Undergraduate Research and Creative Work

13 December 2019 – 10:15am to 1:30pm
Sakamaki Hall & Sinclair Library Heritage Reading Room
Honolulu, Hawai‘i
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<tr>
<td>10:15-10:35a</td>
<td>Registration</td>
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<td>10:35-10:40a</td>
<td>Opening Ceremony</td>
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<td>10:45-11:30a</td>
<td>Oral Presentations</td>
<td>Sakamaki Breakout Rooms</td>
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Please join us for the release reception of volume IV of the Mānoa Horizons undergraduate journal

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Sakamaki Hall Breakout Rooms
Oral Presentations 10:45 - 11:30a

B102 Natural Sciences
B103 Natural Sciences
C101 Engineering & Computer Sciences
Arts & Humanities
C102 Social Sciences
C103 Social Sciences

Please join us for the release reception of volume IV of the Mānoa Horizons undergraduate journal. See page 24 for more info regarding this event.

Sinclair Library Heritage Reading Room
Student Author Panel 11:45a - 12:30p
Lunch 12:30 – 1:30p
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<td>Jenny Fang</td>
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**Sakamaki B102**

**Ma Carmela Therese**
Characterization of Hypoxia-Regulated MiRNAs After Myocardial Infarction

**Malakhi Reynolds**
Seed Drought Tolerance of *Leucaena leucocephala, Dodonaea viscosa, & Sophora chrysophylla*

**Courtnie A. Yokono**
Optimal Concentration of TPPU to Decrease Neuroinflammation in Alzheimer’s Disease

**Sakamaki B103**

**Jenny Fang**
The Involvement of Epigenetics in Cave-Associated Evolved Traits

**Megan Gonsalves, Elizabeth Loschert**
Developing Scoring Functions to Interpret Hawai‘i Soil Health Indicators

**Kyra Jacobson**
Resiliency of *Toxoplasma gondii* in decomposed Hawaiian spinner dolphin tissues
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<td>Noah Domingo, Piers O’Harrow: Mixed Reality with a Therapeutic Application</td>
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<td>Sakamaki C102</td>
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<td>Adam Guzman: A Retrospective Case Study of Injuries Affecting Surfers on the Hawaiian Islands</td>
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<td>Robert Nieto: Addressing Obesity Through Food Access and Nutritional Education Among Native Hawaiian Youth in Hawai‘i: A Political Analysis</td>
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<td>Nicole Graham: Improving Access to Water, Sanitation, and Hygiene in Children</td>
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<td>Sakamaki C103</td>
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<td>Promoting Health Literacy and Active Patient Involvement through Infographics</td>
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Alian Anjum

Riko Lee
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:

Noah Domingo, Piers O’Harrow
Megan Gonsalves, Liz Loschert

Abstracts are direct from presenters; wording and content are the author’s responsibility.
Characterization of Hypoxia-Regulated MiRNAs After Myocardial Infarction

Myocardial infarction (MI) compromises oxygen supply to the heart, often leading to decreased heart function and contractility. The hypoxic response is mediated by Hypoxia Inducible Factor 1 (HIF-1), a transcription factor regulating metabolism, angiogenesis, and erythropoiesis. Previous research has identified miRNAs miR-125a and miR-351 to be dysregulated after MI in cardiac mouse models. Predicted targets of these miRNA are Xin actin binding repeat containing 1 (XIRP1) and Factor Inhibiting HIF (FIH). XIRP1 is a protein found in the intercalated discs of the heart and is thought to maintain structural integrity. FIH aids in the degradation of HIF-1α in normoxic conditions by hydroxylation of an asparagine residue, inhibiting the binding of p300 and transcriptional activity of HIF. Using RNA sequencing and bioinformatic analysis, miR-125a and miR-351 were found to be dysregulated in infarcted tissues along with their predicted mRNA targets FIH and XIRP1, suggesting potential regulation of XIRP1 and FIH through miRNA-targeted mRNA degradation. The objective of this project is to confirm our bioinformatic predictions by analyzing protein level expression of XIRP1 and FIH in ischemic regions of the heart and assessing direct inhibition of FIH and XIRP1 mRNA expression by miR-125a and miR-351. Western blotting was conducted to examine protein expression levels of XIRP1 and FIH on ischemic and remote regions from heart tissue of 1 or 3-day post-MI mice. In the ischemic regions of 3-day mice, FIH protein abundance decreased, whereas XIRP1 protein signaling increased. Luciferase assays were used to determine potential miRNA inhibitory actions on 3’UTR regions of FIH and XIRP1. XIRP1 transcripts appear to be regulated by miR-125a and miR-351, while FIH appears to be regulated only by miR-125a. These data suggest possible alterations in cardiac contractility and amplification of the hypoxic response may be regulated by miRNAs after ischemic injury.

