skills and academic achievement. However, the majority of language development studies have primarily sampled white mothers, leaving the contributions of fathers from ethnic-minority communities unclear. The current study examines if differences exist between ethnic groups on father-child speech input in the ethnically diverse state of Hawai‘i. I hypothesized that group differences will exist given how group differences exist between mothers of different ethnic backgrounds in their amount and type of child-directed speech. Fifty fathers and their children were observed within listening distance around two local malls on the island of O‘ahu. Father and child demographics were collected along with fathers’ decontextualized language usage, fathers’ *wh*-question usage, fathers’ other question usage, father-child conversational turns, fathers’ affect, whether there was technology present (i.e., cell phone out), and other child talk. Across all ethnic groups, father-child conversational turns remained consistent. Father decontextualized language was more prevalent in the white group compared to all other ethnic groups. Father *wh*-question usage was more prevalent in the Native Hawaiian/Pacific Islander group compared to all other ethnic groups. Important educational implications may be gained from this study such as instructional methods for male educators in diverse early childhood classrooms as well as policy implications for single fathers or fathers experiencing incarceration in the United States.

Mentor: Dr. Emily Daubert
Identifying Ultraviolet Sensitive Visual Proteins in the Eyes of a Larval Stomatopod, *Neogonodactylus oerstedii*

Stomatopods are known for their complex eyes, particularly in adults, which have ultraviolet (UV) receptors. Until recently, researchers thought that stomatopod larval eyes were relatively simple, but with new data, larval eyes seem to be more complex and UV light sensitive. For this project, two UV-sensitive proteins, known as opsins, were observed for expression patterns in larval eyes. Locating these UV-sensitive opsins allows observance and confirmation of expression by comparing these opsins’ locations to patterns previously described in adults. Patterns of protein localization give insight into how larvae might be utilizing UV sensitivity. To find opsins, antibodies were produced for two opsin proteins, UV1 and UV2, previously detected in adults of the species *Neogonodactylus oerstedii* and in larval transcriptomes. Larval *N. oerstedii* eyes were sectioned and put through multiple washes during antibody labeling, reducing background fluorescence. One wash followed to bind the antibodies to the opsins within the tissue and another to bind secondary antibodies allowing for visualization after mounting in a medium and coverslip to deter drying. There was no visible expression in the analyzed images, but fair amounts of autofluorescence were observed radiating from tissues surrounding the retina. This amount of autofluorescence made results harder to interpret, causing ambivalent conclusions. It is believed that no expression was visible and future studies will need to use whole-mounted eyes instead of sections as crucial parts with UV expression could have been lost.

Mentors: Dr. Megan Porter, Sitara Palecanda
Non-target Computer Vision-based Structural Deflection Assessment with Machine Learning

Structural deflection is an important factor in assessing structural damage. Most current displacement measurement methods are costly, labor-intensive, and restricted by its surroundings. This research intends to develop a non-contact, indirect deflection measuring method using computer vision (CV) and machine learning approaches to address this weakness of existing methods.

This study presents a non-target, computer vision-based strategy that combines sophisticated point of interest (POI) selection and visual signal processing with Deepflow and Deepmatching techniques. Deepmatching, which identifies dense matching features between two image frames, is used to compute pixel wise dense optical fields in Deepflow. To directly quantify drift-free displacement, the proposed method calculates dense optical fluxes at certain frames in relation to the initial image frame. The proposed approach is experimentally validated on a cantilever beam in both ambient and occluded test conditions.

The proposed method had a maximum displacement of 1.79 mm and a 0.43% error compared with the reference displacement sensor under ambient conditions. Under disturbed conditions, the proposed method, which uses a masking technique to capture features inside the structure, correctly monitored displacement by accurately recovering feature points.

In conclusion, the proposed approach was experimentally confirmed. The ability to quantify non-target specific drift-free displacement was the most notable benefit of the suggested method. Based on the current results, long-term field trials are needed in the future.

Mentor: DoSoo Moon
Induced Spawning of ‘Opihi Using Novel Peptide and a Phosphodiesterase-5 (PDE5) Inhibitor

The Native Hawaiian limpet, the 'opihi (*Cellana exarata, C. sandwicensis*), is a broadcast spawner that releases sperm and eggs into the surrounding intertidal. Due to population declines and inadequate pre-existing methods, we set out to create a new method of spawning induction with higher survival rates and more consistent success, allowing us to replenish wild populations. To induce spawning, we used a mixture of two peptide hormones and a phosphodiesterase-5 (PDE5) inhibitor. The first hormone, conopressin, has been shown to induce contractions within the vas deferens of other gastropods. The second, egg laying hormone (ELH), is the main signaling hormone involved in egg laying behaviors. Both peptide sequences were obtained using bioinformatics from closely related species. Finally, a PDE5 inhibitor was added due to observed positive effects on sperm motility, spawning behaviors and smooth muscle relaxation.

The two peptides were synthesized via solid phase peptide synthesis. Once extracted, the peptides and PDE5 inhibitor were dissolved in seawater and administered via bath. Spawning trials were performed overnight, using adult specimens collected from the western coast of Oahu. Observational data was collected over seven hours after application and any resulting gametes secreted by the 'opihi were treated to ensure proper fertilization. Any resulting viable offspring were transferred to larval rearing tanks that were previously funded by UROP.

Results showed an increase in spawning behavior, but no consistent results for spawning. Further trials will be run using differing concentrations of the solution and other methods of application will be considered, such as injection.

Mentor: Dr. Jon-Paul Bingham
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. 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 preliminary interferograms (surface change and line-of-sight displacement maps). To demonstrate this technique, I processed ascending Sentinel-1 SAR data (provided by the European Space Agency) from May 2, 2018 and May 8, 2018 to construct an interferogram showing deformation changes of the 2018 eruption.

Preliminary results yield a deformation map that reflects the May 4, 2018 M6.9 Leilani Estates earthquake and deformation associated with the eruption along the Lower East Rift Zone from May 2-May 8, 2018. Next steps are to apply this technique to other date ranges spanning the 2018 Kīlauea eruption and model the sources of deformation and stress change at each time step. 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. Bridget Smith-Konter
Makenzie McCarthy
English
Arts & Humanities - Creative
Honors
Oral Presentation: Session 3 (11:50-12:50) in ʻIlina Room

Starting a Conversation about Social and Climate Issues through Children’s Literature

Makenzie McCarthy used her skills in creative writing and digital artwork to write and illustrate three children's picture books that are recommended for early elementary level readers. Each of these books tackle one key issue facing today's younger generation: access to healthy foods, understanding climate change, and embracing that beauty comes from who you are instead of what you look like. These books start a conversation on these topics in a hope to ignite an interest in children from an early age and therefore creating more educated children in the future. Makenzie’s writing was inspired by Ted Talks, professional illustrators, literary journals and her own experiences. She used the illustration software Procreate to digitally draw all of her pages and covers. What helped shape her work was the revision process. Working with her mentors, she was able to revise each book into the end product. While some of the book's topics were chosen because of their importance in today’s society, one was chosen based on her personal experience growing up biracial and having to accept her own differences as beautiful. Together these three books urge children today to make a difference by making little changes everyday.

