Undergraduate Research and Creative Work

4 May 2018 – 8:30am to 2:30pm
Sakamaki Hall
Campus Center Ballroom
Honolulu, Hawai‘i
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<thead>
<tr>
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<th>ACTIVITY</th>
<th>LOCATION</th>
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<tr>
<td>8:30-9:00a</td>
<td>Registration and Breakfast</td>
<td>Sakamaki First Floor</td>
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<tr>
<td>9:05-9:10a</td>
<td>Opening Ceremony</td>
<td>Sakamaki First Floor</td>
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<tr>
<td>9:15-10:05a</td>
<td>Oral Presentations Session One</td>
<td>Breakout Rooms</td>
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<tr>
<td>10:05-10:15a</td>
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<tr>
<td>10:15-11:20a</td>
<td>Oral Presentations Session Two</td>
<td>Breakout Rooms</td>
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<tr>
<td>11:20-11:30a</td>
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<td>Courtyard</td>
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<tr>
<td>11:30a-12:20p</td>
<td>Oral Presentations Session Three</td>
<td>Breakout Rooms</td>
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<tr>
<td>12:30-1:30p</td>
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<td>1:30-2:30p</td>
<td>Poster Presentations Session</td>
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## LOCATION

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<tbody>
<tr>
<td><strong>Sakamaki Hall</strong></td>
<td>Oral Presentations Session One</td>
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<tr>
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<table>
<thead>
<tr>
<th>Room code</th>
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<tbody>
<tr>
<td>A101</td>
<td>Natural Sciences</td>
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<td>A102</td>
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<tr>
<td>A103</td>
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<tr>
<td>A104</td>
<td>Natural Sciences</td>
</tr>
<tr>
<td>B102</td>
<td>Arts &amp; Humanities – Creative and Research</td>
</tr>
<tr>
<td>B103</td>
<td>Social Sciences</td>
</tr>
<tr>
<td>C101</td>
<td>Engineering &amp; Computer Sciences</td>
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<tr>
<td>Sakamaki A101</td>
<td>Natural Sciences</td>
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<tr>
<td>Lauren Ho, Erica Shin</td>
<td>Identifying the 3-dimensional Structure and Gene Expression in the Visual System of the Copepod <em>Labidocera madurae</em></td>
<td></td>
</tr>
<tr>
<td>Leina’ala Cuevas</td>
<td>Directed Molecular Evolution of <em>PiggyBac</em> Transposase</td>
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<tr>
<td>Boonyanudh Jiyarom</td>
<td>Strain Specific Differences in Virus Replication and Host Innate Immune Response Induced by Zika Virus in Primary Human Sertoli Cells and Human Testicular Organoids</td>
<td></td>
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<tr>
<td>Sakamaki A102</td>
<td>Natural Sciences</td>
<td></td>
</tr>
<tr>
<td>Stephanie Bell, Madelyn Rangel</td>
<td>The Effects of Anthropogenic Noise on Coral Health</td>
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<tr>
<td>Yuuki Niimi</td>
<td>Vertical Structure of the Mesopelagic Micronekton Community in the Central Equatorial Pacific Ocean</td>
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<tr>
<td>Mariah Opalek</td>
<td>The Differential Effects of <em>Symbiodinium</em> Type, Coral Color and Light Intensity on Growth in the Coral Species, <em>Montipora capitata</em></td>
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<tr>
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<tr>
<td>Sakamaki A103</td>
<td>Natural Sciences</td>
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<tr>
<td>Ma Carmela Therese Anagaran</td>
<td>Characterization of Mutant HIF1 Transgenic Mouse Line</td>
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<td>Lynn Nguyen*</td>
<td>The ORC4 Protein: The ORC4 Cage Function in Erythroblast Enucleation</td>
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<td>Sakamaki A104</td>
<td>Natural Sciences</td>
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<tr>
<td>Nathan Saxby</td>
<td>Pilot Study to Determine the Glycemic Response of Okinawan Sweet Potato</td>
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<tr>
<td>Jimmy Nguyen</td>
<td>The Effect of Reduced Circadian Rhythm on the Foraging Behavior of Blind Cavefish and Eyed Surface Fish</td>
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* next to name indicates student is also presenting a poster on the same project
Sakamaki B102  Arts & Humanities – Research & Creative

Lana Lobato  A Comparison of Rhythm in English Speakers from Hawai‘i and California
Aljader*

Spencer Oshita  Our “Constitutional Constellation”: The “Fixed Star” of Religion Jurisprudence in the United States

Krista Whang  “Midnight Dreams”

Sakamaki B103  Social Sciences

Shelby Dolim*  The Relationship Between Quality of Life and Religion in People with Schizophrenia in Hawaii

Vila L. Chanthasouvanh*  Hepatitis A Vaccination Among College Students in Hawai‘i: An Empirical Research Survey

Rebecca Bootes*  Shoelaces, Sharks, and Snap Peas: The Impact of Intentional Teaching Strategies on Student Achievement

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**Oral Presentations Session One**  
9:15 - 10:05a

<table>
<thead>
<tr>
<th>Room</th>
<th>Discipline</th>
<th>Presenters</th>
<th>Titles</th>
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<tbody>
<tr>
<td><strong>Sakamaki C101</strong></td>
<td>Engineering &amp; Computer Sciences</td>
<td>Kari Noe*</td>
<td>Virtual Reality and Visualization in Research and Cultural Preservation</td>
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<tr>
<td></td>
<td></td>
<td>Tommy Lam</td>
<td>Construction of Charge Focusing Lens for Time Projection Chamber</td>
</tr>
<tr>
<td><strong>Sakamaki C102</strong></td>
<td>Engineering &amp; Computer Sciences</td>
<td>Elise Chong, Mari Ogino</td>
<td>Early Detection of Urinary Tract Infections Using Novel Biomarker Indicators in Diapers</td>
</tr>
<tr>
<td></td>
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<td>Juanito Moises, Jr.</td>
<td>Effects of Raw Materials on Fresh and Hardened Properties of Geopolymer Concrete</td>
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<tr>
<td></td>
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<td>Joseph Christian B. Peralta</td>
<td>Designing of Landing Trajectories Using Forward and Backward Propagations</td>
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<table>
<thead>
<tr>
<th>Session</th>
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<tbody>
<tr>
<td>Oral Two</td>
<td>Production of Monoclonal Antibody Against MARV Nucleoprotein</td>
<td>Alex McLaury</td>
</tr>
<tr>
<td></td>
<td>Selenoprotein K Modulates Diverse Calcium Signaling Pathways in the Human Melanoma Cells</td>
<td>Katie Lee</td>
</tr>
<tr>
<td></td>
<td>Urine Cytology and UroVysion Fluorescence in Situ Hybridization of Renal Cell Carcinoma</td>
<td>ZoeAnn Kon</td>
</tr>
<tr>
<td></td>
<td>Elucidating the Function of Species-specific Active Site Residues in DAPA Synthase from Biotin Biosynthesis</td>
<td>Casie Kubota</td>
</tr>
<tr>
<td>Oral One</td>
<td>Assessing the down-fjord mechanistic relationships of biodiversity and abundance of Antarctic benthic macrofauna of Andvord Bay</td>
<td>McKenna Lewis</td>
</tr>
<tr>
<td></td>
<td>Experimentally Evolving a Virus to Test Evolutionary Models</td>
<td>Maya Shaulsky</td>
</tr>
<tr>
<td></td>
<td>Relationship Between Morphological Traits, Water Depths, and Foraging Behavior of the Hawaiian Stilt (<em>Himantopus mexicanus knudseni</em>)</td>
<td>Melissa Jones*</td>
</tr>
</tbody>
</table>

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## Oral Presentations Session Two

10:15 - 11:20a

<table>
<thead>
<tr>
<th>Room</th>
<th>Natural Sciences</th>
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<tbody>
<tr>
<td>Sakamaki A103</td>
<td>Characterization of Luciferase and Opsin Genes in the Bioluminescent Copepod genus, <em>Pleuromamma</em></td>
</tr>
<tr>
<td>Jessica WT Chen*</td>
<td>Placenta Specific Upregulation of the Glucose Transporter Glut1: Plasmid Construction and <em>in vitro</em> testing</td>
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<tr>
<td>Lance Gregory A Nunes*</td>
<td>The Role of TEL2, an mTOR Stabilizing Protein, on the Cell Survival of Cardiomyocytes Against Ischemic Stimuli</td>
</tr>
<tr>
<td>Sharon Wong</td>
<td>Lipofibroblast Specific Transcription Factor Required for Lung Alveolar Development</td>
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<tr>
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<tbody>
<tr>
<td>Sakamaki A104</td>
<td>New Model for Protein Misfolding and Aggregation</td>
</tr>
<tr>
<td>Bailey Carlson</td>
<td>Biogeographic History of <em>Echinometra mathaei</em> in the Indo-Pacific</td>
</tr>
<tr>
<td>Katie Lund</td>
<td>The Fungal Life Aquatic: Diversity of Marine Fungal Communities</td>
</tr>
<tr>
<td>Aiko Murakami</td>
<td>Biochemical Characterization of the Potential Parkinson’s Disease Protein Endophilin A1</td>
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* next to name in schedule indicates student is also presenting a poster
Oral Presentations Session Two  
10:15 - 11:20a

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<th>Sakamaki B102</th>
<th>Arts &amp; Humanities – Research</th>
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<tbody>
<tr>
<td>Jessica Burden</td>
<td>Iron Age Scythian Women and Warfare: The “Real” Amazons Warriors?</td>
</tr>
<tr>
<td>Spencer Oshita</td>
<td>The Historians’ Oxymoron: Tragedy Discourse in Cold War Historiography</td>
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<tr>
<td>Aaron Katzeman</td>
<td>Site as System: Local to Global Ecologies</td>
</tr>
<tr>
<td>Ilana Rachel Buffenstein</td>
<td>Humor as Resistance: Understanding Issa Rae’s <em>Insecure</em> as Post-Soul Satire</td>
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<table>
<thead>
<tr>
<th>Sakamaki B103</th>
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<tbody>
<tr>
<td>Keahonui Kam</td>
<td>The 21st Century Belongs to China</td>
</tr>
<tr>
<td>Caira Sato</td>
<td>Hula in Japan</td>
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<tr>
<td>Kaelyn Schenkenberger</td>
<td>Colonialism and its Biological Effects in the Mariana Islands and Adjacent Locals</td>
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Oral Presentations Session Two
10:15 - 11:20a

**Sakamaki C101**

**Engineering & Computer Sciences**

Kalani Danas Rivera, Eliesse Hihara, Austin Morishita, Reyn Mukai, Keola Wong

Gowoon Jung, Marissa Kuwabara, Sara Lin, Kacie Niimoto

Jennice April Bautista, Geena Noelani Wann-Kung, Heather Situ, Leland Kealohikaimana Machii

**Sakamaki C102**

**Engineering & Computer Sciences**

James Cuenca, Raina Duenas, Ashley Kahl, Dayton Lee, Rommel Limjap, Andrew Obiano, William Segall, Travis Shimizu, Nicholas Sumera

Aricia Argyris, Michael Huang, Kai Jones, Andrew Nguyen, Johnny Pham, Ryan Roque

Brock Asato, Jeri Goodin, Design, Manufacture, and Deploy an In-Cody Kinimaka, Ryan Water Coral Nursery Mickelsen, Sharyse Nadamoto, Cheyne Taum, Jeffrey Zheng
### Oral Presentations Session Three
**11:30a - 12:20p**

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<th>Division</th>
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</thead>
<tbody>
<tr>
<td>Sakamaki A101</td>
<td>Natural Sciences</td>
<td>Investigating Zika Virus Infection Kinetics in Primary Human Leydig Cells by Maile Amine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Randomized Double-blinded Placebo-controlled Trial Comparing Blood Pressure with and without Oxytocin Use During Dilation and Evacuation Procedures at 18-24 Weeks Gestation by Clare-Marie Anderson</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Effects of Foliar Fungal Endophytes against <em>Austropuccinia psidii</em> on <em>Eugenia koolaensis</em> by Benjamin K. Hoyt</td>
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<tbody>
<tr>
<td>Sakamaki A102</td>
<td>Natural Sciences</td>
<td>Sea Level Rise Triggering Widespread Coastal Hardening and Environmental Destruction on Hawaiian Shores by Kammie Tavares</td>
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<td></td>
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<td>Thermal Pretreatment of Food Waste and Wastewater Sludge for Enhanced Biogas Production by Kacie T. M. Niimoto</td>
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<td></td>
<td>Native and Non-Native Plant Diversity Along an Elevational Gradient in a Hawaiian Montane Wet Forest by Kūpaʻa Luat-Hūʻeu</td>
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Sakamaki A103  Natural Sciences

Emily Erika Acoba  Evaluating *Bordetella pertussis*-Specific Antibody Secreting Cells

Miranda Yip  Characterization and Positional Cloning of the Maize Mutant *Hairy Sheath Frayed2* (*Hsf2*)

Kiana Lee  Role of Fractones in the Extracellular Matrix of a Mammalian Disease Model

Sakamaki B102  Arts & Humanities – Research & Creative

Kevin Harrison  The Satiric Tragedy of *Doctor Faustus*

Spencer Oshita  In Truth We Trust

Margo Steines  Brutalities  

*CONTENT WARNING: contains readings and images of sexuality [S/M], violence, and animal slaughter*
### Oral Presentations Session Three