Mentor: Dr. Ralph Shohet
An Exploration of Information Processing and Recalls

State-dependent learning suggests that memory can be enhanced if either physical or mental states can be matched at encoding and retrieval (Godden & Baddeley 1975). The current research extends this effect (Goodwin et al., 1969) to conditions involving food, under the assumption that in academic settings many students study while simultaneously eating some type of snack. Specifically, we used a sample of university students to test whether eating a snack while studying and when being tested at a later time would lead to increased performance on a test covering the studied material. We further tested this notion by varying whether participants received food or not at both encoding and retrieval, and whether the same food was consumed at retrieval, or not. Participants were presented with an article to read and were asked to memorize as much information as possible. They were then subsequently tested on this material after a short delay of 10 minutes. The results showed that the group that received the same food at both encoding and retrieval stages performed statistically better in the memory test than the group that received different types of foods at both stages, or no food. Interestingly, the group that did not receive any food did better than the group that received different foods, suggesting increased specificity for stimulus type in state-depending learning, with incongruent food conditions perhaps leading to a detriment in performance.

Mentor: Dr. Scott Sinnett
Jolie Ching  
Computer Science  
Engineering & Computer Sciences  
UROP  
Oral Presentation in Sakamaki C101

Designing a Virtual Reality Visualization of Hawaiian Geographical Knowledge

Digitizing Detours is a virtual reality visualization of Moloka‘i based on the stories of the island told within *Detours: A Decolonial Guide to Hawai‘i* by Dr. Vernadette Gonzalez and Hokulani K. Aikau. This project seeks to answer the question: Can a virtual environment accurately represent a culture that is historically reliant on oral stories and performance rituals? By including Kanaka Maoli geographical elements that are typically absent from Western maps, Digitizing Detours will grant users an interactive and immersive experience of Moloka‘i via a Kanaka Maoli cultural-geographic lens. Geographical details featured in the visualization include 360° footage of the areas surrounding the loko i’a, ahupua’a divisions, celestial bodies, day/night cycle, weather patterns, and oral stories from the locals. With this visualization, we aim to bridge emerging media technologies and Kanaka Maoli culture to represent their place-based knowledge systems that act as a repository of cultural knowledge. The resulting virtual reality and web application will be used as a foundation for future mapping projects of other Hawaiian islands as well as an educational supplement to be utilized by the kia‘i of Keawanui loko i’a, readers of *Detours*, or anyone interested in learning about Moloka‘i.

Mentor: Dr. Jason Leigh

Co-Author: Kari Noe
Noah Domingo, Academy of Creative Media, Japanese Minor
Piers O’Harrow, Academy of Creative Media
Arts & Humanities - Creative
UROP
Oral Presentation in Sakamaki C101

Mixed Reality with a Therapeutic Application

(no abstract submitted)

Mentor: Brittany Biggs
The Involvement of Epigenetics in Cave-Associated Evolved Traits