Mentor: Dr. Todd H. Sammons
Physiological Performance of Two Distinct Color Phenotypes of Porites compressa Fragments Under Thermal Stress

The climatic warming from anthropogenic release of greenhouse gases in the past century is leading to mass die-offs of coral reefs. When temperatures of seawater surrounding coral ecosystems increase, they respond by releasing the symbiotic algae, Symbiodiniaceae, from their tissue as a stress response. This leaves them with less available energy from autotrophy, they are more vulnerable to disease, and if they stay in that stressed state for long periods of time, they are likely to die. Some corals have been observed to be more susceptible to this bleaching phenomenon than others, even within the same species. It is important to identify the characteristics that make corals more resilient than others to implement the most effective reef management strategies. In this experiment, Porites compressa fragments were collected from a variety of different colonies and placed in two aquaria tanks where a heat wave was simulated in one of them and steady ambient temperatures were maintained in the other. This resulted in the identification of two distinct color phenotypes, yellow and pale, when P. compressa experienced the stress of increased temperatures. The coral fragments with the yellow phenotype had a higher photosynthetic efficiency after prolonged thermal stress than their pale counterparts measured using Pulse-Amplitude-Modulation fluorometry (PAM). This could signify that P. compressa fragments with this yellow phenotype are able to withstand high temperatures with less detrimental impacts to their health and may be preferable for use in coral restoration.

Mentor: Dr. Craig Nelson
Molecular Evidence for Possible Cryptic Species
in the South American Fruit Fly

The fruit fly known as *Anastrepha fraterculus*, is a devastating agricultural pest found throughout South America. These flies are significant because they attack unripened foods, like fruit. The presence of this pest is linked to a reduction in agricultural productivity. There is a push to create effective biological controls that do not involve pesticides. One very effective method is the sterile insect treatment (SIT), but this requires the correct identification of the species being targeted. *A. fraterculus*, however, is also thought to be part of a complex of closely related species. For the effective use of SIT, it must be determined if this complex is composed of several unique species or one overarching single species. The objectives of our analysis were to use mitochondrial and nuclear DNA markers to determine levels of genetic variation in collections of *A. fraterculus* from different regions of South America, and determine if these levels are consistent with the presence of a single widespread species or a collection of cryptic, unidentified individual species. Our methods include DNA extraction, amplification of mitochondrial (CO1) and nuclear genes (ITS1) via PCR and DNA sequence analysis. We are currently using bioinformatic methods to analyze the DNA sequences to assess levels of genetic variation amongst our various collections. We will attempt to reach conclusions regarding the potential of unique species or the presence of species complexes within *A. fraterculus*. The outcome of this study will inform biological control methods and potentially reduce the agricultural damage done by these pest species.

Mentor: Dr. David Haymer
Consequences of Marine Heatwaves to Hawaiian Herbivorous Reef Fishes

Coral reefs globally are seeing a phase shift from coral dominance to macroalgal dominance due to a myriad of anthropogenic stressors. The role of herbivorous reef fishes becomes increasingly apparent with this ongoing phase shift as these fishes can regulate algal biomass on reefs and keep phase shifts from occurring, however, warming ocean temperatures in the form of marine heatwaves, or periods of anomalously high sea surface temperatures (SST), pose a major threat to herbivorous reef fishes and their ecosystem functionality. To test the effects of marine heatwaves on herbivorous reef fishes, energetic acquisition and demand were measured in *Acanthurus triostegus* and *Chlorurus sordidus* at winter, summer, and heatwave conditions. Energetic acquisition was measured by counting bites on a provided food source per minute as well as by tracking activity rates. Energetic demand was measured using intermittent flow respirometry. This study found that foraging rates of the two species did not change throughout the three treatments despite an increase in energetic demand seen in standard metabolic rate (SMR) in the heatwave treatment. The increase in energetic costs of maintaining homeostasis (SMR) paired with no change in energetic acquisition caused the perfect storm for body mass of both *A. triostegus* and *C. sordidus* to significantly decline in the heatwave treatment. These findings have alarming implications for Hawaiian coral reefs as the decrease in fitness during marine heatwaves may prevent these species from providing their essential, top-down algal control and put Hawaiian reefs at risk of algal-dominated phase shifts as oceans warm.

Mentor: Dr. Jacob Johansen
Evaluations of Student Psyche, Based on Geographic Locale

The objective of this study was to determine if geographic locales (Rural, Urban, and Suburban) had an effect on the college experience (Self-efficacy, Well-Being, Stress, and Self-esteem). While also comparing data with controls for socioeconomic status and gender. The method used to achieve this was a brief survey of the Manoa student population and gauging their college experience through various scales. To formulate this survey, self-efficacy was measured using the 10-item General Self-efficacy Scale, stress was measured using the 10-item Perceived Stress Scale, self-esteem was measured using the 10-item Rosenberg Self-Esteem Scale, well-being was measured using the 5-item Satisfaction With Life Scale. After data collection and cleaning, several analyses were run in order to compare results between the different independent variables. Upon completion of analysis, no significance differences were found between the geographic locale on college experience, controlling for income and gender, $p = .671$. One interesting piece of collected data was that there were significant differences of stress between males and female gender, $t(287) = -2.817$, $p = .005$. A potential lack of power due to only 33 students with a rural background participated in the study. While results for this study did not show statistically significant differences in college experience, future studies with a larger sample size would create a more diverse understanding of the student demographic of college experience. Lastly, since geographic locale is not a commonly used independent variable, I find that inclusion of it would lessen the gap of literature into geographic based studies.