**11:30a - 12:20p**

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<td>Sakamaki B103</td>
<td><strong>Social Sciences</strong></td>
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<tr>
<td></td>
<td>Lauren Kirkwood</td>
<td>Can We Decipher True vs. False? Psychophysiological Responses to True and False News Headlines Seen on Social Media</td>
</tr>
<tr>
<td></td>
<td>Kayla Soma Tsutsuse</td>
<td>Anxiety and Attention: How Attention Can Be Modulated</td>
</tr>
<tr>
<td></td>
<td>Kathleen Corpuz</td>
<td>Assessing Current Tobacco, Electronic Smoking Devices and Vape Use Among Filipinos in Hawai‘i</td>
</tr>
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<td>Sakamaki C101</td>
<td><strong>Engineering &amp; Computer Sciences</strong></td>
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<tr>
<td></td>
<td>Kevin Cho, Jaimie Obatake</td>
<td>Analysis, Distribution, and Visualization of Weather Data for Sustainability Applications</td>
</tr>
<tr>
<td></td>
<td>Matthew Siegel, Matsu Thornton</td>
<td>Developing Residential Direct Load Control for Residential Water Heater Demand Response</td>
</tr>
<tr>
<td></td>
<td>Deanne Durango, Lee Ann Cauilan, Wade Yoshida, Yaxin Tao</td>
<td>Engaged Development: Using Cognitive Neuroscience to Develop Self-Service IoT Analytics Applications</td>
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Poster Presentations  
1:30p - 2:30p - Campus Center Ballroom

Arts & Humanities

Lana Lobato Aljader  A Comparison of Rhythm in English Speakers from Hawai‘i and California

Engineering & Computer Sciences

Kari Noe  Virtual Reality and Visualization in Research and Cultural Preservation
# Poster Presentations

1:30p - 2:30p - Campus Center Ballroom

## Natural Sciences

<table>
<thead>
<tr>
<th>Speaker</th>
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<tbody>
<tr>
<td>Jessica WT Chen</td>
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# Poster Presentations

**1:30p - 2:30p - Campus Center Ballroom**

## Social Sciences

<table>
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<tr>
<th>Presenter</th>
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<tbody>
<tr>
<td>Rebecca Bootes</td>
<td>Shoelaces, Sharks, and Snap Peas: The Impact of Intentional Teaching Strategies on Student Achievement</td>
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<tr>
<td>Vila L. Chanthasouvanh</td>
<td>Hepatitis A Vaccination Among College Students in Hawai‘i: An Empirical Research Survey</td>
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<tr>
<td>Shelby Dolim</td>
<td>The Relationship Between Quality of Life and Religion in People with Schizophrenia in Hawaii</td>
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</table>
Abstracts of oral and poster presentations are listed in alphabetical order of presenter’s last name. Information below the name includes the student’s major, the category of their presentation, and time/location of presentation. The faculty mentor, if appropriate, is listed below the abstract.

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

**Aricia Argyris**, Michael Huang, Kai Jones, Andrew Nguyen, Johnny Pham, Ryan Roque  
**Brock Asato**, Jeri Goodin, Cody Kinimaka, Ryan Mickelsen, Sharyse Nadamoto, Cheyne Taum, Jeffrey Zheng  
**Jennice April Bautista**, Geena Noelani Wann-Kung, Heather Situ, Leland Kealohikaimana Machii  
**Stephanie Bell**, Madelyn Rangel  
**Kevin Cho**, Jaimie Obatake  
**Elise Chong**, Mari Ogino  
**James Cuenca**, Raina Duenas, Ashley Kahl, Dayton Lee, Rommel Limjap, Andrew Obiano, William Segall, Travis Shimizu, Nicholas Sumera  
**Kalani Danas Rivera**, Eliesse Hihara, Austin Morishita, Reyn Mukai, Keola Wong  
**Lee Ann Cauilan**, Deanne Durango, Wade Yoshida, Yaxin Tao  
**Gowoon Jung**, Marissa Kuwabara, Sara Lin, Kacie Niimoto  
**Matthew Siegel**, Matsu Thornton

Abstracts are direct from presenters; wording and content are the author’s responsibility.
Evaluating *Bordetella pertussis*-Specific Antibody Secreting Cells

*Bordetella pertussis* is the cause of whooping cough associated with high-pitched coughing fits, exhaustion, vomiting, and even death in infants. Despite national vaccine coverage, the US is in danger of a reemergence of pertussis because antibody levels to the acellular pertussis vaccine, DTaP, rapidly wane after vaccination. This may be due to the inability of acellular pertussis antigens to generate long-lasting immune memory. The antigens present in the vaccine include pertussis toxin (PT), pertactin (PRN), filamentous hemagglutinin (FHA), and fimbriae (FIM). The purpose of this study is to evaluate the frequency of circulating pertussis antigen-specific B cells in vaccinated individuals. Human peripheral blood mononuclear cells (PBMCs) and tonsil mononuclear cells (TMCs) were obtained from volunteers vaccinated with DTaP and/or recently boosted with Tdap. To determine the frequency of pertussis antigen-specific B cells, cell cultures were stimulated with combinations of TLR ligands CpG (TLR9), R848 (TLR7) and the cytokine IL-2. Pertussis antigen-specific IgG ELISpot assays were performed on polyvinylidene difluoride plates coated with PT, PRN, or FHA and the frequency of pertussis-specific antibody secreting cells (ASCs) was measured. Polyclonal stimulation with CpG + IL-2 and R848 + IL-2 induced the most ASCs as compared to R848 or CpG alone. Variable frequencies of pertussis-specific ASCs were detected per individual. Most ASCs were specific to FHA and PT. Future studies will include stimulating PBMCs and TMCs with TLR ligands and pertussis antigens to see if TLR ligands can enhance pertussis antigen-specific ASCs and thus may be effective adjuvants to include in TdaP boosters.

Mentor: Dr. Sandra Chang

Co-Author: Jourdan Posner
Investigating Zika Virus Infection Kinetics in Primary Human Leydig Cells

Zika virus (ZIKV) belongs to the *Flaviviridae* family and is an enveloped, positive-sense, single stranded RNA virus. The most recent outbreak of ZIKV resulted in 40,000 ZIKV cases in the United States. The sexual transmission of ZIKV even months after clearance of virus from other parts of the body suggests that ZIKV can modulate the immune environment in the testes to establish persistent infection in the seminiferous tubule compartment. Sertoli cells are the primary cells of seminiferous tubules that nurture and provide support to germ cells. The interstitial space between the tubules has Leydig cells (LC) that produce testosterone. The objective of this study was to investigate the replication kinetics of ZIKV in human LC. We infected Leydig cells with ZIKV at multiplicity of infection (MOI) of 1 and 5 and measured replication of the virus in the supernatant and cell lysate at different time points post infection. RNA was extracted to determine changes in gene expression of host antiviral molecules by qRT-PCR. Plaque assay and qRT-PCR confirmed productive infection of ZIKV with peak virus titers at 96 hours post infection. ZIKV did not induce any cytotoxicity in Leydig cells, however ZIKV did not significantly affect the gene expression of enzymes required for testosterone production. This study provides first evidence that Leydig cells can support ZIKV infection, however the robustness of the infection is much lower as compared to Sertoli cells. Leydig cells may act as a reservoir for virus in the interstitial space.

Mentor: Dr. Saguna Verma
Characterization of Mutant HIF1 Transgenic Mouse Line

Hypoxia-inducible factor 1 (HIF1), a transcription factor, regulates the expression of target genes as a physiological response to hypoxic, low-oxygen level environments. HIF1 acts as a dimer, composed of HIF1α and HIF1β subunits, that binds to hypoxia-response elements (HREs) to promote transcription. Several diseases including myocardial infarction, stroke, and cancer utilize hypoxic pathways. A new strain of transgenic mice has been generated to study the role of HIF1 in hypoxia-associated diseases, expressing a mutated HIF1α transgene, notated as HIF1α-PPN. The PPN mutation replaces two proline and one asparagine residue, which are normally hydroxylated, with alanine residues that allow HIF1a to remain active. Transgene expression is controlled by a tetracycline inducible system under the human elongation factor promoter (EF1α) believed to be expressed in all cells. The goal of this study was to confirm HIF1α-PPN expression in various organs of these transgenic mice. Expression of the transgene was induced with doxycycline water for 3 or 14 days in cages of HIF1α-PPN mice and tissue from multiple organs were harvested. From these samples, RNA was isolated and used for reverse transcription to produce cDNA for transgene expression evaluation by PCR. Western blotting was also used to visualize the HIF1α-PPN protein on 14 day mice. Contrary to our original hypothesis, we found that RNA and protein for the HIF1α-PPN transgene were only expressed in the testes. Hypoxia is known to affect spermatogenesis. Based on our results, these mice can be used to study the role of HIF1 in spermatogenesis.

Mentor: Dr. Ralph Shohet

Co-Authors: Allison Williams, Abigail Avelar
A Randomized Double-blinded Placebo-controlled Trial Comparing Blood Pressure with and without Oxytocin Use During Dilation and Evacuation Procedures at 18-24 Weeks Gestation

Oxytocin is a neurohormone that is routinely administered to patients during dilation and evacuation (D&E) procedures to control bleeding despite minimal existing evidence in support of this common practice. In this study, we seek to evaluate oxytocin’s effect on a clinical marker of blood loss, blood pressure, in patients undergoing D&E at 18-24 weeks gestation. Participants were randomized to receive an IV fluid bolus of either 20-units of Pitocin® (synthetic oxytocin) or 500 mL of saline during the procedure. Blood pressure measurements were recorded before medication provision, at the time of medication provision, and after medication provision in five minute increments until the end of the procedure. Although there was no statistical difference in blood pressures between the Pitocin and placebo treatments, participants who were hypotensive five minutes after medication provision were two times as likely to have received Pitocin than the placebo. Thus, these results have significant clinical implications, as oxytocin’s transient hypotensive effects may complicate the physician’s interpretation of blood loss during surgery. This is the first randomized placebo-controlled trial evaluating the effects of oxytocin on blood pressure during D&E. Our findings indicate that future research into the hypotensive effects of oxytocin is warranted.

Mentor: Dr. Bliss Kaneshiro
Development of an Autonomous Surface Vehicle to Assist in the Monitoring of Ordnance Reef

Ordnance Reef, an area within Pokai Bay off the coast of Waianae on Oahu, Hawaii, contains ocean current, salinity, and chemical composition sensors that monitor unexploded military munitions on the ocean floor. Servicing these sensors is costly and dangerous. Maritime robotic vehicles designed to service these sensors will reduce the cost and risk of monitoring these munitions. An autonomous surface vehicle (ASV) with a remotely operated underwater vehicle (ROV) can be used to accomplish this task. This research describes the development of a proof-of-concept launch and recovery system for the Blue Robotics BlueROV2 off of the Wave Adaptive Modular Vessel (WAM-V) platform. The WAM-V is propelled by four thrusters, one at each corner of the vessel in a holonomic drive configuration, which enables the ASV to transverse sideways for greater position control. To integrate the ROV and ASV, an automated cable management system was developed to keep the ROV tether clear of the ASV’s thrusters. The automated cable management system consists of a servo powered spool and a scissor arm. The spool accommodates 100 meters of cable and can reel in the full distance in around five minutes. Actuated friction rollers are used to manage the cable slack above water. The scissor arm, capable of supporting a 130 newton load, can extend the cable origin one meter under water below the thrusters. The results of this project will help extend the capabilities of the WAM-V for future applications, research, and development.

Mentor: Dr. A Zachary Trimble
Design, Manufacture, and Deploy an In-Water Coral Nursery

Since 2014, different environmental and human-made factors have posed serious threats to the survival of coral colonies around the world, resulting in a decline of healthy coral populations. There have been many small-scale coral reef restoration structures developed, but there are no large-scale nurseries suited for larger coral heads averaging at two feet in diameter. Therefore, the goal for this project is to design and fabricate a large-scale coral nursery that will be assembled and deployed in an area consisting of a hard unleveled seafloor surface.

The final design for the coral nursery consists of four major components, Fiber Reinforced Plastic (FRP) grating, custom Polyvinyl Chloride (PVC) pegs, adjustable FRP legs, and a custom FRP X-shaped foot for each leg. A 4x4 foot grating is supported by four adjustable legs to create a single module. The entire nursery consists of nine modules, totaling at 144 square feet of usable surface to place coral. The PVC pegs will help unbalanced coral from tipping over while resting on the structure.

This project is the first of its kind and will help improve coral rehabilitation efforts for years to come. This structure will allow for coral to continue to grow in a safe environment with the intent that it will later be placed in an area where it will be able to grow into a beautiful coral reef on its own. If shown to be successful after five years, this coral nursery can be used outside Hawaii to help rebuild coral reefs worldwide.

Mentor: Dr. Bardia Konh
Development of a Cost Effective IoT Modular Hydroponics System

Hydroponics employs soil-less methods that integrate three necessities - nutrients, oxygen, and water - to grow plants. Compared to conventional farming, hydroponics have been shown to yield higher quantities of crops while consuming less land and water. While solutions already exist to monitor and adjust parameters of hydroponic systems, many of them are expensive and do not allow the user to control the systems remotely. The purpose of this project is to create a manageable, easy-to-use, cost-effective Internet-connected master greenhouse controller and associated modular actuators and sensors that will optimize production. Collected data can be used to further test and change control conditions that could affect crop yield, taste, and quality. The system includes a main controller and modular units comprised of a single board computer and microcontroller, each integrated with different sensors. Sensor data was collected and then sent via wireless network to our SQL database. The main controller receives the sensor data through a Message Queuing Telemetry Transport Protocol (MQTT) Broker and displays all sensor data on a graphical user interface (GUI) for monitoring and control of the system. These electrical components were then enclosed and mounted to the overall housing of the system. Parameters such as energy, water usage, pH, CO$_2$ levels, nutrients, and lighting were finally monitored to determine the success of the endeavor.

