



2021

SURE Summer
Undergraduate
Research
Experience
SYMPOSIUM

July 30



**Undergraduate Research
Opportunities Program**

Office of the Vice Chancellor for Research
University of Hawai'i at Mānoa



UNIVERSITY
of HAWAII®
MĀNOA

Aloha mai kākou,

Welcome to the 4th Annual Summer Undergraduate Research Experience (SURE) Symposium! As we move into the 2nd year of the COVID pandemic locally, nationally and globally, this has undoubtedly been a challenging year in which to attend school, much less engage in faculty mentored research and creative work scholarship outside of the classroom. You have all experienced and surmounted numerous obstacles over the past year, and we are very proud of all of you for not only persevering, but for excelling. Dealing with uncertainty at such an early stage of your academic life will prepare you for resiliency in your personal and professional lives moving forward – a hallmark of participation in undergraduate research and creative work that is even more pertinent for students today. We are all very excited to hear about what you have been working on over the past several months to a year, and in at least some cases longer.

This is the 2nd year that we have held the SURE symposium virtually due to the pandemic. While not the same as an in-person event, this and last year's SURE symposium events are undoubtedly a huge success, with more presentations than we have had over the prior two years of SURE Symposium events that were held in-person. In addition to all of our student presenters, we also look forward to a large audience online, as was the case last year, perhaps one of the silver linings of the pandemic and holding online events where anyone with an internet connection can participate.

In summary, I want to offer a very large *Ho'omaika'i 'ana*, or congratulations, to all of our UG student presenters. I would also like to acknowledge and thank our faculty mentors for your time, energy and dedication to mentoring UG students, particularly in the summer and most importantly during the middle of a global pandemic when campus life has been turned upside down. I know that you don't get the credit that you deserve for doing this, but you are all making large, positive impacts on these student's academic careers, future professions, and overall lives.

I would also like to say *mahalo nui loa* to the great 'ohana in the Office of the Vice Provost for Research and Scholarship (OVPRS, formerly OVCR) and UROP. In particular I would like to thank Velma Kameoka (iVPRS) for her strong and continued programmatic support of UROP, as well as the UROP team who makes all of this possible. In particular, I want to acknowledge the massive effort that Jessie Chen puts into making the SURE and the SURE Symposium possible this and every year. I also want to recognize and thank the rest of the UROP staff for their help, including Seung Yang, Michelle Tom and Deborah Yuan. Collectively, you are a remarkable team and a pleasure to work with. Finally, I want to acknowledge and thank all of our volunteers who are helping us run the many concurrent Zoom sessions, we could not do this without the selfless gift of your time.

Dr. Creighton M. Litton
UROP Director

2021 SURE Symposium

JULY 30, 2021

8:45 am – 1:00 pm HST

Zoom

<u>Time</u>	<u>Activity</u>	<u>Location</u>
8:45 am – 9:00 am	Opening remarks	Plenary Room
9:00 am – 9:15 am	Break	
9:15 am – 10:15 am	Poster Session I	
	Natural Science Special Session: Connecting physical and genetic diversity through plant images	Anuenue Room
	Arts & Humanities; Natural Science	Breadfruit Room
	Natural Science	Coconut Room, Dragonfruit Room, Elepaio Room, Fern Room
10:15 am – 10:30 am	Break	
10:30 am – 11:30 am	Poster Session II	
	Engineering & Computer Science	Anuenue Room
	Natural Science	Breadfruit Room, Coconut Room, Dragonfruit Room, Elepaio Room
11:30 am – 11:45 am	Break	
11:45 am – 12:45 pm	Oral Session	
	Social Science; Arts & Humanities	Anuenue Room
	Social Science	Breadfruit Room, Coconut Room
	Natural Science; Engineering & Computer Science	Dragonfruit Room
	Natural Science	Elepaio Room, Fern Room, Guava Room
12:45 pm – 12:50 pm	Break	
12:50 pm – 1:00 pm	Closing Remarks	Plenary Room

Time**Activity****Location****9:00 am – 12:45 pm****Technical Support****Plenary Room**

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TIME (HST)	Plenary Room
8:45 - 9:00 AM	OPENING REMARKS
9:00 - 9:15 AM	BREAK
9:00 AM - 12:45 PM	(All-day technical support)