Mentor: Dr. Emily Daubert
Assessing Human-Induced Coral Reef Disturbances from Visitors at Hanauma Bay Nature Preserve

It has been noted in many research papers that regions with high snorkeling and diving activity damages coral reef ecosystems. I investigated the effects of visitor snorkeling density, and the number of times snorkelers physically disturbed the reef. Four plots were designated for bimonthly monitoring, where the number of snorkelers entering each plot and their interaction with the reef was recorded. Coral health was qualitatively observed, and the surface area of the coral tissue was quantitatively measured. My results show a direct relationship between snorkeling density and the number of disturbances. However, there is no evidence of visitor density and coral health impairment. There was no coral breakage or abrasions from snorkelers during the data collection period, possibly a result of low coral cover across the bay, limited branching morphology, and/or species with high skeletal strength due to historical disturbances from higher water motion and extensive visitors. Corals in each of the plots experienced tissue loss mainly from preexisting lesions or tissue damage; the causation of the previous coral injury is unknown. Future management actions in Hanauma Bay could limit the number of visitors and occurrence of reef disturbances to potentially reduce tissue loss and promote coral recruitment.

Mentor: Dr. Ku'ulei Rodgers

The traditional sample used in antibody-based assays is blood collected through venipuncture (VP). VP collection requires trained personnel, specialized equipment, necessitates a strict timeline for collection and processing, and can be uncomfortable for participants. A less invasive technique, which can easily be conducted in community field settings with limited personnel and supplies and stored for years at most temperatures, is collection of a dried blood spot (DBS) using finger prick.

Following informed consent, matching DBS and VP samples (n= 180 samples) were collected from individuals who recovered from a SARS-CoV-2 natural infection and/or had received a COVID-19 vaccination between April 2021 and February 2022 in Hawai‘i. Anti-SARS-CoV-2 spike IgG antibodies were evaluated by a multiplexed microsphere immunoassay (MIA) including beads coated with SARS-CoV-2 spike S1 domain (S1), nucleocapsid (N) antigens and appropriate controls.

We report that the DBS assay was highly sensitive (0.99, 95% CI= 0.78-1.0) and specific (0.99, 95% CI= 0.44-1.0), with a strong correlation between matched blood samples. Further, the positive predictive value (PPV = 0.78) and negative predictive value (NPV = 0.44) was high. Individuals naturally infected with SARS CoV-2 and vaccinated showed higher levels of IgG antibodies compared to those who only received two doses of COVID-19 vaccination. Levels of binding antibodies decreased over six months after dose two of vaccination and increased after booster administration. We developed a low-cost, non-invasive technology for measuring SARS-CoV-2 IgG antibody levels using a DBS assay, demonstrating strong correlation to matched VP samples.

Mentor: Dr. Vivek R. Nerurkar, Lauren L. Ching
Sustainability in the Fashion Industry: Leaders in Sustainable Business Model Innovation

The fashion industry (i.e. clothing designers, manufacturers, and distributors) is one of the largest, most wasteful industries operating in the world. Driven by consumer demand for fast and cheap apparel, many clothing companies operate on a low-cost, mass-production model that is often detrimental to the environment. Growing consumer awareness of the corporate role in climate change has fostered an evolution of brands to create clothing more sustainably, as consumer value placed on environmental responsibility is increasingly contesting the value placed in mass production and sales. In this paper we look at the effects of the fast fashion business model in both an economic and environmental context. Then we examine some of the practices modern clothing companies implement to lessen the environmental impact of their business activities, specifically investigating how three companies—ThredUp, Patagonia, and Mud Jeans—differentiate their offering by centering their respective business activities around a mission to better the planet. This includes an overview of each company’s business model, sustainable operations, and corporate social responsibility strategy. Our work establishes a much-needed understanding of the specific business models that involve practices that are harmful to the environment, and the ways in which fashion firms can fundamentally change their approach to designing, producing, and distributing clothing.

Mentor: Charles Lopez, Jr.
The Relationship of Self-Compassion and Self-Esteem to Resilience: The Moderating Role of Context Sensitivity

In this study, we aim to understand the relationship between resilience and context sensitivity in predicting psychological adjustment. Resilience can be defined as “a stable trajectory of healthy functioning following adverse events.” Flexible self-regulation is proposed to be the process and mechanism underlying resilience. The first step of flexible regulation is context sensitivity, which involves the task of working out the demands of a particular situation. With context sensitivity one asks themselves, “What is happening?” and “What do I need to do?” Research has shown that greater context sensitivity, in particular the ability to identify the absence of threatening cues, is associated with fewer psychopathology symptoms. In examining this relationship, we were also interested in the roles of self-compassion and self-esteem in moderating that relationship. Self-esteem has been linked to a variety of adverse health outcomes such as major depression, schizoaffective disorder, pathological eating, antisocial behavior, and anxiety. Self-compassion has also been found to mediate the relationship between self-esteem and social anxiety, and adopting a self-compassionate stance may be linked to resilience. We distributed an online survey through SONA to undergraduate students at University of Hawai‘i at Manoa. Multiple regression analysis was used to examine moderation and mediation models for each of the three adjustment indices used in this study (anxiety, depression, and stress levels), with a sample size of 170 subjects.

Mentor: Dr. Anthony Papa
Using World Integrated Trade Solution Database to Monitor Sugar-Sweetened Beverage Tax effect in Pacific Island Countries and Territories

The Pacific has some of the highest obesity rates in the world, which has led the region to be recognized as being amid a non-communicable disease crisis. To combat this issue, several Pacific Island Countries and Territories (PICT) have introduced sugar-sweetened beverage (SSB) taxes and tariffs.

Many PICTs import most of their SSBs (with some exceptions) making imports a valuable metric for consumption. While there have been studies of SSB taxation in PICTs these methodologies are not scalable or reproducible. The goal of this research is to create a framework for widespread evaluation of taxation interventions in PICTs by examining export and import data from the World Trade Organization. A reproducible framework was written in the statistical package R to web scrape data from the World Integrated Trade Solution (WITS) database.

The results of this framework for the Kingdom of Tonga were compared with data directly from the Statistics Department of Tonga to access the quality of WITS trade data. It was found that trade data for Tonga from WITS matched statistical department data within 10 liters each year. However, other countries that exported to Tonga (partners) on WITS were checked for their exports of SSBs to Tonga and these results were highly variable and could be greatly affected by missing data among one or more partners.

This reproducible framework can be used to preform widespread analysis of SSB imports in PICT but there are limitations including availability of partner data.