Mentor: Dr. Reza Ghorbani
The Effects of Anthropogenic Noise on Coral Health

Underwater anthropogenic noise is a growing concern. Coral ecosystems are keystone habitats and corals are currently under major stresses worldwide. In this study we seek to investigate the relationship between underwater anthropogenic noise and coral health. We hypothesized that there will be a relationship between anthropogenic underwater noise and coral health. We investigated this with a dosage response test in which 240 microfragments of 3 different coral species (Montipora capitata, Pocillopora damicornis and Porites compressa), with plating and branching genotypes for Montipora, were exposed to varying frequencies of underwater noise. Treatments were as follows: high (50 kHz), medium (10 kHz) and low (1 kHz), a control group exposed to no sound and a final treatment which received all three frequencies. Corals were exposed to sounds once every two weeks and growth rates and other coral health indicators were measured photographically throughout the experiment. All data was then quantified and statistically analyzed. Our results are still in progress.

Mentors: Dr. Robert Toonen, Dr. Zac Forsman, Dr. Aude Pacini
Shoelaces, Sharks, and Snap Peas: The Impact of Intentional Teaching Strategies on Student Achievement

The classroom environment is one of the most important factors relating to student achievement. The purpose of this work is to examine the important role that the environment plays in the education and development of elementary aged children. My goal is to better understand how a caring classroom environment—one established with mutual respect and trust, where students take responsibility, share control and ownership—and sense of community can contribute to meaningful learning experiences.

I implement intentional teaching strategies in my work with kindergarten students at Linapuni Elementary. I have looked at key characteristics of a caring classroom community and the effects this kind of community has on the academic and personal development of young children. These characteristics include the environment in which the learning takes place, the type of relationship that exists between the student and teacher, the levels of engagement with the curriculum being taught, and the teacher’s recognition of the knowledge that students bring to the classroom.

This work will also serve as a road map of my own professional growth through research, observation and the development of a personal teaching philosophy. Ultimately this portfolio will serve as a testament to my dedication to improving the field of education, documenting my learning on my journey to becoming a certified early childhood and elementary teacher. With this portfolio, I challenge teachers to see the potential of all students, to understand the power of optimism in our work with children, to recognize that academic success is tied to the personal relationships we create in the classroom.

Mentors: Jane Dickson Iijima, Dr. Rayna Fujii
Humor as Resistance: Understanding Issa Rae’s *Insecure* as Post-Soul Satire

As a self-described “awkward black girl,” Issa Rae’s distinctly witty voice shines through in her early web series *The Misadventures of Awkward Black Girl*; however, less critical work has been done on her landmark new HBO series, *Insecure*, which she writes and co-stars in. I argue that Season 1 of *Insecure* may be interpreted as post-soul satire, due to its use of both externalized Juvenalian and internalized Horatian satire, its blurring of racial boundaries, and its rejection of black Civil Rights era essentialism and uplift in favor of playful, apolitical performativity. My materials included season 1 of *Insecure*. My methods were watching the episodes; selecting and summarizing key scenes from the script; and weaving elements of modern social science and interviews into my analysis of humor as a mode of resistance. My critical methodologies included intersectional feminism, critical race theory, conflict theory, and humor theory. The last of these methodologies, which formed the foundation of the whole project, included relief, superiority, and incongruity theory; Juvenalian/Horatian, post-soul, hip-hop, and embodied/disembodied satire; “charged,” slave, urban, and African American humor; and situational comedy. My conclusion is that *Insecure* features a grounded, realistic, and refined sense of humor with universal appeal, and rejects racial authenticity in favor of racial sincerity.

Mentor: Dr. James Caron
Iron Age Scythian Women and Warfare: The “Real” Amazons Warriors?

The Greeks of antiquity spoke extensively of race of warrior women known as the Amazons. These women were recorded as having close ties to Iron Age Scythia, a region populated by pastoral nomads and known as the western Eurasian steppe north of the Black Sea. Archaeological investigation into the area has shown that female burials included a wide range of weapons, such as spear heads, swords, bows, and arrows. There exists skepticism in academia about the extent to which these weapons are indicators of actual participation in warfare. This thesis intends to analyze material remains and published site reports from Iron Age Scythian burial mounds in order to determine if women from this nomadic culture participated in warfare. By applying a feminist lense to the archaeology of the western Eurasian steppe region, traditional views of gendered behavior are abandoned in favor of a more holistic and complex analysis of female agency in warfare.

Mentors: Dr. Christine Beaule, Dr. Guy Smoot
Biogeographic History of *Echinometra mathaei* in the Indo-Pacific

The history and frequency of colonization of the Hawaiian archipelago can be investigated in one of two ways: direct observations of species in the fossil record or indirect inferences using genetic data. Because the fossil record only captures some types of organisms, genetic methods have proven particularly useful because colonization events are expected to create predictable patterns of genetic variation. In Hawai‘i, recently colonized species should exhibit uniformly low genetic diversity, as island colonization presumably involves dispersal of a relatively small number of individuals. This project focuses on the sea urchin, *Echinometra mathaei*, which in earlier studies, was found to have no mtDNA variability within Hawai‘i. However, the mtDNA genome is sensitive to genetic drift but is nonrecombining, so strong selection on a single nucleotide position has the potential to eliminate variation across the whole mtDNA genome. To distinguish among these hypotheses, I am analyzing genome-wide data sets, using next generation sequencing, from 50 samples of *E. mathaei* collected from Oahu, Hawai‘i Island, Guam, and Marshall Islands. The sequence data will be analyzed with a combination of classical, coalescent, and simulation-based methods that can distinguish among selection, a recent colonization, or a genetic bottleneck.

Mentor: Dr. Peter Marko
Hepatitis A Vaccination Among College Students in Hawai‘i: An Empirical Research Survey

PURPOSE: To estimate the percent of University of Hawai‘i at Mānoa (UHM) students who are vaccinated against hepatitis A and, evaluate their knowledge and perceived risk.

INTRODUCTION: Hepatitis A is an infection of the liver caused by the highly contagious hepatitis A virus (HAV). Infections are transmitted through the fecal-oral route by ingesting contaminated food and water with trace amounts of HAV-infected feces. Despite it being a vaccine preventable disease, outbreaks still occur in Hawai‘i and the United States mainland. Commonly contracted as a foodborne illness, unvaccinated college students who eat out are vulnerable to hepatitis A infections. Food establishment sanitation practices and food-handler vaccination status are contributing factors to students’ risk of infections.

METHODS: A cross-sectional Institutional Review Board approved study was conducted in a random sample of 201 UHM students between September 1, 2017 and October 23, 2017. Participants completed a self-administered survey using a mobile device. Descriptive statistics were computed to address the study’s aims.

RESULTS: The vast majority of UHM students lack basic understanding about hepatitis A and almost half believe that the HAV vaccine is mandated for food-handlers. Four in 10 students report not being vaccinated against hepatitis A.

CONCLUSION: Perceived risk and knowledge of hepatitis A are relatively low among UHM students. This project raises awareness of the risk-factors of HAV in vulnerable student populations. Efforts to improve HAV knowledge at UHM are warranted as are surveys on other campuses to assess the generalizability of these findings.

Mentor: Dr. Eric Hurwitz DC, PhD
Characterization of Luciferase and Opsin Genes in the Bioluminescent Copepod genus, *Pleuromamma*

Bioluminescence, the biochemical production of light by living organisms, is produced by both terrestrial and marine species. Bioluminescence can be used for courtship, predator-prey defense mechanisms, and intra-specific communication. Because bioluminescence is the result of convergent evolution, there is a diverse range of bioluminescent compounds and reactions. The bioluminescent marine copepod genus, *Pleuromamma*, consists of 11 described bioluminescent species, with many species having multiple luciferase genes. Currently, there are no published data on opsins and incomplete data on luciferases within the genus *Pleuromamma*. Transcriptomic analysis of *Pleuromamma* species can reveal the phylogeny among opsin and luciferase genes, respectively, for both intraspecific and interspecific relationships.

RNA was extracted from three individuals each of seven *Pleuromamma* species - *P. xiphias*, *P. abdominalis*, *P. antarctica*, *P. robusta*, *P. quadrangulata*, *P. gracilis*, and *P. piseki*. Confirmation of morphological identification was done using COI sequences. Known copepod luciferase and opsin genes, specifically known *Pleuromamma* and *Metridia* luciferase and known opsins from other calanoids, were used to annotate the assembled *Pleuromamma* transcriptomes. Replicates permitted us to quantify luciferase and opsin expression.

Transcriptome sequencing and analysis will contribute to known luciferase findings within *P. xiphias* and *P. abdominalis* and identify novel luciferases and opsins within the *Pleuromamma* genus. The completed data set will allow for the phylogenetic analysis of luciferase and opsins, determination of the relationships between luciferase and opsins and examination on the origins of bioluminescence in the *Pleuromamma* genus.

Mentor: Dr. Megan Porter

Co-Authors: Tom Iwanicki, Dr. Erica Goetze, Mireille Steck, Dr. Amy Maas, Dr. Leocadio Blanco-Bercial
Analysis, Distribution, and Visualization of Weather Data for Sustainability Applications

Expansion of technology in the recent decade has driven dependency on electricity, as we rely on it to power our livelihoods (e.g. computers, entertainment, smart devices, electric cars). Fossil fuel shortages have raised electricity costs for states dependent on them, such as Hawai`i, to more than double the national average of 13 cents/KWh. To solve issues of growing electricity consumption and elevated costs, the State of Hawai`i has committed to one hundred percent renewable energy sources by 2045. Currently the intermittency of weather patterns and the inability to forecast power load and production has limited the use of renewable energy in the utility grid. Future integration of intermittent sources would require energy control systems to provide real-time response of users and control large variability of energy production due to seasonal, time of day, and weather changes. This work proposes a well-engineered approach to solving the current unreliability of microgrids. The design uses a three-stage system involving modular data collection, visualization, and prediction subsystems. Using a scalable software infrastructure and powerful data analysis tools, the integrated software system is able to display almost-real-time data collection and subsequent hourly forecast analysis. This approach can assist the State of Hawai`i in meeting its ambitious goal of 100% renewable energy generation.

Mentor: Dr. Anthony Kuh
Early Detection of Urinary Tract Infections Using Novel Biomarker Indicators in Diapers

Urinary tract infections (UTIs) comprise a significant portion of disease burden in elderly populations both in terms of complications and healthcare costs. The symptoms of UTIs in the elderly are usually less specific and can be masked by other comorbid conditions like dementia that affect the patient’s ability to communicate. The purpose of this project was to determine whether NGAL and KIM-1, two proteins recently discovered to be secreted by kidney cells into the urine in response to injury or UTIs, could be used as biomarkers for early detection of UTIs in incontinent patients. Using these human biomarkers to detect UTIs is an advantage over the current methods of measuring nitrites and leukocyte esterases because there is no risk of fecal contamination giving false positives. After thorough consideration of different prototype designs, a lateral flow assay strip system utilizing monoclonal antibodies specific to NGAL and KIM-1 was constructed and integrated into diapers. First, we screened various commercial antibodies for sensitivity and threshold limits using standard dot blot immunoassays. After identifying the best antibodies for both proteins, we generated lateral flow strips made of porous nitrocellulose membrane coated with immobilized capture antibodies against NGAL and KIM-1. Conjugating a separate detection antibody to colloidal gold allowed a color change after the lateral flow when the detection antibody-biomarker complex was bound to the capture antibody. The future steps of the project include increasing the detection threshold of the prototype and moving onto sensitivity and specificity testing in adult diapers.

Mentor: Dr. Ben Fogelgren

C-Authors: Calvin Chang, Bryce Tanaka
Kathleen Corpuz  
American Studies, Political Science; Minor in Filipino 
Arts & Humanities – Research 
Participation for Honors 
Oral Presentation: Session 3 (11:30a-12:20a) in Sakamaki B103

Assessing Current Tobacco, Electronic Smoking Devices and Vape Use Among Filipinos in Hawai’i

Tobacco use continues to damage the health of Filipinos, and it is important to understand the historical and contemporary processes that affect their health. Filipinos are the fastest growing minority population in Hawai’i. Constant use of tobacco increases the risk of developing diseases such as cancers of the heart and lung. Filipinos have the second highest rate of smoking in Hawai’i, and this study investigated the conditions that shape their smoking behavior. Electronic smoking device or “vape” is becoming more popular and accessible to residents, and this study analyzed their consumption patterns, attitudes and behaviors of electronic smoking device users. Their knowledge on tobacco cessation services and their motivation to quit smoking were also measured. This project used a mixed methods research approach to explore the characteristics of Filipinos who vape and/or smoke cigarettes. Two individual semi-structured interviews were conducted to describe the influences of their smoking behaviors. A survey was also designed to gain an insight of their awareness and perception of cessation programs. The findings of this study will help improve tobacco cessation programs for the Filipino community in Hawai’i who are at risk of developing tobacco related diseases.

Mentors: Dr. Roderick Labrador, Dr. May Rose Dela Cruz
Development of a Folding Recumbent Tadpole Tricycle

The 2017-2018 Human Powered Vehicle Project highlights the research, design, manufacture, and testing of a recumbent tadpole tricycle developed to compete in the 2018 American Society of Mechanical Engineers (ASME) Human Powered Vehicle Competition. This year, the team is composed of 10 Senior Mechanical Engineering students each selected to become an expert in one or more of the three vehicle subsystems: Frame, Drivetrain, and Fairing. The vehicle was designed to improve upon the shortcomings faced by last year’s team while implementing a highly competitive folding attribute for the Innovation Event of the competition. This folding innovation theoretically halves the length of the vehicle, which accommodates tight storage spaces and also allows it to fit through a standard-sized doorway. Along with the folding aspect, the vehicle also highlights a direct-steering system, an intermediary sprocket, and a partial fairing to enhance performance capabilities. In the production of this vehicle, the team has carefully researched and selected optimal design concepts, material types, and manufacturing processes to create a product that best represents the University of Hawai‘i at Mānoa at the 2018 ASME E-Fest West.