Many organisms have rapid adaptation histories during their evolutionary processes, yet some are too rapid to be explained by classical genetics. The cave-dwelling blind morph of the Mexican teleost, *Astyanax mexicanus*, has evolved behavioral and morphological phenotypes which are adaptive to dark, nutrient-poor environments. Cavefish phenotypes include regressed eyes, albinism, and cave-type behaviors such as vibration-attraction foraging, continuous food-seeking, and sleep loss, which are distinct from the surface-dwelling morph. The cavefish genome, however, has no coding mutations in the known responsible genes for eye-loss and other cave phenotypes. Instead, a recent study presented epigenetic modification as a major factor for eye regression. Cavefish express higher levels of dnmt3bb.1, an epigenetic DNA methyltransferase, in the eyes and have increased methylation in promoter regions of key eye genes. However, the critical developmental periods of epigenetic regulation and its involvement in other cave-adaptive phenotypes have not yet been addressed. Here, we pharmacologically inhibited the epigenetic methylation system during the first and second weeks of larval development. A methylation inhibition cocktail composed of decitabine (DAC) and valproic acid (VPA) were used to reduce *de novo* methylation in both morphotypes for a week duration at high and low concentrations. Cavefish treated during the first larval week showed recovered eye roundness and larger eye area relative to the control and to the second larval week treatment. We are further testing whether sleep loss is under epigenetic regulation by building a new sleep assay system. These results will contribute to the knowledge on evolutionary mechanisms for rapid adaptation.

Mentor: Dr. Masato Yoshizawa

Co-Author: McLean Worsham
Developing Scoring Functions to Interpret Hawai‘i Soil Health Indicators

Evaluating the health of soil is foundational in successful and sustainable agriculture, but currently there is not a soil health index that is applicable to the diverse range of Hawaiian soils. The purpose of this project is to develop soil health scoring functions calibrated for the soils of Hawai‘i that can be used within a soil health index for the state. This project consists of in-field sampling followed by laboratory analysis of 90 samples that encompass a range of soil types most prominent in Hawai‘i. Soils are categorized into high activity clays (Vertisols, Mollisols, Inceptisols), low activity clays (Oxisols and Inceptisols), and amorphous clays (Andisols). Six indicators representing the chemical, physical, and biological soil properties will be measured for the scoring functions. Values determined in laboratory analysis will be interpreted using a probability scale that runs from very low to very high to allow scoring. Through testing a variety of soils from a range of land uses, scoring functions were able to be determined. This information is extremely useful to the study and protection of Hawaiian soils, as well as the continued use for agriculture. Having a soil health index that is accurately calibrated for Hawai‘i will allow farmers and land managers to more successfully evaluate and protect soil that is needed to support sustainable food production and agriculture.

Mentor: Dr. Jonathan Deenik
Universal access to clean, affordable water and basic sanitation and hygiene (WASH) practices are commonplace luxuries for most of the world. However, due to lack of infrastructure, government funding and coordination, and access to proper facilities, millions of people worldwide struggle to meet these basic needs. A lack of these fundamental practices results in an incidence of many preventable and often fatal diseases, undernutrition, and school absenteeism. These issues especially impact children as diarrheal diseases are the second largest killer in children under five. However, diarrheal diseases are completely preventable with proper sanitation and hygiene practices. Various initiatives are being taken to combat these issues including community health clubs, hygiene and sanitation education in schools, and improvements to infrastructure. This project analyzed several existing WASH programs and developed an integrated approach that is economical and sustainable.

Mentor: Dr. Denise Nelson-Hurwitz
Surfing is a popular leisure activity that comes with a high risk of injury that may participants fail to mitigate. The following research examines surfing injuries within the Hawaiian Islands and explores ways that these injuries can be prevented. It is hypothesized that surfing on a reef or sand break will be predictive of severe injuries to the head and face region and producing an innovative surf helmet would reduce these injuries.

A retrospective review of the trauma registry from the main trauma center in Honolulu, Hawaii was conducted on patients admitted between January 1, 2014 and December 31, 2018. 143 patients were included and analyzed. The majority were adult (89.5%), male (85.3%), non-residents (53.2% = 37.8% U.S. Non-residents + 15.4% International). Spine (35.1%), face (17.5%), and head (12.3%) were the most common regions injured. The types of injuries included fractures (59.4%), lacerations (28.7%), contusions (22.4%), concussions (4.9%) and incomplete and complete quadriplegia (7.00%).