Mentor: Dr. Deveraux Talagi
Investigation of Cognitive Flexibility in Bilinguals Modulated by L2 Proficiency and Age of Acquisition

Bilingual advantage in cognition remains unclear despite a growing interest across multiple fields. Many studies focus on the executive functions (EF) that are associated with goal-maintenance, distractor-inhibition, and task-switching to see if this system is enhanced by bilingual experience. However, the literature in this area is less clear, with some studies reporting contrasting reports of bilingual advantage and bilingual hindrance. Here, we consider a multidimensional approach to investigate possible bilingual advantages in EF by examining bilinguals with varying second language (L2) proficiency and age of L2 acquisition. Using the Stroop switching task (a modified version of the conventional Stroop Test), participants were presented with a cue followed by a target word (e.g., “RED”) with matching (red-ink) or mismatching (green-ink) color. In each trial, the cue signaled the participants to judge the upcoming word (“RED” or “GREEN”) or color (red or green color) with associated keypresses as quickly and accurately as possible. Each trial required participants to actively switch or repeat between two tasks, with increased performance being associated with better task-switching capabilities. While we initially hypothesized that bilinguals would outperform monolinguals on this task, no significant differences were found between groups, despite controlling for proficiency and age of L2 acquisition. Limitations and future extensions will be discussed with the consideration of more homogenized bilingual and monolingual groups and controlling for other dimensions that could confound the bilingual studies on cognition.

Mentors: Dr. Jonas Vibell, Dr. Scott Sinnett

Co-Author: Isak Kim
Seed Analysis with Multispectral Imaging

The multispectral imaging system was designed and fabricated to produce rapid, non-destructive seed oil content measurements. A monochrome camera was integrated with a network of light-emitting diodes (LEDs) so that an image was taken when a sample was illuminated with a single wavelength of light. With Python code each LED was set at a certain brightness level to ensure proper diffusion of lighting and similar intensities were set. Object identification code was also used to crop out the seeds in the image. This code had a success rate of 100% at a light intensity of 50 steps and above, able to detect and crop every seed in the image. To ensure repeatability the lighting system ran image tests, and the highest standard deviation was 0.07 pixel light values. To correlate the oil content with images taken the free fatty acid method (Ca 5a-40) was then conducted and used to determine the percentage of fatty acid in the extracted oil. After the camera system was calibrated, a random selection of 10-13 seeds were taken for the set of images at each wavelength. From the oven batch, 200 grams of the seeds were taken, heated and pressed to extract the oil. From the oil, free fatty acid titrations were conducted and found that 0.63% of the oil in the seed is Oleic acid.

Mentor: Ryan Kurasaki
Cardiac Fibrosis in Relation to Age

The heart is one of the most important organs in the human body and cardiovascular disease is one of the leading causes of death in the world. Heart failure can be due to different risk factors such as heart attacks, also known as myocardial infarction. Many clinical studies demonstrated that older people are more susceptible to heart failure despite having no significant history of cardiovascular disease in their lives. We hypothesized that aging, itself, can be a risk factor for cardiac dysfunction caused by several types of cardiomyocyte cell death. We examined 10 cadaveric hearts from individuals who had no history of myocardial infarction using histological assays with Masson’s trichrome staining that identifies fibrosis with a blue color. We differentiated the healthy cardiomyocytes from the fibrosis and measured the amount of replacement fibrosis as a representation of a nonfunctional area. Tissue samples, from each individual heart, were taken at random from all three regions of the heart: septal, anterior, and posterior walls. The amount of fibrosis was determined for each heart and compared based on the age of the individuals with a range of age group from 55 to 92. Plotting the amount of fibrosis with the age of the cadaveric hearts showed that there was a slight correlation between the two variabilities, although it was not statistically different. Using histological assay to define the mechanism underlying myocardial fibrosis in aging hearts, it was observed that the cell death types, both apoptosis and ferroptosis occurred.

Mentor: Dr. Takashi Matsui
The Exocyst Complex is an Insulin-sensitive Regulator of Amyloid Precursor Protein (APP) Trafficking and Amyloid-beta Generation in Neurons

Alzheimer’s disease (AD) is a progressive neurodegenerative disorder characterized by the loss of cognitive function, language, and memory. One prominent histopathological hallmark of AD is the accumulation of amyloid beta (Aβ) peptide plaques. Regulation of APP intracellular trafficking in neurons directly influences generation of Aβ peptide by β- and γ-secretases and plays a key role in the balance of amyloidogenic APP processing. The exocyst is a highly-conserved eight-protein complex that acts as a Rab GTPase effector to guide intracellular transport vesicles to their destination for vesicle fusion. Assembly and targeting of the exocyst is controlled by a variety of protein kinases and small GTPases. We hypothesize that the exocyst plays a key role in trafficking intracellular APP in neurons.

We show in human SH-SY5Y neuronal cells and primary mouse hippocampal neurons that the exocyst co-localize with APP on intracellular vesicles. We confirmed these findings using proximity ligation assays, showing APP and Exoc5 co-localized within 40nm. However, after 15 mins of insulin treatment, this APP-Exoc5 interaction was greatly reduced, while Exoc5 association with glucose transporter GLUT4 increased. Using an engineered SH-SY5Y cell line with familial AD mutations in APP, RNAi silencing of exocyst subunits led to dramatic decreases in Aβ secretion, with intracellular accumulation of full-length APP. We observed the same results with RNAi silencing of Exoc3L2, an uncharacterized exocyst gene homolog genetically linked to AD. These experiments show that the exocyst plays a key role in trafficking and Aβ secretion in neurons, directly regulated by insulin signaling.
Improving the Waste Management and Resource Recovery at the University of Hawai‘i

Waste disposal can be streamlined through the primary separation of materials, then segregated to appropriate sites such as composting (for food waste) and recycling centers (for aluminum cans and plastic/glass bottles). Preventing unnecessary waste from going into the landfill reduces the amount of methane emissions and takes up less space in the landfill. This project aimed to improve the waste management and resource recovery at the University of Hawai‘i at Manoa (UHM) by reducing the volume of aluminum cans and assesses the amount of different types of waste generated in the Paradise Palms food court. The overall device includes an automated pneumatic can compactor to compact aluminum cans. It also consists of sensors that determine the current level of waste of each bin and once it is detected full, there is an alert system to notify personnel to empty out the waste bin(s). This can reduce the amount of time trash bins need to be changed out and checked on. To prevent overfilling of waste, an indicator light turns on to express when a waste bin is full. Lastly, this concept encourages students and staff to separate their leftover food waste from their takeout containers.

Mentor: Dr. Samir Kumar Khanal
Novel Drug Discovery Using *Conus*

The genus *Conus* encompasses over 100 different species of marine cone snails, each capable of secreting a wide variety of toxins. These toxins range from small bioactive molecules to highly selective peptides called conotoxins. My project’s research is focused on the nirvana cabal, which is the collection of compounds and peptides responsible for prey sedation. This portion of the venom varies from species to species and has been of pharmaceutical interest for the past few decades. Recently, a study published by Sefavi-Hemami suggested that conoinsulins could be responsible for the anesthetizing portion of *Conus geographus*’s venom, and maybe other species of *Conus* as well. To test these claims, we built a two-part bioassay using *Poecilia reticulata*, which consists of a general mobility assessment and a startle/habituation response. Dose-response curves were created for *C. catus*, *C. striatus*, and *C. geographus* venom, as well as human insulin for a mobility and startle/habituation bioactivity comparison. Further confirmation of *C. geographus*’s nirvana cabal was done by fractionating the sample and testing the individual components. This additional fractionation was done as a proof of concept, demonstrating the ability of this bioassay to characterize each component of the nirvana cabal. The exact characterization of each of the venom components is still not finished, but current evidence suggests that small biomolecules play a substantial role in the sedative effect of *Conus* venom.