Mentor: Dr. Bardia Konh
Directed Molecular Evolution of *PiggyBac* Transposase

*PiggyBac* (pB) is a transposable element derived from moth *Trichoplusia ni*, integrating transgenes into the genomes of bacterial and mammalian cells. Among transposases available, pB is uniquely noted for its ability to deliver a large cargo or a transgene into non-dividing cells, and the ability to excise and insert a transposon without altering the target site. Increasing pB efficiency to create a hyperactive pB would make an ideal delivery system for gene therapy.

Directed evolution will be applied to improve the efficiency of pB by PACE (Phage-Assisted Continuous Evolution), a method of protein evolution that can provide generations of directed evolution in a short time period using bacteriophage. Briefly, PACE works by creating selective pressure for mutant library constructs capable of activating protein III (pIII) expression which is required for phage propagation. Plasmids were constructed in which a transposon was inserted within the coding sequence for gene III (gIII). The excision activity of pB will excise the transposon that renders gIII non-functional, thus activating gIII which expresses pIII, allowing for propagation of phage carrying successful pB mutants.

A reporter plasmid with a green fluorescent protein (GFP) gene that is similarly disrupted by a transposon was created to quantify and compare the pB activity of mutants created by directed evolution. Active mutants that correspond to increased GFP activation will be sequenced and mapped in order to create hyperactive pB which can be used as an effective tool in gene therapy and the possible application in curing various genetic diseases.

Mentors: Dr. Stefan Moisyadi, Dr. Brian Hew
Design of an Autonomous Unmanned Aerial System for Search-and-Rescue Missions

The University of Hawai‘i Drone Technologies (UHDT) is a Vertically Integrated Project (VIP) comprising of undergraduate students from various engineering disciplines and class standings. The goal of UHDT is to increase the efficiency and success of search-and-rescue (SAR) missions during disasters through the development of autonomous waypoint navigation, target localization, image capture and recognition, and payload delivery for unmanned aerial systems (UAS). UHDT has developed a UAS by modifying a commercially available fixed-wing *MyTwinDream* airframe. The airframe serves as a platform to support an onboard computer and communications system, air delivery system, and image capture system integrated into a power distribution board. At the ground station computer, image processing software has been developed to identify and classify targets in images based on shape and color characteristics. Implementing UASs for SAR give rescuers access to a rapidly deployable system capable of searching disaster-stricken areas, locating victims in jeopardy, and – if necessary – distributing disaster relief kits. Through UHDT’s development in UASs, SAR missions can be conducted without requiring human intervention, which would allow for quick and efficient extraction of afflicted victims.

Mentor: Dr. Wayne Shiroma
The Relationship Between Quality of Life and Religion in People with Schizophrenia in Hawaii

Research around the world reports religious individuals with schizophrenia are likely to experience a higher quality of life through self-forgiveness and/or divine intervention. Further investigation on the effects of spirituality in people with schizophrenia is important because it could determine practical lifestyle changes that may lead to a happier and healthier life. In this study, we evaluated religious affiliation in relation to social functioning, a component of quality of life in people with schizophrenia in Hawaii. The objective of this study is to determine whether religious people of Hawaii with schizophrenia experience higher social functioning. Sixteen outpatients with schizophrenia and eleven healthy controls were assessed using the Structured Clinical Interview for the DSM-5 (SCID), Social Functioning Scale (SFS), and Brief Multidimensional Measure of Religiousness/Spirituality scale (BMMRS). This study’s findings found that religious people with schizophrenia score higher on the Social Functioning Scale than non-religious people with schizophrenia.

Mentor: Dr. David C. Cicero
Engaged Development: Using Cognitive Neuroscience to Develop Self-Service IoT Analytics Applications

Society is being increasingly reliant on technology. With a massive amount of devices being added to the “Internet of Things” (IoT), human and machine generated data is growing exponentially and the need to translate huge amounts of data into palatable information is growing with it. With so many “smart” devices in homes we have seen a significant technological gap that exists between utility companies and consumers' desire for increased awareness and understanding of their energy usage. 70% of residents believe it is the utility company’s role to build education and awareness, yet only 7% think their utility providers meet those needs. In order to help fill the gap, experiments will be conducted in partnership with the Hawaii Interdisciplinary Neurobehavioral and Technology Lab (HINTLab), a Human-Computer Interaction (HCI) laboratory at the University of Hawai’i, to study how household energy data can be better communicated to the average consumer. Participants are expected to be connected to an Electroencephalography (EEG) device to track their brain activity, and equipped with an eye tracking device to monitor eye movements while looking at energy usage data. Our goal is to design a system that contributes to the idea of a “more informed world”, measuring the success of data visualization techniques and the retention of that data from users. We expect our initial findings to indicate that data containing high visualization but low content, will be the easiest for users to extract meaningful information from in order to optimize their decision making process.

Mentor: Dr. Randall Minas
New Model for Protein Misfolding and Aggregation

Neurodegenerative diseases represent a large class of disorders affecting neurons in the brain. Many of the most common neurodegenerative diseases, including Alzheimer's, Parkinson's, and prion disease, are generally associated with the aggregation of misfolded or abnormally self-assembled proteins. We model the self-spreading and propagation of misfolded prion aggregates, incorporating new biochemical research. In previous models, healthy prion monomers $\PrP^c$ (prion protein cellular) attach to polymer chains $\PrP^{Sc}$ (prion protein scrapie) in a process called polymerization, becoming infectious. A polymer of length $i$ would then be able to fragment into two polymers of size $j$ and $i - j$, for some $n \leq j < i$, where $n$ is the length of the smallest stable polymer. New biochemical research, however, indicates that fragmentation does not play a role in the spreading of $\PrP^{Sc}$. Instead, polymers undergo depolymerization, which means they can only lose a single unit from either extremity at a time. In fact, this research also suggests that infectious prion assemblies are made up of an oligomeric subunit $\text{SuPrP}$, called an elementary brick, rather than monomers; these bricks are thought to likely be trimers. We develop a mathematical model to reflect the new research and use it to examine the dynamics of the system through computer simulations. Our model will be useful to researchers developing techniques for early detection of prion diseases, along with potentially providing a deeper insight into the little understood biological processes responsible for prion proliferation.

Mentor: Dr. Monique Chyba

Co-Author: Dr. Human Rezaei
Christopher Marlowe is arguably one of the most important pre-Shakespearean dramatists, though he does not receive as much attention as Shakespeare does. I hypothesize, though, that in his four major works—Doctor Faustus, The Jew of Malta, Edward II, and Tamburlaine—Marlowe is commenting on the inhumanity of Elizabethan England. Using ideas of satire from the Elizabethan period, I argue that, in Doctor Faustus, Marlowe has created a satiric tragedy that comments on Renaissance ambition and pride. I show that, in using satiric techniques such as parody, Marlowe is warning his audience against the pitfalls of striving for trying to surpass the limits of man, of fueling one’s ambition with little mind to the cost of doing so. This project is only a small portion of a wider inquiry into the works of Marlowe and the ways in which he comments on the society of his day and what he sees as its moral pitfalls.

Mentor: Dr. Todd Sammons
Identifying the 3-Dimensional structure and gene expression in the visual systems of Copepoda

The copepod, *Labidocera madurae*, has an unusual visual system consisting of two dorsal eyes with lenses and one lensless ventral eye. Despite the unique structure of their visual system, little is known about either the eye structure or opsin expression. To investigate this unique yet uncharacterized visual system, this study separates the molecular and physical structures of their visual systems. Molecular and cellular biology methods utilized were RNA extraction of near-adult stage copepods, confirmation of predicted gene sequence expression using reverse transcriptase Polymerase Chain Reaction (RT-PCR) and Sanger sequencing, and construction of DNA probes for future in situ hybridization. Confocal microscopy and 3-D analysis software were used to create a rendering of the copepod visual system. It is hypothesized that when the visual structure of the *L. madurae* is observed, there will be differences between the eye structure of females and males regarding only the dorsal eye and not the ventral eye. Previous research suggests at least six opsin genes are expressed in this species; of these, the expression of three opsin genes have been confirmed. All confirmed opsin genes are predicted to form a visual pigment with middle wavelength sensitivity (e.g. sensitive to blue light). Future work will use in situ hybridization to identify the expression patterns of these three opsins within the three distinct eyes of *L. madurae*. By examining and identifying these differences, we will gain insight regarding the ecology and interactions of *L. madurae* along with insight on the evolutionary structures of other marine species.

Mentor: Dr. Megan Porter

Co-Author Mireille Steck
The Effects of Foliar Fungal Endophytes against *Austropuccinia psidii* on *Eugenia koolaensis*

*Austropuccinia psidii* an introduced fungal pathogen, is described as a type of rust which creates a bright orange powder leading to lesions on the leaf, killing the leaves, inhibiting photosynthesis, and eventually leading to plant death. Ideal conditions here in Hawai‘i make many plants in the myrtaceae family susceptible, like rose apple, ohia, and *E. koolaensis*. A single genotype of *A. psidii* in Hawaii persists in its urediospore stage due to favorable neotropical temperatures, bypassing its two host system. A priority of conservationists should be to exclude any other new strains of *A. psidii* and to reduce the current damage caused by the prominent strain in Hawai‘i.

Inoculating *E. koolaensis* with beneficial fungi, may be one method to reduce plant loss to *A. psidii* and control the pathogen on Oahu. Foliar Endophytic Fungi (FEF) found within leaves play a key role in symbiotic relationships among plants. Within the leaf environment, some of the most diverse and potentially influential members of the biotic community are fungal endophytes. Some endophytes have been noted to have beneficial effects to their inoculated hosts. *E. koolaensis* was treated with an FEF slurry made from homogenized wild *E. koolaensis* leaves. Previous studies done within the UH Mycology lab on another endangered plant and powder mildew, showed a treatment of FEF slurry proved effective at controlling the pathogen. Similar techniques were applied to *E. koolaensis* and *A. psidii* to combat the pathogen and inoculate the host with FEF so it can be out-planted. The use of a Scanning Electron Microscope (SEM) was utilized to view any fungal/leaf interactions.

Mentor: Anthony Amend

Co-Author: Kama Chock
Strain Specific Differences in Virus Replication and Host Innate Immune Response Induced by Zika Virus in Primary Human Sertoli Cells and Human Testicular Organoids

Zika virus (ZIKV) strain (MR766), first identified in 1947 in the Zika Forest of Uganda, is a mosquito-borne flavivirus traditionally associated with sporadic febrile illness in humans. However, the recent emergent ZIKV strain (PRVABC59) was the leading cause of neonatal microcephaly during the 2015-16 epidemic and was also shown to be sexually transmitted by males. Detection of PRVABC59 in semen months after initial infection suggests the virus establishes persistent infection in the testes, mechanisms of which are still unclear. Sertoli cells (SC) that form the blood-testis barrier and support spermatogenesis are shown to be highly susceptible to PRVABC59 in comparison to Leydig cells (LC) that produce testosterone, which activates genes in Sertoli cells that promote differentiation of spermatogonia, but permissibility of SC and LC to MR766 has not been investigated. In this study, we compare replication kinetics and host immune response of founder strain MR766 and emergent strain PRVABC59 in two primary human testicular cells, SC and LC, to gain further insights into ZIKV persistence in the testes. Our results demonstrate that ZIKV titers for both strains measured by plaque assay and qRT-PCR increased at 24 hours and peaked by 72 hours post-infection, with PRVABC59 replicating more robustly than MR766. However, MR766 exhibited significantly higher pro-inflammatory and antiviral (IFN-α/-β) responses compared to PRVABC59, as measured by qRT-PCR. These data suggest that PRVABC59 may block host antiviral responses in both SC and LC, favoring more robust replication compared to the founder strain MR766. This is the first study to compare infection kinetics of two strains of ZIKV in a relevant testes cell types and provides clues into why the emergent strain PRVABC59 establishes persistent testicular infection in humans.

Mentor: Dr. Saguna Verma
Human Testicular Organoid Model as an *in vitro* System to Investigate Zika virus Pathogenesis

Zika virus (ZIKV) is an arbovirus belonging to the Flavivirus genus of the Flaviviridae family. The 2015-16 ZIKV epidemic in South America resulted in more than 1.5 million symptomatic cases. Traditionally associated with mild febrile illness, the recent outbreak brought forth newly emergent features of ZIKV disease, including neonatal microcephaly and Guillain-Barre syndrome in adults. Further, sexual transmission of ZIKV emerged as a prominent threat for disease spread to non-endemic regions, a unique concern not reported for other mosquito-borne flaviviruses. ZIKV has been detected in semen for up to 188 days after symptoms onset and has been demonstrated to potentially affect fertility, indicating that the virus establishes persistence in the testes. With a lack of relevant animal models to study ZIKV pathogenesis, an in vitro human model system which incorporates multiple testicular cell types, is considered ideal to recapitulate testis function and to investigate the pathogenic features, including persistence, of ZIKV infection in the human testes. Our recently developed human testicular organoid (hTO) model, consisting of multiple testicular cell types, is shown to produce testosterone continuously and to partially support early stages of spermatogenesis. Thus, our objective here was to evaluate the hTO model as an in vitro system to study ZIKV pathogenesis. hTO were infected with an epidemic ZIKV strain PRVABC59 and then subsequently assessed for virus replication, hTO viability, and hTO function post-infection. We found that hTO supported productive ZIKV replication over the time course of infection, which resulted in reduced hTO survival and function. Collectively, our results indicate that hTO can be used as a relevant model to study ZIKV pathogenesis, including cellular targets, immune response, and potential effects on spermatogenesis.