Sustaining an injury on Maui was predictive of an overall severe injury, and particularly, severe spinal injury, as was being a patient from the mainland United States. Those who sustained severe spinal injuries were likely to remain in the hospital longer than most patients. Those patients who were severely injured were more likely to be discharged to a rehabilitation facility.

Community awareness can be addressed to take precautionary measures with surfers in understanding the risks before partaking in the sport, especially for those visiting the Hawaiian islands.

Mentor: Dr. Sid Johnson

Co-Author: Ashley Marumoto
Deceased cetaceans found in Hawai‘i can be heavily decomposed, and organ tissues are usually not targeted as samples due to assumed lack of scientific value. In nature, the parasite *Toxoplasma gondii* is very resilient and little work has been done regarding the viability in an intermediate host. Tissues from deceased Hawaiian spinner dolphins (*Stenella longirostris*) found off of the coast of Hawai‘i Island and O‘ahu in 2015 and 2019, respectively, were re-tested for toxoplasmosis after various stages of decomposition in an outdoor environment. There were two simulated environments and tissues were tested after 1, 2, 3, 5, 7, 10, and 14 days. Polymerase chain reaction (PCR) and gel electrophoresis analysis were used to test the degraded tissues for *T. gondii* using known affiliated DNA markers. Testing was done on six different tissue types in each animal and showed sample viability at a number of increments of time post-mortem through fluorometer analysis.

Understanding the resiliency of *T. gondii* in a deceased specimen will allow the Marine Mammal Stranding Program team, as well as other researchers, to develop an understanding of when tissue samples may be effectively tested for toxoplasmosis. Additionally, it may allow researchers to find cases that have previously been overlooked. Various tissues were tested to determine if some tissues have a higher capacity to carry *T. gondii* than others. Developing a timeline of when tissues can be sampled will increase the potential scientific value of decomposed cetacean tissues.

Mentors: Dr. Cynthia Hunter, Dr. Kristi West
Currently, the state of Hawai‘i maintains the highest homeless per capita rate in the nation. As of May 2019, a total of 4,453 sheltered and unsheltered homeless individuals were recorded on the island of Oahu. Although this total is a 1% (42 persons) decline from the 2018 statistic, the unsheltered population alone has increased by 12%. Demographically, this represents an increase in unsheltered female Native Hawaiian and/or Pacific Islander minors.

The combination of limited resources, inadequate social support, and low health literacy puts the disadvantaged at greater risk for poor health. This study aims to test the hypothesis that increasing access to simple and concise graphic representations of healthcare strategies through comics and infographics will increase awareness of public health issues and promote active self-management of health problems.

In a one-year retrospective chart review, the Hawai‘i Homeless Outreach Medical Education (HOME) Project accumulated 766 patient visits among nine clinic sites. Data accumulated from this chart review revealed five prevalent chief complaints. Areas of patient health care needs were further contextualized through the assessment of pre-intervention surveys and field notes. Comics on the topic of hypertension, wound care, PPD skin tests, and an infographic on women’s health were created. The impressions of these four health brochures were assessed in a post-intervention survey to determine its efficacy in raising interest in good health management.

The results of this study may reinforce the concept that poor health outcomes are in itself a deeply-rooted problem that commands both infrastructure and deliberate patient participation.