Mentor: Dr. Jon-Paul Bingham
How to Survive in a News Desert: Ways that Local News Gets Made and Spread with Mobile Technologies on Molokai

Newspapers in rural areas are closing across the country at a dramatic rate, creating vast news deserts, where local news has just about dried up for its residents. So how are people getting their news in these places? In this study, we conducted an immersive cultural analysis of a specific news desert under development, the Hawaiian island of Molokai. Using semi-structured and in-situ interviews, we asked more than 20 of Molokai’s citizen journalists, thought leaders, and political representatives how they create, share, cultivate, curate, and fact-check an ad-hoc infosphere operating mostly via social media and through smartphones. The transcripts of these interviews were unitized, open coded, and then axial coded into categories. This inductive process allowed important themes to emerge that illuminated issues about Molokai’s infosphere specifically but also about news deserts in general. Findings show that Molokai already is dried up in terms of legacy news but also that a new media ecosystem is emerging through social media that highlights a secondary succession of media, as 20th century forms give way to novel and new approaches to sharing news.

Mentor: Dr. Brett Oppegaard
The Role of Trophoblast Lat1 in the Regulation of Placental Function and Fetal Growth: Plasmid Construction and \textit{in vitro} Testing

Abnormal fetal growth affects approximately 15% of all babies and increases the risk of injuries during child birth as well as the child developing health complications later in life, such as obesity, type 2 diabetes, or cardiovascular disease. The goal of the project was to generate a Lat1 “knock-in” plasmid to be used to insert extra copies of the essential amino acid transport gene Lat1 into the genome of mice. The hypothesis was Lat1 knock-in results in an increase of Lat1 protein in the placenta which will lead to an increase in fetal growth and allows us to determine if Lat1 contributes mechanistically to irregular fetal growth. Besides the Lat1 transgene the plasmid contains an element that allows for the activation of the transgene to be initiated when tetracycline is introduced to the mouse as well as being under the control of the promoter \textit{Cyp 19I.1} that restricts the expression of the plasmid to the placenta. The functionality of the plasmid was assessed in placenta-derived cells \textit{in vitro} before making knock-in transgenic mice. The assessment of the plasmid was done by transfecting choriocarcinoma (BeWo) cells with the plasmid and extracting Lat1 RNA and protein. The Lat1 RNA was analyzed using quantitative PCR to confirm knock-in-initiated Lat1 upregulation in mRNA levels and the Lat1 protein upregulation was confirmed using Western Blot analysis.

Mentor: Johann Urschitz
Interviewing Zen Buddhists on the Mindful Attention Awareness Scale Validity

Mindfulness practice, an ancient Eastern tradition, has become popularized in the West. Mindfulness program evaluation requires valid measures in determining the degree of effectiveness in different populations. Currently many programs rely on mindfulness interventions evaluated by a battery of tests facing critique, such as Zen Buddhists questioning its ability to measure mindfulness and the lack of sample diversity during measurement development and validity studies. One highly cited—and thus highly criticized—measure is the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The author’s 15 years of rigorous and consistent Zen mindfulness practice served a vital part of the design. This study gathered qualitative data on Zen Buddhists’ perspectives on possible gaps and strengths of the MAAS using cognitive virtual interviews. Eight adult practitioners with at least ten years of Zen mindfulness experience in Hawai‘i and the U.S. Mainland were interviewed. Three overarching themes emerged: 1) Types of Conscious Mindful Awareness, 2) Awareness in Specific Circumstance, and 3) Positive and Negative MAAS Feedback. According to the Zen Buddhist participants, the MAAS’ ability to measure mindfulness is inconclusive, as it fails to capture various experiences of mindfulness mentioned in the results.

Mentor: Dr. Jane Onoye

Co-Authors: Aydyia Espinosa, Shannon Sanchez, Geneva Dela Cruz
Social-like Behavior and its Dietary Effect in Surface- and Cave-dwelling Populations of the Mexican Tetra

The dietary condition can affect the output of behaviors, including social behaviors. For example, ketosis inducing ketogenic diet can reduce food uptake, epileptic episodes, and hyperactivity, and also increase social activities in patients with autism, compared to typical diets. However, it is unclear whether subtle nutrient differences still affect the behavioral outputs, particularly between the typical lab fish diets. Our preliminary result implied that brine shrimp larvae (juvenile fish diet) could induce more social-like collective behaviors than the zebrafish standard diet (typical adult fish diet) did in our fish model. Our research hypothesis is then that the brine shrimp diet can induce more ketosis; therefore, social behavior than the zebrafish diet. We use a well-established comparative model, the Mexican tetra Astyanax mexicanus, consisting of the sighted riverine (surface fish) and blind cave-dwelling (cavefish) forms. Cavefish adapted to the dark and food-sparse environment and exhibit asociality, repetitive turning, adherence to a particular object, hyperactivity, and sleeplessness. In contrast, surface fish are typical without showing these behaviors. By applying the one-month treatments of brine shrimp or zebrafish diet on cave and surface fish, we tracked their collective behavior and measured their body weight, blood ketone and glucose. We have completed data collection and observed consistent results. We will share the latest analyzed data of them.

Mentor: Dr. Masato Yoshizawa

Co-Author: Motoko Iwashita
The Organization and Enzymology of the Flavonoid Biosynthetic Pathway in *Citrus Sinensis*

Flavonoids are important to many biological activities within plants, vegetables, and fruits. They are a class of secondary metabolites that even provide various health benefits to humans. The main objective of this research is to learn about the metabolic organization and enzymology of the flavonoid biosynthetic pathway to better understand its functions and applications. We later hope to expand on this objective and establish a relationship between these enzymatic activities and the biosynthetic genes of the *Citrus sinensis* (sweet orange). In order to achieve these objectives, we first extracted RNA from Citrus sinensis leaves to convert into cDNA by means of in vitro reverse transcription. After, a polymerase chain reaction (PCR) was conducted on the cDNA with utilization of key enzymes as primers from the flavonoid pathway: DFR, ANS, CHS2, CHI, F3H, FNS2, FLS1, CP3GT, and F3H. The products were visualized with gel electrophoresis, followed by a TOPO cloning reaction to insert our products into a vector that was transformed in *E. coli*. While we are still in the process of data collection and sequencing, we hope to see results through plate growth and successful vector cloning. When we are able to successfully transform the different glycosyltransferases into vectors, a yeast 2-hybrid system will be utilized for establishing protein interactions within the flavonoid biosynthesis pathway. From these processes, we aim to establish a map of interactions between the proteins to better understand and establish the enzyme complex.