**Mentor:** Dr. Saguna Verma
Relationship Between Morphological Traits, Water Depths, and Foraging Behavior of the Hawaiian Stilt (*Himantopus mexicanus knudseni*)

The Hawaiian Stilt (*Himantopus mexicanus knudseni*), or Aeʻo, is an endangered subspecies of the Black-necked Stilt (*Himantopus mexicanus*) that inhabits wetlands throughout the Hawaiian Islands. Hawaiian Stilts frequently move among wetlands in search of food, but are limited by habitat characteristics, such as water depth. The Hawaiian Stilt is threatened by sea level rise, which has led to an increase in flooding events by raising the water table, particularly in coastal communities. Due to this threat, it is important to determine possible impacts of increased water depths on Hawaiian Stilt foraging success. However, research on foraging behavior of stilts is limited, and optimal foraging conditions are unknown. In this study we determined optimal water depths for foraging stilts. Field surveys were conducted in wetlands on the windward side of Oʻahu island, Hawaiʻi, USA. Wetland water levels were found to be negatively correlated with the number of observed foraging stilts. Tarsus length was found to be positively correlated with water depths. Our results may be used to better understand how potential future water depths may impact the foraging ability of the Hawaiian Stilt, and inform decisions for optimal management of water depth in managed wetlands.

Mentor: Dr. Melissa Price

Co-Author: Kristen Harmon
Design of Small-Scale Water Treatment System for the Ala Wai Canal

The Ala Wai Canal (AWC) is arguably the most well known impaired water body on Oahu, with the State of Hawaii currently spending about $1 million annually for its upkeep. This high maintenance cost motivated the design of a cost-effective and sustainable water treatment system for the AWC. The proposed systems are a trickling filter (TF) and constructed wetland (CW), both of which utilize biological processes to remove contaminants from water. The first step in designing the systems was to identify the contaminants in the canal. Results showed that the AWC had an alarmingly high average chemical oxygen demand (COD) concentration of 234 mg/L - a high COD concentration correlates to a high biological oxygen demand (BOD), a U.S. Environmental Protection Agency (EPA) regulated contaminant for water quality. Bench-scale TF and CW reactors were modeled and constructed to determine their COD removal efficiencies. Hydraulic loading rates and recirculation flow rates were then optimized appropriately for each system. Based on the bench-scale system performances, either the TF or the CW was selected as the full-scale system by comparing efficiency, cost, aesthetics, and size. A full-scale model of the final system will be designed to reduce the canal’s predicted BOD concentration to EPA DOH limits (60 mg/L). A comprehensive analysis was performed to determine how many full-scale system units are required to treat the entire AWC.

Mentor: Dr. Samir Khanal
With the incessant growth and expansion of China, the economy has used copious amounts of investment and credit to leverage their growth, which has caused a debt overhang problem of excessive corporate credit. Due to the nation’s debt load approaching crisis levels, government leaders in 2017 pledged to de-lever and prevent financial risk by cutting back on credit, increasing regulation, and diminishing shadow banking (which is lending and other financial activities conducted by unregulated institutions). The sustainability of China’s economic growth is imperative, but can China maintain it? Or will their markets crash? In order to understand the growth of the economy, I must first analyze the performance of China’s main banks. Because of the direct relationship that the bank has with the economy, they are responsible for a great part of China’s growth. For my research, I created a financial model of China’s largest bank Industrial and Commercial Bank of China using their 2016 annual report. The model projects what will happen to the bank in the next 5 years, based off its historical trends. From my research, I have found that China’s deposits are gradually shrinking while their loans are expanding, depicting China’s consumers lifestyle change of saving less and consuming more. In regards to their net charge offs (debt that can’t be recovered), while it continues to increase, their cash reserves are big enough to cover those losses. According to these trends, the economy will not crash if they follow their plan to promote sustainable economic growth.

Mentor: Professor Alexander Hittle
Site as System: Local to Global Ecologies

The discourse of site-specificity in art has been historically fluid. Although generally a distinction applied to work that was intentionally made to have a defined relationship to the specific place in which it is located, differing ideas of the meaning of site itself have emerged, inggraining the site within a complex network of continually transforming conditions, absolving the site from purely geographical constraints, and, thus, ultimately altering the perception of what exactly constitutes a site. Concurrently, the general public has become increasingly aware of the scope of environmental concerns, made most visible by the ongoing effects of climate change, capitalism’s role in the mismanagement of natural resources, and the general interconnectedness of place thanks to processes of globalization. Through a comprehensive literature review on the history of ecological art, artists have shown to have expanded their theoretical framework to include both the local to the global through the lens of systems ecology, or the theory that ecosystems are an elaborate mixture of interconnected abiotic and biotic factors. Centered around recent environmental issues encompassing the city of Los Angeles, this research discusses the applications of the term site-specific as strategically used by artists and art historians, narrowing in the presence (or lack thereof) of systems ecology thinking in multiple contemporary works. By limiting the geographical scope, one can succinctly summarize how various artists are incorporating site and systems ecology within the pertinent issues of an artificially confined location while still remaining in conversation with global environmental concerns.

Mentors: Dr. Jaimey Hamilton Faris, Dr. John Szostak
Can We Decipher True vs. False? Psychophysiological Responses to True and False News Headlines Seen on Social Media

Social media has morphed from a form of entertainment used to maintain connections with friends to a major platform for idea sharing. Almost everyone in our society utilizes at least one form of social media every day, and in 2017, twenty-six percent of adults in America obtained their news from social media sites. However, information posted on social media does not undergo the same filters as traditional news outlets, resulting in decreased credibility and an increase in the propagation of false information.

Previous research has focused on self-reported emotion and has addressed the relationship between the credibility of sources and trust. However, few studies have related psychophysiological responses to true and false information on social media. This research utilizes psychophysiological measures, specifically heart rate variability and skin conductance, to compare the actual and perceived credibility of news headlines posted on social media.

This study consisted of 24 participants and utilized a within-subjects design. Participants viewed headlines that were either true or false and gave ratings on credibility, their intent to post the information, and the level of positive/negative emotion they felt in response to each article.

Our findings indicate that individuals had varying levels of approach and avoidance behavior to true and false news. One implication of this research is that individuals are only slightly better than chance at determining whether a headline is true or false. Additionally, information that is perceived as credible versus incredible has differential psychophysiological responses which could indicate confirmation bias or cognitive dissonance.

Mentor: Dr. Randall K. Minas, Jr.
Urine Cytology and UroVysion Fluorescence in Situ Hybridization of Renal Cell Carcinoma

**Objectives:** Renal cell carcinoma (RCC) comprises approximately 3% of all malignancies in adults, and is only rarely diagnosed by urine cytology. UroVysion fluorescence in-situ hybridization (FISH) is a non-invasive molecular-based urine assay for the detection of high grade urothelial cancer, but is not routinely utilized for RCC. In our study, we aspired to determine the efficacy of urine cytology and UroVysion FISH in the detection of RCC at our institution.

**Methods:** We searched for all patients undergoing surgery for RCC at the Queens Medical Center from April 2008 to January 2017, and reviewed their prior urine cytology and/or Urovysion FISH exams in our laboratory database.

**Conclusion:** During our 8.8 year study period, 815 RCC were excised. Of these, 647 (79.4%) were clear cell, 76 (9.3%) papillary, 51 (6.3%) chromophobe, and 41 (5%) were of other histologic types. Of these RCC patients, 10 (1.2%) patients underwent Urovysion FISH exam, of whom 8 also submitted urine cytologies. Four (40%) of these 10 patients had abnormal Urovysion FISH results. There was no difference in age, sex, sidedness, histologic type, size, grade, stage, and renal pelvis involvement between patients with normal and abnormal Urovysion FISH tests. In contrast, of the 8 patients with urine cytology, only one (12.5%) patient had an abnormal urine cytology. This patient was a 74 year-old female with a grade 4 stage 3 papillary renal cell carcinoma with sarcomatoid differentiation, with renal pelvis and vein involvement. Our study showed that UroVysion FISH is a more sensitive test than urine cytology in the detection of RCC. Because RCC may lead to abnormal UroVysion FISH results, caution must be exercised in the interpretation of a positive UroVysion test in the setting of a renal mass.

Mentor: Dr. Pamela Tauchi-Nishi

Co-Authors: Diane Chen MD, Sarah Carlile, Rasleen Saluja MD
Elucidating the Function of Species-specific Active Site Residues in DAPA Synthase from Biotin Biosynthesis

Biotin (vitamin H) is a vital cofactor to all organisms because of its participation in essential biological processes such as gluconeogenesis, fatty acid metabolism, and fatty acid biosynthesis. Humans lack the pathway for synthesizing biotin, and therefore must obtain it from the diet, while plants and other microorganisms possess the genes necessary for biotin synthesis. The enzymes required for biotin biosynthesis are encoded by the bioA, bioB, bioD, and bioF genes. It has been previously reported that in *Escherichia coli* and *Mycobacterium tuberculosis*, the enzyme 7,8-diaminopelargonic acid (DAPA) synthase encoded by bioA is an aminotransferase that utilizes S-adenosyl-methionine (SAM) as the nitrogen source to convert 7-keto-8-aminopelargonic acid (KAPA) to DAPA. Although DAPA aminotransferase in *Bacillus subtilis* and *E. coli* is 34% similar, it has been shown that rather than utilizing SAM as an amino donor, *B. subtilis* instead uses L-lysine. In order to determine which of the non-conserved residues across *B. subtilis* and *E. coli* within BioA contributes to the utilization of L-lysine rather than SAM, mutants of DAPA synthase were created using site-directed mutagenesis. Three amino acid residues, F17, V53, and L82, in *B. subtilis* DAPA synthase were targeted through analysis of the 3D protein structure and mutated to the aligned corresponding residues in *E. coli*—Y17, W53, and G82. *In vivo* growth curve studies were conducted to determine the activity of the mutant enzymes. Additionally, *in vitro* binding assays provided information about the binding of SAM and L-lysine to the mutant DAPA synthase.

Mentor: Dr. Joseph Jarrett
Construction of Charge Focusing Lens for Time Projection Chamber

The Time Projection Chamber (TPC) is a detector of subatomic particles that images ionization in 3D. As a general purpose detector of ionization, the TPC is widely used in particle physics experiments and dark matter searches. However, with dark matter searches and large particle experiments, costs increase significantly due to the number of pixel chips required in order to convert ionization charge into pixels. Hence, the ability to focus the ionization tracks onto a smaller area comparable to the size of a pixel chip would greatly reduce costs, allowing for the potential to increase the number of detectors in production or increase their size at fixed costs. Therefore, the goal of the project is to design an electrostatic lens that will uniformly focus ionization drifting in a TPC while minimizing the effects of charge diffusion, which would distort the signal.

A spherical voltage potential distribution was used as a model for the desired lens voltage distribution. In order to evaluate the effectiveness of different designs, GARFIELD, a CERN program, was used to simulate resulting electric fields. This presentation will summarize preliminary results of the simulations and progress towards prototype construction.

Mentor: Dr. Sven Vahsen
Selenoprotein K Modulates Diverse Calcium Signaling Pathways in the Human Melanoma Cells

The importance of effective calcium flux from the endoplasmic reticulum (ER) has been recently demonstrated for the growth and migration of human melanoma cells. Because Selenoprotein K (SELENOK) has been implicated in calcium flux in immune cells during activation and migration, we hypothesized that it also plays a critical role in the proliferation and migration of melanoma cells. To test this hypothesis, we developed an in vitro human melanoma cell model using the NCI-60 validated human melanoma cell line, SK-Mel28. CRISPR/Cas9 techniques were used to generate a SELENOK-null clone and effective mutation of SELENOK was confirmed by DNA sequencing as well as western blot analyses showing truncated protein. The SELENOK-null SK-Mel28 cells were compared to w.t. control SK-Mel28 cells for proliferation using fluorescence based assays. In addition, migration was evaluated using a scratch assay and invasion was analyzed using a soft agar colony formation assay. All three functions were impaired in the SELENOK-null cells compared to controls. These assays were repeated in the SELENOK-null SK-Mel28 cells rescued with transient transfection of GFP-SELENOK or as a control just GFP. Results showed that transfection of the SELENOK-null SK-Mel28 cells with GFP-SELENOK but not GFP alone restored capacity to proliferate and migrate. Calcium flux was evaluated using fluorescence based assays and showed reduced levels in the SELENOK-null SK-Mel28 cells compared to the controls. The regulation of calcium dependent signaling pathways were evaluated via next-generation transcriptome profiling tools, and calcium dependent enzyme nuclear factor of activated T-cells (NFAT) showed decreased functionality in SELENOK-null SK-Mel28 cells. Altogether, these data suggest that SELENOK is important for the stemness, growth, and migration of melanoma cells and suggest that SELENOK may serve as a therapeutic target for treating melanoma in humans.

Mentor: Dr. Peter R. Hoffmann
Role of Fractones in the Extracellular Matrix of a Mammalian Disease Model

Fractones are part of the extracellular matrix (ECM) in the stem cell niche of the brain that controls the growth and proliferation of neurogenic stem cells. Fractones directly contact stem cells to promote the effect of the growth factors they bind and encourage differentiation to suit specialized functions such as neurogenesis. We will characterize the role of fractones in a cancer disease model.

We have optimized a model of the neurogenic explant, a 1mm x 1mm piece of the adult neurogenic zone that retains the interaction between stem cells, fractones and growth factors in a near-physiological context. We have used this brain explant model and microinjection of neuroblastoma cells to examine the specific growth factor/fractone molecular interactions that lead to the control of neurogenesis and disease proliferation. Neuroblastoma cells transfected with GFP were injected into the explants to visualize stem cell fate via live fluorescence microscopy after the addition of various fluorescently labeled growth factors and antibodies.

Fluorescence microscopy imaging and immunohistochemistry on the explants will allow us to develop the use of explants as a model to study pathology. Use of explants in the context of a neuroblastoma model will allow us to examine the development of diseases and elucidate the interactions between ECM structures such as fractones in normal tissue and in the progression of disease.