POSTER SESSION I (9:15 - 10:15 am HST)												
	Natural Science Special Session: Connecting physical and genetic diversity through plant images			Arts & Humanities; Natural Science			Natural Science					
TIME (HST)	ID	Anuenue Room	ID	Breadfruit Room	ID	Coconut Room	ID	Dragonfruit Room	ID	Elepaio Room	Fern Room	
9:15 AM	1	Connecting Shoot Growth Variation to Genetic Differences in a Maize Diversity Panel Byrceon Tugade, Lydia Rigge	5	The Lili'u Project Caitlin Gaven, Aleta Hammerich	9	Orientation of Dark Matter Halo Symmetry Axes in Latte Galaxies Jay Baptista	13	A comparison of opsin diversity across four Stomatopoda species with morphologically distinct eyes Amir Van Gieson	17	Using receiver functions to image deep crustal structure beneath Okmok volcano Madeleine Tan	21	Detecting Organization of Shallow Cumulus Clouds in the Central Pacific using Artificial Intelligence Emma Layton
9:30 AM	2	Using Support Vector Machines to Model and Classify Phenotypic Differences in Diverse Maize Shoot Systems Elizabeth Swantek, Alycia Tausaga	6	The Use of Cell Lines with Raman-Enhanced Spectroscopy to Characterize Childhood Cancers Jessica Natale	10	High Resolution Infrared Spectroscopy of CO in the Massive Binary Mon R2 IRS3 Amanda Lee	14	A novel approach to exploring epigenetic regulation in the Hawaiian coral <i>Montipora capitata</i> Hanna Mantanona	18	What is the origin of the highly differentiated lava that erupted from the 2018 eruption at Kilauea? Araela Richie	22	Identification of fault scarps for calculating M in mid-ocean ridges Silvia Alemany
9:45 AM	3	Quantitative high-throughput characterization of genetically diverse maize root systems Jesse Mikasobe-Kealinihomoku, Katie Strachan	7	Synthesis of a Planar Chiral Ferrocene for Possible Anticancer Treatment Christian Lopez	11	Analysis of ~3000 Massive High-Redshift Galaxies in the Hawaii Twenty Square Degree Survey Isabella Valdes	15	Developing the use of stationary time-lapse photography to capture fine-scale temporal variation in wetlands in Hawai'i Lauren Katayama, Claire Atkins	19	Analysis of Passive Acoustic Data at Station ALOHA Cabled Observatory Yuliya Kornikova	23	PIDGM: Paleo Isotopic Dynamics with a Global Model Brandon Duran
10:00 AM	4	Using Support Vector Machines to Model and Classify Phenotypic Differences in Diverse Maize Root Systems Livvy Johnson, Germaine Lindsay Juan	8	SN 2015bo: A 1991bg-like Type Ia Supernova with a Twin Willem Hoogendam	12	From Dust to Disks: Uncovering White Dwarf Debris Disks in the UKIRT UHS Survey Anna Gardner	16	Quantifying feral pig rooting across multiple Hawaiian ecosystems Wade Naguwa	20	ALOHA Cabled Observatory Service Cruise Samantha Hanson		
10:15 - 10:30 AM	BREAK											

POSTER SESSION II (10:30 - 11:30 am HST)												
	Engineering & Computer Science			Natural Science								
TIME (HST)	ID	Anuenue Room	ID	Breadfruit Room	ID	Coconut Room	ID	Dragonfruit Room	ID	Elepaio Room	Fern Room	
10:30 AM	24	Implementation of Security System and Solid State Dehumidifier in ATLAS site Rommela Dimaunahan	28	Revisiting Antlia 2's Effect on the Outer Disk Tetsuto Nagashima	32	Uniform Forward-Modeling of Ultracool Dwarfs Using BT-Settl Spencer Hurt	36	Visual Identification and DNA Bar-coding to Resolve Diet Of Endemic and Invasive Baitfishes in the Main Hawaiian Islands Nicholas Camacho	40	Characterizing of Volcanic Features with Drone and Satellite Data at Sierra Negra Johanna Alén-Bella		
10:45 AM	25	Raising Retention with RadGrad Andre Ruiz, Callana Fortin, Trey Sumida, Timothy Huo	29	Searching for Oscillating M Giant Stars in Eclipsing Binary Systems Madison Hara	33	Uncovering Dwarf AGN With TESS Helena Treiber	37	Generating a DNA fingerprint for the traditional Hawaiian Crop Kalo (Taro) Carter Zamora	41	Micro-Raman Spectroscopy of Sulfur Compounds Present in Volcanic Aerosols (Vog) John Fast		
11:00 AM	26	Autonomy Software and Simulation Environment for a Resident Underwater Robot Brandon Yee	30	Group Equivariant Neural Networks for Spectropolarimetric Inversions in Solar Astronomy Michael Ito	34	Uncovering the Origins of Infrared Emission in ULIRGs using Far-Infrared Fine-Structure Lines and a Cutting-Edge Model Maya Joyce	38	Indirect Assessment of Biodiversity with eDNA Brian Van Lee	42	Atmospheric Variables and Their Relation to Rain on Oahu Jacob Flores		
11:15 AM	27	Design of Seafloor USBL Modem Mount Christian Pak	31	Light It Up! High-mass galaxies with High Star Formation Rates in High Density Environments at High Redshift Finn Giddings	35	Multi-Wavelength and Morphological Properties of Galaxies Hosting X-ray Luminous AGN in the GOODS Fields William Jarvis	39	Genome size estimates for a threatened endemic flora Cuyler Yafuso	43	Connecting Radar Derived Rainfall in Hawaii with Weather Conditions Lena Fleischer		
11:30 - 11:45 AM	BREAK											