Mentor: Dr. Daniel Owens

Co-Author: David Knittel, Brooke Suzuki
How can Intersectional & Multicultural Pedagogies Contribute to Hawaiʻi High School Students’ Self-awareness and School Belonging?

Diversity, Equity, Inclusion and Belonging (DEIB) is included in many Hawaiʻi independent school aims, though curricular implementation of multicultural and intersectional pedagogies remains at the periphery in comparison to western centric approaches. While a racial and socioeconomic divide remains between secondary public and private institutions, Hawaiʻi is widely regarded as a place of racial diversity, yet the majority of independent school students represent historically privileged groups. In a setting where ethnic inequality is largely unaddressed, how will students at independent institutions from both privileged and marginalized backgrounds develop social agency when their identities are overshadowed by romanticized ideals of racial harmony? Self-awareness and school belonging can be fostered when students actively participate in workshops and discussions with multicultural and intersectional frameworks, empowering reflection on lived experiences correlated to overarching systemic inequality. Forty-six high school students who attended the 2022 Hawaiʻi DEI Conference hosted by Shanti Alliance responded to ten questions centered on self-awareness, diversity, inclusion, and school belonging on a Likert’s scale. Survey responses found intersectional and multicultural pedagogies (initiated by the 2022 Hawaiʻi DEI Conference) pertinent to self-awareness and school belonging, and support the need for increased application of intersectional and multicultural pedagogies within formal school curriculum. Incorporating DEIB into school mission statements institutes acknowledgement of systemic inequality, and curricular implementation of intersectional and multicultural pedagogies achieves this aim in practice.

Mentor: Dr. Roderick Labrador
Development and Implementation of Autonomous Rover Surveying Sensor Suite

The field of autonomous navigation within robotics is a rapidly evolving sector, soon to play an increasingly important role in our daily lives. Over the past decade, significant increases in computing power and the affordability of modular sensors have enabled the development and implementation of autonomous navigation systems within consumer products, including but not limited to rescue robots and self-driving vehicles. On Mars, rovers can autonomously navigate and map previously unknown terrain with ease, gathering valuable knowledge of planetary surfaces. A significant challenge for autonomous systems involves maintaining an accurate estimate of a rover’s position over rough terrain. Current autonomous rover systems are highly complex, dependent on the platforms on which they are implemented.

Using a combination of proven methodologies including Simultaneous Localization and Mapping (SLAM), Visual-Inertial Odometry (VIO), Robot-centric Elevation Mapping, and sensor fusion, an accurate local and global position of a rover can be maintained over expansive distances. We designed, implemented, and simulated a scalable autonomous navigation stack integrated using the open-source Robot Operating System (ROS), to be used on a Mars-like six-wheeled rover, capable of obstacle detection, path planning, and waypoint navigation to specified Augmented Reality (AR) tags.

Mentor: Dr. Frances Zhu
Developing A Low Cost Fixed-Wing Unmanned Aerial Vehicle for Atmospheric Sensing

Within the earth and atmospheric science disciplines, there has been a consistent need for low-cost unmanned aerial vehicles (UAV) and their associated instrumentation. UAVs have the ability to facilitate both in-situ and remote sensing measurements in the lower atmosphere without the cost and complexity of manned aircraft. This design thesis tackles the challenge of creating a low-cost airframe that does not require significant experience to build, maintain, or operate. All materials needed to build the airframe are found at local hardware stores including expanded polystyrene, aluminum bar stock, and corrugated plastic. Five airframe designs were tested for their effectiveness given a number of set requirements including the ability to fly for 15 minutes of continuous flight, reach 30 kilometers per hour (kph) airspeed, and report usable temperature, pressure, and position data from an onboard suite of sensors. The final airframe design was found to be effective at flying at speeds between 5-45 kph with temperature, pressure, and position data continuously logged onto an onboard SD card. The final design is particularly effective because of its cost to operate, its ability to fly with a wide variety of sensors, and its effective range. The airframe is useful for earth and atmospheric science research purposes and provides new affordable opportunities for scientific measurement.

Mentor: Dr. Alison Nugent
Mottled Coloration of Encrusting *Montipora capitata* in Kailua Bay, O‘ahu, HI

Coral reefs harbor immense biodiversity and provide many benefits to coastal ecosystems and civilizations. The threats to these fragile biodiversity hotspots are many and costly, so we must monitor and protect them. One of the most mentioned threats to coral reefs today is climate change, particularly the warming and acidification of our oceans as it pertains to coral bleaching. Major bleaching events are typically observed seasonally (during warmer weather). However, the encrusting *Montipora capitata* corals in Kailua Bay, O‘ahu, HI have been observed exhibiting mottled bleaching even during the coolest times of the year.

This project takes the first step in monitoring these corals during the winter and spring, when they appear to still be bleaching contrary to our expectations. Pictures were taken of 5 specified colonies in a lawn-mowing pattern approximately once a month from November 2021 to March 2022. Six sets of photos were taken for each colony except colonies 2, 3, and 5 that each have five sets and colony 4 that has four sets. Each photo set was stitched together using Agisoft Metashape to create a three-dimensional model and an orthomosaic. The models from each date for each colony individually were compared to determine if and how the mottled bleaching changes in severity or surface area/location over time.

Although little to no change was observed in the severity and arrangement of bleaching of each colony, more research is necessary to identify the potential causes and future trajectory of this bleaching.

Mentor: Dr. Cynthia Hunter
Co-Author: Dr. Kuulei Rodgers
Determination of Soil Moisture Content Through Infrared Imagery

When a soil is exposed to radiation, the energy absorbed by the soil will cause the soil molecules to vibrate, which in turn will increase its temperature. The temperature of the soil can be easily measured with an infrared camera. Due to the difference in the thermal inertia of water and dry soil, infrared (IR) imagery can be utilized to determine the moisture content of a soil since drier soils tend to vibrate and heat up more than wetter soils. To accomplish this feat, a calibration curve must first be obtained by measuring the soil temperature at different water contents. Calibration curves were obtained for three different soils (ash, sand, and red soil). Each soil was placed into three identical tin containers with varying thickness and then placed in the oven at 105°C to dry. After an hour, the nine samples were placed in desiccators to cool down overnight. A temperature reading was collected the following day using a FLIR E8-XT IR camera. This process was repeated until the weight of the samples plateaued, signifying that the soils have completely dried out. The calibration curves (water moisture content (%) versus temperature (°F)) were then used to determine the moisture content of the same soil in the “field.” It was also used to study the effects of soil thickness on the accuracy of the moisture content prediction. If successful, this research can be beneficial to many fields including engineering, military, and agriculture.