Mentor: Dr. Scott Lozanoff

Co-Authors: Dr. Frederic Mercier, Dr. Harry Davis
Assessing the Down-Fjord Mechanistic Relationships of Biodiversity and Abundance of Antarctic Benthic Macrofauna of Andvord Bay

Glaciomarine fjords exhibit substantially different ecosystem forcing than adjacent continental shelves and can be highly sensitive to climate warming. Extensive research indicates that subpolar Arctic fjords are heavily influenced by glacial meltwater and sediment inputs, resulting in high turbidity and seafloor burial rates. These physical disturbances yield macrofaunal communities with low abundance and diversity. In contrast, poorly-studied sub-polar fjords along the Western Antarctic Peninsula (WAP) sustain weak meltwater influences, resulting in low turbidity and seafloor burial rates. Thus, benthic communities in WAP fjords may not currently be limited by turbidity and burial disturbance and may have the potential to harbor abundant and diverse macrobenthic communities. Here we characterize the benthic macrofaunal community of Andvord Bay, a subpolar fjord along the warming WAP. We compare down-fjord changes in macrobenthic abundance, diversity, and functional-group structure (groups of organisms with different ecosystem roles) to a variety of potential ecological drivers. These ecological drivers include sediment burial rate, sediment Chl-a concentration (an indicator of labile detritus availability), and sediment-community respiration (an indicator of seafloor detrital carbon flux). Benthic abundance is high in the mid-fjord region and is most strongly correlated with carbon flux and food availability. Macrofauna abundance is high in the inner fjord regions relative to abundance in Arctic fjords in the same area. Burial disturbance may occur only within 1 kilometer of actively flowing tidewater glaciers in sub-polar Antarctic fjords. These patterns are likely to change as warming increases meltwater and sediment inputs, limiting food availability and benthic habitat.

Mentor: Dr. Craig Smith
A Comparison of Rhythm in English Speakers from Hawai‘i and California

There has been a long tradition, since at least 1945, of research into the rhythm of speech. Considered a universal feature of language, speech rhythm is often broken down into two main categories, stress-timed and syllable-timed. Languages are assumed to fit into, or fall along a continuum between, these two categories. This study compares the recorded speech of two politicians speaking Californian English, a so-called stress-timed language, and two politicians speaking Hawaiian English, which has yet to be categorized. The software DARLA and the program PRAAT were used to assist in the manual insertion of vowel boundaries. Pairwise Variability Indices (PVI) were calculated to compare the ratio of differences in duration between successive vowels for each speaker. The hypothesis that Hawaiian English is more syllable-timed than other American varieties, as has been impressionistically observed in the literature, was not supported. Limitations of the traditional conception of rhythm and of the current study, as well as the need for further work, are discussed.

Mentor: Dr. Victoria B. Anderson
Native and Non-Native Plant Diversity Along an Elevational Gradient in a Hawaiian Montane Wet Forest

Hawaiʻi’s native forests are unique ecosystems that are home to some of the most endangered species in the world. One potential mechanism driving declines in Hawaiian native plants is displacement by invasive species. The objective of this study was to quantify the relationship between environmental parameters and native and non-native plant diversity along an elevational gradient in a Hawaiian montane wet forest. In Summer 2017, plant diversity was measured in 24 plots along an elevational gradient in Kīpahulu Valley Biological Reserve on Maui, with three replicate plots at each of eight elevations. In each plot, percent cover of all plant species was estimated in the lower-canopy (<2m) and upper-canopy (>2m). Plant diversity was then analyzed in two ways, richness (defined as total number of species in a plot) and evenness (relative abundance of each species in a plot). Linear regression models were used to assess how species richness and evenness change across elevation and with respect to key environmental parameters. In the lower-canopy, native species richness significantly increases with elevation, but there is no trend in non-native species richness across elevation. Plant species evenness in the lower canopy does not change across elevation. In the upper-canopy, non-native species richness significantly decreases with elevation, but there is no trend in native species richness across elevation. Plant species evenness significantly decreases with elevation. Management efforts should focus on restoring rare plant habitats at lower elevations and conserving rare plant habitats at upper elevations.

Mentor: Dr. Kasey Barton
The Fungal Life Aquatic: Diversity of Marine Fungal Communities

Scientists have only discovered a small fraction of extant fungal communities living in marine environments, which likely contain a vast range of unexplored diversity. A cost-effective, high-throughput isolation device was developed to culture undiscovered diversity but was found ineffective in marine environments. Despite this setback, the device still has great potential for other applications. Over two hundred samples were collected from marine sediment and water column and isolated in a laboratory using 96-well agar plates. The sediment samples were diluted while the water column was concentrated using a vacuum filter method to ensure a single cell colony per well. Once cultured on the 96-well plate, the fungal samples were isolated on their own agar dish to eliminate contamination. These samples were run through Sanger sequencing then compared to known fungal communities using basic local alignment search tool (BLAST) to attempt to determine taxonomy. We then looked at diversity present in marine environments and classified them using a phylogenetic approach.

Mentor: Anthony Amend
Production of Monoclonal Antibody Against MARV Nucleoprotein

The Marburg virus (MARV) is a member of the family Filoviridae, a group of viruses that cause sporadic outbreaks of viral hemorrhagic fever. MARV was discovered in 1967 in Marburg, Germany, after several laboratory workers contracted the virus after dissecting African Green Monkeys. Our project was aimed at targeting the nucleoprotein (NP) because of its abundance in all stages of the infection. Antibody against MARV NP is generated early during infection, therefore this is a target for early serological diagnosis, for example using an enzyme-linked immunosorbent assay (ELISA). Such an assay can be used to detect active infection or allows retrospective analysis for epidemiological purposes. BALB/c mice were immunized with three doses of 10 μg recombinant MARV NP produced in our laboratory and the serum levels of NP-specific antibodies were measured two weeks after each dose. Splenocytes from mice with the highest NP-specific antibody titers were harvested and fused with P3 myeloma cells to generate immortalized hybridoma cell lines. Supernatants from hybridoma cells distributed over five 96-well plates were screened using an antigen–specific microsphere immunoassay (MIA) to select the most successful cell lines for subcloning. The subcloning process ensures the selection of a culture originating from a single cell which secretes a monoclonal antibody (mAb). Supernatants from cell cultures with the highest production of antibodies specific to MARV NP will be purified using protein G affinity chromatography. Purified MARV NP-specific mAb can further be used to develop an ELISA-based diagnostic test for MARV infections in animals and patients.

Mentor: Dr. Axel Lehrer
Production of Monoclonal Antibodies against Zika Virus Non-Structural Protein 1 – a Tool for the Development of Viral Diagnostics

The purpose for the experiment is to test the immunogenicity of recombinant Zika virus (ZIKV) nonstructural protein 1 (NS1) protein in BALB/c mice and generate monoclonal antibodies (mAbs) against the antigen. ZIKV is a member of the family Flaviviridae. It is transmitted by mosquitos of the Aedes species. Since 2015 ZIKV has been implicated in causing birth defects in babies born to infected mothers. ZIKV NS1 has a >50% conserved sequence with other flaviviruses and has potential to serve as a diagnostic marker for ZIKV infection.

Recombinant ZIKV NS1 protein was administered twice to five BALB/c mice. Two weeks after the second dose, IgG titers against ZIKV NS1 were determined using a flavivirus multiplex immunoassay (Luminex). Following another immunization, splenocytes prepared from the two animals showing the highest antibody responses were fused with P3 myeloma cells. The hybridoma cells were cultured and those with the highest IgG titers were subcloned. The mAbs were tested for binding to ZIKV NS1, and DENV NS1 using Western blot analysis. Subsequent characterization included epitope mapping and determination of the antibody isotype/IgG subtype using Enzyme-linked immunosorbent assays (ELISAs).

We successfully generated and cloned eight mAbs. All eight mAbs were reactive to ZIKV NS1 and not cross reactive to DENV NS1. Each mAb was purified from cell culture supernatants with a Protein G Column on FPLC. Ongoing experiments are being conducted to determine binding epitopes. We have successfully generated anti-ZIKV NS1 mAbs which can be utilized to develop a serodiagnostic assay for ZIKV infection.

Mentor: Dr. Axel Lehrer

Co-Authors: Teri-Ann S. Wong, Alan Garcia, Draven Aquino, Liana Medina, Brien Haun, Madhuri Namekar, Axel T. Lehrer, John M Berestecky
Effects of Raw Materials on Fresh and Hardened Properties of Geopolymer Concrete

Geopolymer concrete is composed of geopolymer cement thru the chemical mixture of solutions and particles. Geopolymer concrete develop 80% of its full strength in 24 hours, but conventional concrete, commonly uses Portland cement, takes 14 days. Geopolymer cement generate less carbon emissions (CO$_2$) during manufacture; reduction rate of 40% to 80-90% to that of Portland cement. Geopolymer relies on minimal processed natural materials or industrial byproducts reducing carbon footprint, and it is also very resistant (e.g. fire) to many durability issues. Geopolymer is cost-effective and user-friendly. But because of the complicated process of getting the right mixture of a strong geopolymer concrete, the question to understand thru the research is, how does the compressive strength of geopolymer concrete differ from conventional concrete?

To perform the compressive testing on the testing samples, the American Society for Testing and Materials (ASTM) C109, “Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)” will be followed. The compressive testing for constant mix designs for each geopolymer concrete will be performed for seven days and 28 days curing periods and will be compared to that of conventional concrete.

Geopolymer concrete can be stronger than conventional concrete, but for consistency, there is still space for improvements in getting the right mix design because of the effects of raw materials on its properties.

It can be implicated that the compressive strength of geopolymer can be on par with conventional concrete and can become an alternative construction material in the future.

Mentor: Dr. Lin Shen
Biochemical Characterization of the Potential Parkinson’s Disease Protein Endophilin A1

Endophilins are ~ 40 kDa proteins involved in membrane vesiculaiton during receptor-mediated endocytosis. Structurally, endophilins contain an SH3 and N-BAR domain which allow for direct interaction with endocytic proteins and phospholipids, respectively. In 2012, endophilin was identified as a protein target for the Parkinson’s disease (PD) protein leucine-rich repeat kinase 2 (LRRK2). Mutations in LRRK2 are the most common genetic alterations associated with familial and sporadic PD typically resulting in a gain-of-function within LRRK2. Though treatment options for PD currently include levadopa (L-DOPA), MAO-B inhibitors, and dopamine agonists, these treatments only address the physical symptoms and do not actually address the cause of the disease itself. Therefore, there is currently no cure for this disease. Recent studies have looked at the inhibition of LRRK2 kinase activity as potential treatments to PD but, due to the multifaceted nature of the protein, the potential treatments resulted in various unexpected complications that make such treatments unfeasible. This project investigates the potential link between LRRK2 and neuronal endophilin (EndoA1) as a causative agent for PD pathogenesis. Our lab has successfully expressed, purified, and analyzed human EndoA1 activity through fluorescence polarization, lipid tubulation, and fluorescence correlation spectroscopy (FCS). The ability of human EndoA1 to bind lipids has been confirmed and the dimerization concentration has been found through these experiments. Information about this potential drug target for PD was successfully obtained and can be used in the pursuit of more targeted therapeutics.

Mentors: Dr. Nicholas James, Dr. Robert Nichols
The Effect of Reduced Circadian Rhythm on the Foraging Behavior of Blind Cavefish and Eyed Surface Fish

Animals entrain their daily activities depending on the light-dark cycle (i.e. circadian rhythm). However, it is largely unknown whether non-visual based foraging behaviors are also light-entrained especially in cave-dwelling animals, which evolutionarily lost circadian rhythm. We tested the influence of the light-dark cycle on the mechanosensory based-foraging behaviors, vibration attraction behavior (VAB), in the Mexican tetra, *Astyanax mexicanus*, composed of blind cave-dwelling and eyed surface-dwelling forms. VAB is a tendency that the fish are attracted toward vibrating rods in the dark and measured as the number of approaches to the vibrating rod. We ran a 3-factorial test based on the comparisons between cave- and surface-populations, normal (12 hrs-light and 12 hrs-darkness/day) and dark (24 hrs-darkness/day) conditions and assaying at day (9 am: ZT2) and night (9 pm: ZT14). Our result showed that the VAB level did not show any detectable change between day and night, or between the normal-lighting (12 hrs-light: 12 hrs-dark) and the continuous dark conditions in surface fish. In cavefish, however, VAB level was significantly reduced in the night in normal lighting condition but not in the dark condition. This implies that the blind cavefish somehow couples the light sensing ability with foraging activity. Our result is surprising in a light of the evolution under the darkness.

Mentor: Masato Yoshizawa
Lynn Nguyen
Biology
Natural Sciences
Participation for Honors, UROP
Oral Presentation: Session 1 (9:15-10:05a) in Sakamaki A103
Poster Presentation: 1:30-2:30p in Campus Center Ballroom

The ORC4 Protein: The ORC4 Cage Function in Erythroblast Enucleation

This research project focused on determining further functions of the origin recognition complex 4 protein (ORC4) – one of six ORC proteins. We aimed to investigate whether the ORC4 cage mechanism, which plays a significant role in DNA replication preparation, is also used in other cell types aside from oocytes for chromatin expulsion. Erythroblasts were used as a model, as they display a very similar cellular process, enucleation, to polar body extrusion. The erythroblasts were isolated, cultured, and stimulated to enucleate with vacuolin-1. Then, the progression of ORC4 activity throughout the various enucleating timepoints was tracked. The results obtained from this experiment indicate that the formation of the ORC4 cage is required for the enucleation of chromatin in erythroblast cells. The ratio of different cell forms during the process of enucleation, as well as the ratio of the control population at the various timepoints of vacuolin-1 induction suggest that the process of MEL cell enucleation proceeds in a stepwise manner. This project may help to increase understanding of hematopoiesis, blood cell development, and the enucleation process in erythroblasts; and have important implications for injury rehabilitation, as well as the study of hemophilia, Von Willebrand disease, anemia, and cancers of the blood such as leukemia and myeloma.