Mentor: Dr. Jill Omori, MD
Addressing Obesity Through Food Access and Nutritional Education Among Native Hawaiian Youth in Hawai‘i: A Policy Analysis

Obesity is an international epidemic that impacts all ethnicities and ages, and has become more prominent over the last few decades. The rise of globalization, processed foods, and a sedentary lifestyles have contributed to the rise of obesity rates, which has subsequently increased diabetes, hypertension, and cardiovascular illnesses that claim millions of lives every year. While obesity itself is a non-communicable disease, there are disparities that have disproportionately affected Native Hawaiian communities in the United States, particularly among youth in Hawai‘i. Risk factors for obesity exist at multiple levels, including at the individual level such as a physical inactivity or socio-economic status, while other factors are present at the governmental level where public policy may support a business agenda over health and wellness. Obesity is a central issue for Native Hawaiian youth. While present statistics illustrate an increase in obesity, there are potential solutions that may be implemented at the policy level. Based on policies selected, and analyzed, immediate recommendations include adoption of a policy centered on nutritious food access in after-school programming, accompanied by physical activity promotion. Policies such as this may provide a bright future for the next generation of Native Hawaiians can live and maintain a healthy weight throughout their lifetime.

Mentor: Dr. Denise Nelson-Hurwitz
Seed Drought Tolerance of *Leucaena leucocephala*, *Dodonaea viscosa*, & *Sophora chrysophylla*

Due to climate change, drought is projected to increase in frequency and duration globally. Vegetation stability will depend on continued seedling recruitment under increasing drought. To investigate seedling drought tolerance in Hawaiian plants, we used an experimental approach with 2 native (*Sophora chrysophylla* and *Dodonaea viscosa*) and 1 invasive (*Leucaena leucocephala*) species. Seedlings were grown from field-collected seeds and initially watered daily. At the 5-leaf stage, seedlings are randomly assigned to a control group with continued daily watering or a drought group with no water for 4 weeks. Following the drought, all seedlings are watered daily for 4 weeks, at which time, half of both groups are harvested. The remaining half are subjected to a final terminal drought to determine how many days they can survive without water. Seedling drought tolerance is measured as the capacity for drought-stressed plants to survive and grow compared to control plants.

Mentor: Dr. Kasey Barton
Packaging for Ultra-Small Microphones

A key issue with creating a microelectromechanical system (MEMS) microphone is to create an effective package. Packaging is necessary to avoid exposure to liquids or environmental debris that could damage the electronic components of the ultra-small microphone. Determining the material of the microphone package and defining different ways to fabricate this component must be considered. Using COMSOL Multiphysics for simulating the different types of materials for packaging was conducted. From the conducted simulation, using plastic materials such as nylon would allow an appropriate amount of sound pressure to flow through the package. Another simulation was done to see how much displacement that a tungsten transducer plate within the MEMS microphone will move in response to sound waves. 3D printing processes such as fused deposition modeling and stereolithography were considered for manufacturing the component. Fabrication phase consists the use of adhesives such as JB clear weld and JB weld steel hardener. The microphone package performed well through the water durability test. The integration process which consists of attachment of the package to a wafer/surface was realistic. We found that the adhesive used to apply on the microphone package has to have an even amount of epoxy to allow a fine bond. With this result, packaging for an ultra-small (millimeter-scale and smaller) microphone is possible.

Mentor: Dr. Joseph Brown
Alzheimer’s disease (AD) is the sixth-leading cause of death in the United States (US) and the fifth-leading amongst those over the age of 65. However, recent studies show that this progressive neurodegenerative disease may actually be the third-leading cause of death in the US. Despite being one of the leading causes of deaths, the origins of the complex mechanisms that manifest this disease are still unknown. A current hypothesis being explored is neuroinflammation, which is an inflammatory response or inflammation of nervous tissue that leads to neuronal death. Preventing the death of neurons by reducing inflammation could be an effective preventative treatment against AD.

A previous study done at the University of Hawai’i at Manoa (UHM) showed that 1-Trifluoromethoxyphenyl-3-(1-propionylpiperidin-4-yl) urea (TPPU) prevents neuronal death. The objective of this study was to find the optimal concentration of TPPU to provide the maximum decrease in neuroinflammation associated in AD in microglia cells. This was done by testing various concentrations of TPPU on microglia treated with lipopolysaccharide (LPS) to induce inflammation over a 24 hour period in an incubator set at 37°C. Measurements of nitrite oxide were determined via Griess assay to determine the decrease in neuroinflammation.