Mentor: Dr. Phillip S.K. Ooi
An Examination of Marine Fungi's Ability to Degrade Plastic Pollution

Plastics are a prevalent and persistent pollutant in the marine environment. With plastic production continuing to increase, finding ways to break down the plastics in the ocean is of great importance. Several fungi have demonstrated potential in degrading various types of plastic. Since plastics are widespread in the oceans, we hypothesized that fungi isolated from the marine environment would demonstrate high success rates in degrading polyurethane (PU) and polyethylene (PE). To test this, visual degradation assays were performed by inoculating 1% PU-medium and ultra-high-density PE-medium plates with 68 unique cultured fungal strains. The area of clearance of the fungus was measured periodically, to determine a relative degradation rate. Of the 68 fungal strains, 41 demonstrated the ability to degrade PU. Reliably determining the areas of clearance on the PE plates was not viable, so liquid medium containing pieces of PE were inoculated with the 68 strains and possible degradation will be determined using IR methods. The 11 fastest PU degraders underwent experimental evolution through serial inoculations into liquid media with increasing concentrations of PU. The original and “evolved” fungi were then raced, but preliminary results suggest that the “evolved” fungi do not degrade PU faster, but further experiments are necessary. Additionally, interactions between the 7 fastest degraders were tested by inoculating one plate with two different fungi, so that every isolate was grown with every other isolate. Competitively dominant species were of special interest for future work. Marine fungi show promise in helping remediate our oceans of plastic pollution.

Mentor: Dr. Anthony Amend
Microbial Community Response to Contaminants of Emerging Concern in the Kāneʻohe Watershed

A survey on groundwater discharge flux within the Kāneʻohe Watershed found that its contributions equaled surface runoff, supporting the hypothesis that groundwater discharge contributes significantly to water quality in streams and the coastal ocean. This influence includes submarine groundwater discharge (SGD), which has been recently demonstrated to be a major source of Contaminants of Emerging Concern (CECs) to nearshore environments on Oʻahu. CECs can include pharmaceuticals, pesticides, or any other organic, anthropogenically-sourced compounds; their concentration can decrease through microbial processes. This project aims to observe how three CECs - Glyphosate, caffeine, and sulfamethoxazole - found in two streams within the Northern Kāneʻohe watershed, Kahaluʻu & ʻĀhuimanu, may interact with microbial community metabolism. I hypothesized that CEC concentrations will differ between streams according to onsite sewage disposal system (OSDS) density, CECs will be differentially attenuated along stream reaches in different areas of the watershed, and that water column microbial degradation would differ among upstream, downstream and estuarine habitats. I set out to study what areas in the stream system would have naturally occurring microbial taxa that are able to attenuate the studied CECs. In order to test whether CECs could be attenuated by natural aquatic microbial communities collected water samples had each of these contaminants added to them and then had additional samples collected from each treatment. Contaminant concentrations were then tracked along with microbial community density. These observations will help us understand the prevalence of CECs in this region and whether their concentrations can be attenuated through microbial interactions affecting their residence time.

Mentors: Dr. Craig Nelson, Dr. Henrietta Dulai
Uncovering the Jewels of Hawaiʻi’s Waters: An Assessment of Sapphirinid Copepod Biodiversity

Copepods are one of the most abundant multicellular animal groups on the planet. These microscopic crustaceans form the basis of most aquatic food webs, serving as the essential link between photosynthetic phytoplankton and larger, heterotrophic marine sea creatures. Sapphirinidae is a unique family of cyclopoid copepods found locally in Hawaiʻi, composed of three genera: *Copilia*, *Sapphirina*, and *Vettoria*. Copepods in this group are well known for their intensely iridescent cuticle, which gives their bodies a sapphire-like appearance.

Despite these copepods’ unique morphology and their importance to local ecosystems, comprehensive studies assessing sapphirinid diversity in Hawaiian waters have not been conducted. This research project had two primary goals: (1) assess and quantify the extent of Sapphirinidae copepod biodiversity in Māmala Bay using DNA barcoding techniques, and (2) create a taxonomic resource for identification of sapphirinid copepods found in Hawaiʻi. To achieve these objectives, monthly plankton tows were conducted from August 2021 to February 2022. Copepods from the family Sapphirinidae were sorted, counted, and photographed under a microscope. DNA barcoding results were correlated with microscope photos to create a photographic resource for identifying sapphirinid copepods in future studies. At least three distinct species groups have been identified in the bay, including *Sapphirina stellata*, *Sapphirina vorax*, and *Copilia mirabilis*. This project has established a “Rosetta Stone” for Hawaiian sapphirinid identification by synthesizing historic taxonomic keys, modern microscope images, and DNA barcodes, opening up the door for more extensive studies on this unique family of copepods.

Mentor: Dr. Megan L. Porter
Empowering Students Through Inclusive Mathematics Pedagogy

Many students in the U.S., especially girls, have a negative perception of mathematics. This negative outlook can continue throughout their lives and eventually into their decision to choose, or not choose, a career involving mathematics. Mathematics teachers at the secondary level have a large impact on their students’ success and perception of the subject. In this portfolio, I examine what mathematics anxiety looks like in the typical secondary math classroom, explore connections between math pedagogy and student mindset, and discuss strategies for secondary teachers to utilize to reduce math anxiety. The components of this portfolio include a compilation of strategies for reducing mathematics anxiety that I have collected through semi-structured interviews with women who have taught secondary mathematics, their stories and advice, and my own teaching philosophy. The first two components share stories of women from various backgrounds in their experiences as mathematics teachers. The stories feature their successes and struggles, along with those of their students, including classroom strategies for overcoming math anxiety, teaching equitably for all, and how to embolden students to feel empowered by math. These stories inspire my own teaching philosophy, which is included as the final component to support the notion that when mathematics is taught in an empowering and compassionate way, the results are overwhelmingly positive. Enacting changes in the secondary mathematics classroom, including utilizing mathematics anxiety-reducing strategies and sharing stories of success or struggle, can be extremely beneficial to encouraging more students, especially girls, to develop a positive self-efficacy toward mathematics.