Mentors: Dr. William Steven Ward, Dr. Hieu Nguyen, Ilko Stoychev
Yuuki Niimi  
Marine Biology  
Natural Sciences  
Participation for UROP  
Oral Presentation: Session 1 (9:15-10:05a) in Sakamaki A102

Vertical Structure of the Mesopelagic Micronekton Community in the Central Equatorial Pacific Ocean

The deep-sea is the largest habitat on Earth and the upper portion (200 - 1,000 m) of the open waters is called the mesopelagic. The ecosystem is ecologically distinct since most animals vertically migrate from the depth during the day to the surface at night to avoid predators. The mesopelagic micronekton are critical in food webs, functioning as intermediates between lower trophic levels and top predators, including commercially exploited fish such as tuna. Though the vertical structure of the mesopelagic community has been investigated around Hawai‘i and in other parts of the Pacific Ocean, there currently are not any evaluations of this community in the dynamic equatorial region. The equator’s oceanography changes rapidly with latitude and generally has high primary productivity as a result of upwelling of cold nutrient rich water. Here we look at the quantitative abundance, biomass, and the vertical structure of the communities between 5° and 8° North, sites that differ in their productivity and extent of low oxygen zones. Mesopelagic micronekton at the two sites were collected from a depth discrete trawl to provide quantitative vertical structure. This study will provide important information for fishery managers to understand how mesopelagic micronekton are latitudinally affected by the equator. The sampled dominant taxa are cyclothone, euphausid, and sergestidae. Between the two stations, there were differences between the abundance and biomass of these dominant taxa. We also found significant difference in the depth distribution of vertical migration in most of the dominant taxa between the two stations.

Mentor: Dr. Jeffrey Drazen
Thermal Pretreatment of Food Waste and Wastewater Sludge for Enhanced Biogas Production

In the U.S., about 38 million tons of food waste is generated annually; the amount of food waste production is expected to increase due to population growth and increased urbanization. Most food wastes end up in landfills where microorganisms metabolise the organic material - causing landfills to be the third largest source of methane in the United States. Anaerobic digestion (AD) is a series of biological processes where microorganisms breakdown organic material in the absence of oxygen. One of the major end products in AD is biogas - a mixture of 55-65% methane, 30-35% carbon dioxide, and some hydrogen sulfide as an impurity. Methane and digested solids generated in AD can be utilized as a renewable energy source and organic fertilizer respectively. Substrate pretreatment is used to enhance digestion through various mechanical, thermal, chemical, and biological methods. In previous studies, thermal pretreatment has been successful in enhancing digestion, increasing biogas production, and inactivating pathogens. The overall objective of this project is to enhance the anaerobic digestibility of wastewater sludge and food waste for biogas production through thermal pretreatment and co-digestion and to utilize the digestate as a safe and nutrient rich organic fertilizer. It is hypothesized that pretreatment will provide supplemental breakdown of substrate chemical structure and cell lysis while simultaneously sterilizing the substrate (for safe application of digestate as soil amendment). Also, co-digestion of food waste with wastewater sludge is expected to aid in nutrient balance and heavy metal dilution.

Mentor: Dr. Samir K. Khanal

Co-Author: Surendra KC
Virtual Reality and Visualization in Research and Cultural Preservation

Visualization as a field can be defined as the process of turning data into interactive images to provide insight or knowledge to a user. With the new innovations of virtual reality hardware, these new technologies can also be utilized in the field of visualization, rather than just for entertainment. My research portfolio and poster highlights two visualization projects that I have created that utilize current virtual reality hardware, the HTC Vive and the University of Hawai‘i at Mānoa’s Laboratory of Advanced Visualization and Applications (LAVA) Destiny-class cyberCANOE. The At-Risk Artifact Visualization System will allow users to view and study 3D models of archaeological artifacts and sites that are considered “at-risk” within the cyberCANOE. “At-risk” in this case is defined as: an archaeological artifact or site in danger of destruction by either human or environmental influences. Kilo Hōkū, optimized for the HTC Vive, is an immersive virtual reality simulation to aid in the visualization and education of Hawaiian star navigation practices. The goal of this portfolio is to both demonstrate the possibilities virtual reality has for the field of visualization, and how visualizations can aid in cultural and heritage preservation.

Mentor: Jason Leigh
Placenta Specific Upregulation of the Glucose Transporter Glut1: Plasmid Construction and *in vitro* testing

A multitude of health complications arise from obesity. In pregnant women, maternal obesity predisposes both the mother and fetus to additional health problems. One health complication is macrosomia, a condition in which the fetus is large for gestational age. This may lead to complications during delivery as well as a higher likelihood of developing early onset diabetes, hypertension, and metabolic syndrome later in life. The placenta, the organ responsible for transporting nutrients to the fetus, represents a promising target for interventional strategies. Limiting nutrient transfer from the placenta to the fetus presents an innovative approach in preventing fetal overgrowth. Since glucose is one of the main molecules transported through the placenta, it has been hypothesized that excess glucose is one of the contributing factors to this condition. This project is focused on providing a way to study the role Glut1, the most abundant glucose transporter in the placenta, has on fetal growth. Consequently, we’ve constructed a plasmid containing a copy of *Glut1* under the control of *Cyp 19l.1*, a promoter that restricts expression to the placenta. This vector was also designed to include a transposon system, *PiggyBac*, that will be used to create a line of transgenic Glut1 knock-in mice. We tested this vector in vitro and compared transgene expression and genomic integration in human placental choriocarcinoma (BeWo) and human embryonic kidney (Hek293) cells.

Mentors: Dr. Johann Urschitz, Dr. Stefan Moisyadi
The Differential Effects of _Symbiodinium_ Type, Coral Color and Light Intensity on Growth in the Coral Species, _Montipora capitata_

Coral bleaching is a widely known and devastating phenomenon affecting the health of coral species. However, other factors such as growth can be a determining factor for life or death in a competitive reef environment. _Montipora capitata_ is a dominant reef-building coral species found in Kāneʻohe Bay, Oʻahu. They rely on their algal endosymbiont partners, _Symbiodinium_, that through photosynthesis generate nutrients needed for coral growth. Colonies of _Montipora capitata_ in Kāneʻohe Bay associate with _Symbiodinium_ in clades C or D. Here we investigate how _Symbiodinium_ type influence coral growth at different light environments (% irradiance). Coral fragments (<5cm) were collected from Reef 13 at depths of 2-3m from tagged parent colonies with a known history (qPCR) of being clade C (120 fragments) or clade D (120 fragments). The coral fragments were divided into four different light exposures using shade cloth: 100% (control) and reductions to 75%, 25% and 5%. Growth was measured by buoyant weighing the fragments every four weeks for three months. Preliminary evidence shows that the dominant _Symbiodinium_ type plays an influential role in regards to coral growth in _Montipora capitata_ (C > D) when light exposure is high. However, there is no significant difference in growth due to clade type in treatments with low light. Understanding how _Symbiodinium_ effects coral growth in different light environments can help us understand how corals will respond (or recover) in different locations on the reef during stress events occur.

Mentor: Ruth Gates

Co-Authors: Shayle Matsuda, Raphael Ritson-Williams, Ross Cunning and Ruth D. Gates
Our “Constitutional Constellation”: The “Fixed Star” of Religion Jurisprudence in the United States

Religion is an impossibly hard term to define, but our Constitution asks, in the First Amendment, that we provide a legal definition of religion so that we can both freely exercise and disestablish that “religion.” While the tension between these two contradictory interests provides the backdrop for this study, my paper seeks to put forward a suggestion on how to cut through religious discourse and create more even terrain in religion jurisprudence. Through analyzing Supreme Court decisions in *Minersville School District v. Gobitis*, *West Virginia State Board of Education v. Barnette*, and *Lynch v. Donnelly*, I conclude that if we can separate out the word “religion” from the discourse that it represents and start conversing about religion in a more nuanced way, the state of religion jurisprudence will begin to clear a way for us to discuss religious discourse in legal studies and simultaneously figure out what to do about it.

Mentor: Dr. Kathleen Sands
The Historians’ Oxymoron: Tragedy Discourse in Cold War Historiography

The success of the Allies in World War II “had always depended upon the pursuit of compatible objectives by incompatible systems,” remarked John Lewis Gaddis, famed orthodox historian of the Cold War. That fact led Winston Churchill to conclude his memoir series with the title *Triumph and Tragedy*, but all throughout the Cold War and afterward, historians would continuously invoke the same word—tragedy—to different ends. Analyzing revisionist historian William Appleman Williams’ central work *The Tragedy of American Diplomacy*, revanchist historian Martin Malia’s seminal work *The Soviet Tragedy*, and Gaddis’ article “The Tragedy of Cold War History,” I start to pull apart how these historians treat the word so that we can begin to understand the ways in which contemporary discussions of the Cold War are so affected by these different points of view, which all inevitably return to a discussion of tragedy.

Mentor: Dr. Suzanna Reiss
In Truth We Trust

“I give you truth in the pleasant disguise of illusion,” writes Tennessee Williams in The Glass Menagerie. But what is truth? And how do we define such a thing in the post-truth era? Is it the responsibility of fiction to continue towing the line of writing truth when truth itself is so greatly questioned? Such is the premise of this collection of fictional documents weaved through a narrative about a woman searching for her missing best friend in a town where mysterious town-wide blackouts threaten to destroy individual and institutional memory. Blending (and blurring) the lines between what is real and what is true, In Truth We Trust seeks to explore how real something can be if it isn’t true and how true something can be when it isn’t real.

Mentor: Professor Shawna Yang Ryan
Lipofibroblast Specific Transcription Factor Required for Lung Alveolar Development

Respiratory Distress Syndrome occurs in preterm births. These immature lungs lack pulmonary surfactant normally produced by type II alveolar cells in late gestation. The discovery of signaling pathways that promote maturation of type II cells could reduce time spent in the neonatal care units. Tcf21, a bHLH transcription factor, is expressed during lung development, and loss of Tcf21 leads to respiratory failure and dysregulation of Wnt signaling. I hypothesize that lipofibroblasts secrete Wnt ligands to induce type II alveolar cell differentiation. Using genetically engineered mice that permit isolation of ribosomes from Tcf21 lineage cells, I determined the profile of Wnt ligand RNA expression. To determine if Tcf21 is sufficient to induce these Wnt ligands, Tcf21 was overexpressed in primary lung fibroblasts. Tcf21 overexpression resulted in increased levels of Wnt 2, Wnt 2b, Wnt 4, and Wnt 5a, suggesting that Tcf21 promotes expression of these four Wnt ligands. Expression of Wnts by Tcf21 was investigated in vivo by isolating ribosomal associated RNA from Tcf21 control and null cells. Quantitative PCR demonstrated some Wnt ligands were expressed by lipofibroblasts, that both Wnt2 and Wnt5a were expressed by lipofibroblasts in vivo. Further more, data from Tcf21 mutant lungs demonstrated a loss of lipofibroblasts with subsequent reduction in type II alveolar cells. Future experiments will determine if expression of any of the Wnt ligands is disrupted in the absence of Tcf21. Findings from these studies indicate that lipofibroblasts are necessary for type II cell differentiation and that Wnt ligands may be involved.

Mentors: Dr. Michelle D. Tallquist, Dr. Juwon Park
Designing of Landing Trajectories Using Forward and Backward Propagations

By 2020, NASA is planning to conduct a rover mission in order to collect samples and data in search of possible signs of life on Mars. To obtain quality results, scientists believe that exploration into hazardous, uneven terrain is essential. In order to successfully land on such terrain, a triad of phases must be completed; the first being entry into Mars’ atmosphere, the second being the descent phase, and the third being the landing phase. Although landing on Mars has already been achieved, precision landing, within one kilometer of the landing site, still remains a problem. In this study, the third phase is focused on entry, descent, and landing maneuvers by setting a few assumptions and using backward and forward integration techniques to conduct simulations in MATLAB. Through the use of forward and backward integration, manifolds of possible trajectories are created and the trajectories are adjusted by altering numerous lander parameters. Backward and forward integration traces the lander trajectories between the surface of Mars and the atmosphere, but from varying perspectives. In addition to analyzing each iteration and combination of parameters that meet the landing maneuver requirements, an analysis of fuel consumption efficiency will be determined for each trajectory. The expected result is that the lander parameters of specific impulse and thrust to weight ratio will heavily influence the trajectory of the lander and its ability to land precisely.

Mentors: Dr. Dilmurat Azimov (Advisor), Melissa Onishi (Mentor)
Hula in Japan

Hula has spread worldwide and especially built its reputation in Japan. From the creation of hula festivals, participation in the “Hula Olympics”, the prestigious Merrie Monarch Festival, and the opening of many hālau (hula schools), Japan has demonstrated hula’s influence and popularity. Hula is credited with preserving the Hawaiian culture and building teamwork, confidence and communication are some of the many values that are universal within the Hawaiian and Japanese cultures, in which hula can serve as an intercultural communicator that connects them. The Japanese population currently faces high suicide rates, stress levels, and overworking. Japan’s youth aged 16 through 25 have been the primary experiencers of these concerning issues which are yet to be resolved and acknowledged.

This thesis investigates the influence of Ka Lei Makamae, a hula program first run by kumu hula Blaine Kia in August 2017 and specifically targeting 16-25 year olds. This program not only teaches hula, but also incorporates Hawaiian themed activities that are important to both Hawaiian and Japanese cultures and pertinent to the issues mentioned above. Examining the efficiency of the program by focusing on hula’s outcomes, this study includes data from surveys and interviews before and after the program sessions, as well as supplementary surveys and interviews from haumana (hula students) of hālau within Japan and Hawai‘i. The findings show that hula has a positive impact on Japanese youth, specifically for this study’s purposes as a tool to increase intercultural communication skills, including teamwork, confidence and communication.