Further optimization of the TPPU concentration is currently being investigated. The completion of this study would give further insight on the potential of TPPU as an anti-inflammatory therapeutic agent against AD.

Mentor: Dr. Qing Li

Co-Author: Meng Xu
ACKNOWLEDGMENTS

MAHALO Ā NUI LOA to Interim UH-Mānoa President David Lassner, Provost Michael Bruno, Associate Vice Chancellor for Research Velma Kameoka, and Assistant Vice Chancellor for Undergraduate Education Ronald Cambra.

STUDENT VOLUNTEERS
We also thank the student volunteers who helped to set up for, run, and clean up these events.

STAFF
The organizers would like to extend a special thank you to their respective office staff for all their hard work behind the scenes during the conference and throughout the year. Thank you to:

Arby Barone Graduate Assistant, Honors Program
Jessie Chen Program Coordinator, UROP
Dr. Siobhán Ní Dhonacha Faculty Specialist/Academic Advisor, Honors Program
Dr. Vernadette Gonzalez Director, Honors Program
Dr. Sue Haglund Educational Specialist, Honors Program
Angel Lepordo Student Assistant, Honors Program
Dr. Creighton M. Litton Director, UROP
Kacie Manabe Communications Assistant, UROP
Dr. Jayme Scally Academic Advisor, Honors Program
Sylvia Wu Educational Specialist, Honors Program
Seung Yang Program Coordinator, UROP
Hyang Yoon Graduate Assistant, UROP

SPECIAL THANKS
Mahalo to our event partners:

Yama’s Fish Market for food and refreshments
Work Coordination Center, Sakamaki Hall, and Sinclair Library for facilities and planning assistance
ACKNOWLEDGMENTS

MODERATORS
We would especially like to thank the graduate students who volunteered to moderate the oral sessions and to lend their experience and expertise to this undergraduate student conference:

Amihan Camson
Jarresa Kiyoko Harris
David Knittel
Mark Oandasan
Angelica Valdez

FACULTY MENTORS
Lastly, we want to acknowledge the time, effort, and expertise that the following faculty mentors gave by advising students on their projects:

Dr. Kasey Barton
Brittany Biggs
Dr. Joseph Brown
Dr. Jonathan Deenik
Dr. Cynthia Hunter
Dr. Sid Johnson
Dr. Jason Leigh
Dr. Qing Li
Dr. Denise Nelson-Hurwitz
Dr. Jill Omori, MD
Dr. Ralph Shohet
Dr. Scott Sinnett
Dr. Kristi West
Dr. Masato Yoshizawa
PROGRAM SCHEDULE
Welcome & Introduction........................Dr. Vernadette Gonzalez, Honors Director
Panel Discussion............................................................Volume IV Student Authors
           Moderator: Dr. Jayme Scally, Editor
Closing..............................................................................Dr. Jayme Scally, Editor

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

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

CALL FOR SUBMISSIONS
We invite students enrolled at UHM during the 2019-2020 academic year to submit work produced within this time frame to be considered for the Fall 2020 issue (Volume V). We encourage submissions from any undergraduate academic discipline.

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

ACKNOWLEDGMENTS
Mahalo nui loa to Mānoa Horizons collaborators:
    Faculty serving on journal’s advisory and editorial boards
    Honors Program
    Undergraduate Research Opportunities Program
    Office of the Vice Chancellor for Research
    Office of the Provost
    Student Authors and their Faculty Mentors
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.

manoa.hawaii.edu/undergrad/honors/

The Undergraduate Research Opportunities Program (UROP) under the Office of the Vice Chancellor for Research (OVCR) coordinates and promotes opportunities for undergraduate students across all disciplines at the University of Hawai‘i at Mānoa to engage in faculty-mentored research and creative work. UROP serves all undergraduate students in all disciplines by offering financial and programmatic support that includes: project and presentation funding; the Summer Undergraduate Research Experience (SURE) and accompanying SURE Symposium; a database of on- and off-campus research and creative work opportunities; and, in collaboration with the Honors program, the Undergraduate Showcase Event.

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