Mentors: Dr. Seanyelle Yagi, Dr. Michelle Manes
The Role of Worry and Secondary Stressors on Maladaptive Grief Responses

Worry is a type of repetitive thought about the future that arises after loss which can cause poor adjustment to bereavement. People resort to worrying as an attempt to regain a sense of control and prevent future negative events during a time associated with increases in secondary-stressors. However, research on worry and its role in grief resolution is limited, and no studies have examined the moderating effect of secondary stressors on worry and maladaptive grief responses. The purpose of this study was to determine if worry predicts maladaptive grief responses and if secondary stressors and the unique secondary stressors of the COVID-19 pandemic will act as moderators in the strength of the relationship between worry and maladaptive grief responses.

Participants were 523 bereaved adults who completed questionnaires on worry, secondary stressors, post-traumatic stress disorder (PTSD), depression, and prolonged grief symptoms. Worry predicted grief over and above demographic and loss-related variables, depression, and PTSD. The moderation analyses showed that difficulties in daily life, pandemic stressors, and pandemic loneliness were moderators in the relation between worry and grief. Our results indicated that targeting worry and secondary stressors in treatment for grief responses is important, particularly during global crises like the COVID-19 pandemic where there is an increased likelihood of secondary stressors that can impede grief resolution.

Mentor: Dr. Anthony Papa
Hyperlipidemia and Bone Density in *Astyanax mexicanus* on the Ketogenic Diet

The ketogenic diet is rediscovered as a powerful and potentially life-saving tool that has applications to a wide range of health problems such as seizures and autism spectrum disorder (ASD). However, because the ketogenic diet contains high fat, it may result in frequent bone fractures or osteoporosis as known in human hyperlipidemia. In order to best analyze the side effects of the ketogenic diet, a model system of *Astyanax mexicanus* a Mexican tetra was used because they show many parallels in gene expressions, behavioral symptoms, and basic metabolisms with the patients with ASD. *Astyanax mexicanus* consists of two morphs within the species: a typical surface morph and ASD-comparable cave morph. These two morphs allow applying powerful comparative studies. Here, we compared the growth, blood metabolites, bone density, and social behavior under three dietary treatments: a high-fat diet (HFD), ketogenic diet, and control diet on both surface and cave morphs. First, we could repeat the former results under the six-week dietary treatment: the ketogenic diet promoted the social-like behavior in cavefish while the social-like behavior decayed under the control diet. We also repeated that the ketogenic diet reduced the growth in both surface and cavefish. We then newly found that HFD promoted the social-like behavior in cavefish at the comparable level as the ketogenic diet, while it induced the typical growth as the control diet. Both the ketogenic diet and HFD, however, suffered significant loss of bone minerals. We will present our updated results and, if possible, blood metabolites.

Mentor: Dr. Masato Yoshizawa
Validation of Defensive Activation Theory Using Circadian State-Dependent Visual Perception

The recently published defensive activation theory (Eagleman & Vaughn, 2021) proposes that dreaming and occipital stimulation is a defense mechanism for the visual cortex not to deteriorate during sleep. The brain operates on a ‘use it or lose it’ principle. For this to work, the brain relies on cortical plasticity, the action of ‘rewiring’ neurons in the brain for new uses (Kolb, 2017). Eagleman and Vaughn attribute REM sleep and dreaming to preventing cortical plasticity from affecting the visual cortex during inactive periods (e.g., sleep). Their original study used generalized REM sleep data from 25 different primate species. To gain further clarity on these mechanisms, this project used a visual search paradigm and human REM sleep data to gain specific insight on plasticity prevention in an individual’s visual cortex. The visual search paradigm allowed both accuracy and reaction time data to be measured which was then correlated with the REM sleep data from each participant to determine the impact of REM sleep percentages on occipital cortex preparedness. Preliminary results indicate a significant increase in reaction times in individuals that received more REM sleep than individuals that received less. These findings support the hypothesis that individuals with higher percentages of REM sleep are less susceptible to cortical takeover efforts that occur during sleep. The results of this experiment not only support the defensive activation theory but also shed light on the importance of REM sleep and dreaming.

Mentor: Dr. Jonas Vibell
Genome Size Estimation for a Threatened Endemic Flora

Genome size of flowering plants varies, with some plant genomes being 50 times larger than the human genome. While genome size evolution can be associated with the evolution of key traits and adaptations, genome size estimates in the Hawaiian flora are limited. Here, we estimated Hawaiian plant genome sizes through flow cytometry, a technique that allows us to measure the physical size of a plant genome via fluorescence of stained DNA. Using improved methods, we resampled species studied from a summer 2021 study. Major improved methods include adjustments of how much propidium iodide dye we are using, as well as changing the way we run samples through the flow cytometer. Data analysis methods have also been improved through the use of a new program. Our new data provides a basis for future genomic studies of Hawaiian plants, since such studies require a basic knowledge of the plant genome and its size. The data also serves as a source of comparison to learn more about how Hawaiian species’ genomes have changed compared to their non Hawaiian relatives. Future work will include chromosome counts of the same sampled plants through the squashing and staining of plant root tips to better understand ploidy.

Mentor: Dr. Karolina Heyduk
1980s Taiwan: Democratic Reforms, the AIDS Pandemic, and Sexual Morality

The 1980s was a particularly tumultuous time for Taiwan, both in regard to its waning geopolitical position in the world and its increasingly unstable internal political dynamics. Instability within Taiwanese society coincided with the first confirmed case of community transmission of HIV was in 1985, and with crackdowns on several nightclubs and parks frequented by gay males. The explosion in media coverage of both the ensuing AIDS pandemic and the queer community at large points to a society that is increasingly trying to grapple with a nation they perceive to be denegrating. This is reflected in the increase in the increasing clinicalization of homosexuality, increased interest in understanding the queer community, and the labeling of the AIDS pandemic and homosexuality as a foreign-born virus.

In this paper, I will utilize primary sources from the 1980s that covered the AIDS pandemic and crackdowns on areas frequented by gay males to contribute to our existing understanding of the geopolitical and social landscape of Taiwan at the time. The sources I will be using will be primarily newspaper articles covering both the ensuing AIDS pandemic and Chi’s activism, and I will be utilizing primarily English language sources, and Chinese language sources language skills permitting. In terms of content, I will attempt to connect the sources’ discussion of sexual morality as it relates to issues of national identity and questions of governance and democracy. I will further contextualize my findings with similar scholarship on the relationship between sexual morality, surveillance, and national identity as seen in other Sinophone spaces, such as the comparison of China’s views towards homosexuality during the republican and dynastic eras.

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