Mentors: Dr. Jayme Scally, Dr. Hanae Kramer
Pilot Study to Determine the Glycemic Response of Okinawan Sweet Potato

The overconsumption of calorie-dense and nutritionally poor foods, specifically those with a high glycemic index (GI), has been demonstrated to induce oxidative stress and chronic inflammation, known etiological factors of insulin resistance and type 2 diabetes (T2D). A healthy diet has been associated with longevity and few chronic diseases among the Okinawan population. The Okinawan sweet potato (OSP) is one of the primary carbohydrate sources in their diet. OSP has high amounts of resistant starch (RS), imparting a prebiotic effect. OSP is also a widely consumed and culturally relevant food in the Hawaiian Islands. The goal of our study is to identify the correlation between RS content of boiled OSP and its effect on postprandial glycemic response in healthy individuals. Based on literature reviews we hypothesize that consumption of OSP will result in lower postprandial glycemic responses in participants due to its high RS content. Participants’ glycemic responses will be measured using One Touch Ultra fingertip blood glucose meters over the course of six 30-minute intervals for two hours. RS in OSP will be measured according to published protocol using a commercial resistant starch assay kit. Results from our study are expected to aid the local population in making informed and healthier choices when choosing starch based foods for consumption. This project is supported in parts by Undergraduate Research Opportunities Program (UROP) and NIFA, USDA (HAW05023-R, HAW00598-H, W3122, HAW00526-H, 2004-34135-15182).

Mentor: Dr. Pratibha Nerurkar
Colonialism and its Biological Effects in the Mariana Islands and Adjacent Locals

The process of European colonialism is recognized as a watershed event in world history, one that had a significant effect on the health of indigenous populations. The first recorded account of European-indigenous contact in the Mariana Islands was in 1521 and is considered the earliest of any European colonialist effort in Oceania. The ambiguous nature of this colonization process, as well as the fact that the Marianas case represents the initial colonization of the Pacific, make this case an attractive arena for analysis. This research project sought to study the stresses exhibited on the human skeleton and their potential connection to European contact utilizing a skeletal collection unearthed in Saipan. The original analysis of these skeletons was combined with previous analyses of collections from the region to understand the biological effects of Spanish colonialism. This project used both metric and non-metric analyses including assessments of age, sex, and overall health of the individual, as well as estimation of stature. Additional analyses, reports, and data from International Archaeological Research Institute, Inc. and other sources were systematically surveyed and recorded to locate the presence or lack of similar indicators of contact. This combination of sources allowed for an analysis of over 1,000 individuals. In this grouped series it was found that health in the Mariana Islands fluctuated through time. Marked variation in the biological manifestation of colonialism can be seen in different regions of the world associated with Spanish intrusion, highlighting the mutability of colonial interaction.

Mentor: Seth Quintus
Experimentally Evolving a Virus to Test Evolutionary Models

The field of evolutionary biology seeks to understand the historical relatedness among species. Evolutionary biologists use DNA sequence data and statistical models in order to infer this evolutionary history and depict it as a phylogeny—a tree-like diagram that begins with a common ancestor and uses diverging branches of variable length to denote the relatedness and amount of evolution between organisms. If the statistical models that the field relies on is incorrect or overly simplistic, the resulting inferences about evolutionary history may also be incorrect. Here we construct a test of the accuracy of these models by experimentally evolving the bacteriophage T7. We evolved the virus by serially propagating it along a known phylogeny that branches into 25 descendant lineages. Upon completion of the experimental evolution portion of the project, we will sequence the complete genomes for the final generation of each lineage, the ancestor at each branching point of the phylogeny, and the initial lineage with which we started. Using these data, we will reconstruct the evolutionary history of the group using several alternative statistical models that seek to describe various aspects of the evolutionary process. By comparing the evolutionary history estimated under different statistical models to the known history, we will assess the adequacy of these models and the accuracy of phylogenetic inference itself.

Mentors: Dr. Robert Thomson, Dr. Floyd Reed
Developing Residential Direct Load Control for Residential Water Heater Demand Response

In our quest to move away from generation of power from finite resources and turn to renewable energy, we face the problem of intermittent generation from wind and solar which have been a source of destabilization of the power grid. This project focuses on providing stabilization for the power grid by coordinated control over loads—matching load to available generation. This strategy is known as demand response. Specifically, we have developed a network connected device using simple and cost efficient components which provide sensor data and control over water heater loads. Our laboratory has developed a market for demand response resources in order to incentivize consumers to participate. At each timestep throughout the day, the water heaters report estimated available responsive load. This load was then auctioned in this market using a networked Stackelberg game. The main focus of this work was on the implementation of this market for demand response with water heaters and the development of appropriate low cost devices for data acquisition and control. The devices were installed in several homes to collect historical data which was used as a baseline for optimization strategies. Future will include comparative studies for feasibility and performance of market and optimization strategies. Data collected from the devices will be utilized to create simulated device nodes which will be used to develop further simulations and studies.

Mentor: Dr. Reza Ghorbani
Anxiety and Attention: How Attention Can Be Modulated

Introduction: The attentional control theory posits that anxiety increases distractibility. However, a systematic manipulation of stress and its effects on one’s ability to attend to relevant information has yet to be conducted. This study does precisely this, and also measures how a person’s baseline anxiety level can modulate this effect.

Methods: This study manipulated stress levels by varying feedback (inaccurate, accurate, none) on a visual recognition task. Participants were instructed to detect picture repetitions while listening to an irrelevant stream of sounds, some threatening and some neutral, as anxious individuals are more likely to be distracted by threatening distractors. A recognition task for sounds was utilized to test distractibility after the visual task. It was hypothesized that participants who scored higher on the anxiety measure would recognize more sounds, given that they should more distractible. Feedback further modulates this, with the most stressful condition (inaccurate feedback) leading to enhanced recognition (i.e., due to increased distractibility).

Results: Preliminary results failed to show a significant difference in the ability to detect target repetitions between participants with traits of social anxiety (M=0.24, SD=0.057) and those without social anxiety (M=0.27, SD=0.014); t(2)=0.7223, p>0.05. A non-significant trend in the opposite direction was observed in the recognition test. The social anxiety group recognized fewer sounds (M=0.61) than the non-social anxiety group (M=0.72).

Conclusion: Preliminary results suggest that stress does not affect memory, regardless of if the individual shows traits of social anxiety. These findings will be discussed in regards to the attentional theory.

Mentor: Dr. Scott Sinnett
Margo Steines
English
Arts & Humanities – Creative
Participation for Honors
Oral Presentation: Session 3 (11:30a-12:20a) in Sakamaki B102

Brutalities

“Brutalities” is a collection of linked creative nonfiction narratives that discuss physical pain, violence, and the body through the lenses of endurance sport, homestead agriculture, and sadomasochism. This novella-length memoir is an investigation into the nature of pain and its relationship to memory, storytelling, and the body, written in conversation with contemporary and canonical work on physical extremity.

In choosing to refuse taboos around various forms of violence, and to push back against the cultural enforcement of secrecy and euphemism concerning these taboos, I looked to the body of literary and theoretical work on violence and sexual taboo. I also looked at work that explores the normalization of violence and suffering in agriculture and in extreme sports. I sought to tell the truth of my own experience, in the tradition of feminist testimony.

Mentor: Professor Shawna Yang Ryan

[CONTENT WARNING: contains readings and images of sexuality [S/M], violence, and animal slaughter]
Sea Level Rise Triggering Widespread Coastal Hardening and Environmental Destruction on Hawaiian Shores

In Hawaiʻi, protecting beach resources helps to preserve a high quality of life for residents, is critical to our tourism-based economy, and preserves an important coastal environment that is crucial for a number of endangered endemic and indigenous species. However, narrowing and loss due to shoreline hardening continues to threaten Hawaiian beaches. Additionally, sea level rise accelerates erosion and may also accelerate the hardening of shorelines throughout the state. Thus, modeling future beach vulnerability to hardening provides important data for developing resource management plans. We model future erosion for 0, 0.15, 0.3, 0.6, and 0.92 meters of sea level rise for the entire island of Oʻahu. Results show near-term sea level rise of 0.15 to 0.3 m triggering a cascade of seawall applications, risking sensitive beach resources. We conclude that current and near-term sea level rise, not future sea level rise, poses the greatest threat to critical habitat and therefore the greatest priority for management planning exists now.

Mentor: Dr. Chip Fletcher
Zika Virus Detection in Urine and Saliva of Pregnant Guinea Pigs

Zika virus (ZIKV) has recently emerged as a new public health threat. ZIKV infections have caused a wide spectrum of neurological diseases, such as Guillain-Barré syndrome, myelitis, meningoencephalitis, and congenital microcephaly. No effective therapies currently exist for treating patients infected with ZIKV. Diagnosis of ZIKV infection remains difficult. ZIKV infection can be diagnosed by conducting qRT-PCR on serum specimens. However, the window of detection is small since viremia is short-lived and usually undetectable by the end of the first week after infection. Studies with ZIKV-infected patients have suggested that viral RNA persists in the urine and saliva for a longer period of time than in serum. ZIKV RNA has also been detected in semen and vaginal secretion. Our laboratory has previously demonstrated that guinea pigs infected with ZIKV display clinical signs of infection and have detectable viremia in whole blood and serum. The goal of this project is to evaluate the presence of ZIKV RNA in urine and saliva samples collected from ZIKV-infected pregnant guinea pigs at various time points after infection. Viral RNA was extracted from all urine and saliva samples and converted to cDNA. Viral loads were assessed against standards using qRT-PCR. Results from this study will have a significant impact on determining the feasibility of using various bodily fluids tested via RT-PCR as a non-invasive method of screening for ZIKV RNA in pregnant females. Further, the data will enhance our understanding of the role of various bodily fluids in ZIKV transmission.

Mentor: Dr. Vivek R. Nerurkar

Co-Authors: Francine Azouz, Shannon Kutscher, and Mukesh Kumar
I have always loved the way reading can transport you, especially during the most difficult periods in life. When I was a little girl, I used to rely on stories to get me through the darkest times and admired the way a good book could make even the most insurmountable odds appear possible. I dreamed of being a writer, and crafting the kind of stories that changed my life. Reading is still my favorite escape, and I still love getting lost in a book. Authors like Neil Gaiman, Kurt Vonnegut, C.S Lewis, George R.R Martin, Madeleine L’Engle, and many others, have inspired me to write my own stories. I am especially interested in adapting fairy tales and myths into unique stories that appeal to both the modern generation as well as those who love classics. For my Honors Thesis, I chose to adapt a series of classic fairy tales into new, fresh tales that appeal to all ages of reader. My collection includes four adaptations entitled “White as Snow, Red as Blood”, “Ashes to Ashes”, “Tyger, Tyger”, and “Red Rose, White Wolf” based on “Snow White”, “Cinderella”, “Bluebeard”, and “Beauty and the Beast”. The reason I am drawn to this type of fiction is because we are a culture that has grown up on stories of princes and princesses, dragons and dragon slayers, and happy endings. These tales are not only important, but vital, as they both inspire and caution us, letting us know that while anything may be possible, maintaining morality is also important. Thus, fairy tales have the power to shape and change lives.

Mentor: Dr. Cristina Bacchilega
The Role of TEL2, an mTOR Stabilizing Protein, on the Cell Survival of Cardiomyocytes Against Ischemic Stimuli

The aim of this study is to take a glance at how stabilizing mTOR (mechanistic target of rapamycin), a cardioprotective protein, can potentially affect cell survival in cardiomyocytes. More specifically, how ischemic stimuli may affect cell survival. My hypothesis is that stabilization of mTOR provided by TEL2 binding via adenoviral transfection will enable increased levels of both mTORC1 and mTORC2 complexes, to positively affect and increase cell survival in cardiomyocytes, thus providing a cardioprotective effect against ischemic stress byproducts, such as hydrogen peroxide.

Previously, the Matsui Lab has reported that cardiac mTOR protein protects the heart against ischemia in *in vitro* and *in vivo* models of heart attacks. However, it is difficult to manipulate the gene in cardiac cells using current gene transfer techniques due to the fact that mTOR is a large (~289 kDa) protein. The molecular size of TEL2 (~75 kDa) is more reasonable candidate for generating recombinant adenoviruses (Ad.). Therefore, gene transfer for AdTEL2 is a feasible method and therapeutic strategy in order to regulate cardiac mTOR stability and expression for this experiment.

Understanding cell survival is crucial for determining how to prevent detrimental conditions from spreading around the heart after a traumatic injury such as myocardial infarction. By examining the effect of mTOR complex manipulation through the use of TEL2 protein, evidence gained from the study can be used to further prevent post-ischemic pathologies, such as fibrosis and cell death.

Mentor: Dr. Takashi Matsui
Characterization and Positional Cloning of the Maize Mutant *Hairy Sheath Frayed2 (Hsf2)*

The purpose of this study involves studying a new maize mutant named *Hairy Sheath Frayed2 (Hsf2)* that alters both leaf growth and leaf development. *Hsf2* mutant plants have short, narrow leaves with unusual tissue growing out from the leaf blade margin and a “hairy” appearance due to more and larger macrohairs. This mutant phenotype is unique and suggests the mutated gene controls an essential function of leaf growth and development. Previous work showed the *Hsf2* mutant phenotype is caused by a single locus inherited in a semi-dominant manner. The locus is located on chromosome 5 between coordinates 203.5 Mb and 203.8 Mb, of the reference maize genome. This region contains 2 candidate genes. In order to better understand how the *Hsf2* mutant affects growth and development and to identify the underlying gene, a detailed characterization of the *Hsf2* mutant phenotype was performed and one of the two candidate genes was sequenced to locate nucleotide differences between the progenitor inbred A619 and the *Hsf2* mutant. Results from my phenotype and sequence analyses will be presented. The results of this analysis are important in order to fully understand how development influences crop growth and yield. In addition, these genes might be useful for modifying plant development in order to improve agronomic traits using plant breeding or genetic engineering technologies.

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

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