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ORAL SESSION (11:45 am - 12:45 pm HST)														
	Social Science; Arts & Humanities		Social Science			Natural Science; Engineering & Computer Science		Natural Science						
TIME (HST)	ID	Anuenue Room	ID	Breadfruit Room	ID	Coconut Room	ID	Dragonfruit Room	ID	Elepaio Room	ID	Fern Room	ID	Guava Room
11:45 AM	44	Reproductive Injustice in the Territory of Hawai'i Sarah Hamid	48	Interviewing Zen Buddhists on the Mindful Attention Awareness Scale Validity Tiare Sabellano-Tsutsui	52	The First-Year Experience and Honors: Exploring Successes and Challenges During Pandemic Abigail Jones	56	Prediction of Same Day Discharge in Unicompartmental Knee Arthroplasty Patients using the Outpatient Arthroplasty Risk Assessment Score Ryan Nguyen	59	Protection or production? Using QTL mapping to isolate how stomatal ratio affects photosynthesis and pathogen defense Genevieve Triplett	62	Category Learning in Honeybees: The Search for Visual Categories Joseph Caldwell	66	Submarine Groundwater Discharge and Related Contaminants in Shark's Cove Kapo'o Tide Pools Aston Ramos
12:00 PM	45	Discrimination in Hawai'i: Experiences and Perceptions of Latinx Emerson Abreu	49	Bringing Food to the Table: Exploring the Potential of Urban Agriculture in Honolulu Seraphina King	53	Ke Ho'i A'ela ka 'Ōpua i Awalau: Reconnecting K-12 Students to Hawai'i Donavan Albano, Tara Sutton	57	Calibration of Silicon Detectors for the GAPS Experiment with Atmospherically-produced Muons Hershel Weiner	60	Effects of Agricultural Intensification on Climate in the Midwest Eleanor Yuan	63	Adipocyte Area and Index in North Pacific Humpback Whales Hannah Fuchser	67	Deletion of Alternative ribosomal proteins in <i>Mycobacterium smegmatis</i> Ariana Sosa, Leah Ghazali
12:15 PM	46	Allyship: Reckoning with Learned Histories Alessandra Talabong	50	Are All Eyes The Same? Eye Gaze Cue Processing Differences in People with Autism Spectrum Disorder Maximillian Soares Miehlsstein	54	Technology and K-12 Teaching During COVID-19 Janet Breckenridge, Kimiko Smith, Kelley Ho	58	High precision 3D-printed molds for soft lithography of epidermal microfluidic devices Faith Rolark	61	Investigating Epizoic Growths on Planktonic Crustaceans in Kāneohe Bay, HI Daniel Cervantes	64	An Assessment of the Variability of Hormones Between Baleen Plates in a Pregnant Humpback Whale Sabrina Nicole Haverly	68	Synthesis of L-Alanine 3,3-D2 and L-Alanine-3-D Nathaniel Hogsten
12:30 PM	47	Developing an English-Hawaiian Classical Dictionary Kali Konopko, Cody Powers, Vivian Hurney, Mariko Jurcsak	51	Understanding Oahu's Reentry Support System for the Formerly Incarcerated Madison Sweaney	55	Project KUALIMA: Transforming an Innovative Professional Learning Series into Research Jessica Lau, Vanessa Liang					65	DNA Degradation in Marine Mammals for the Estimation of Post-Mortem Interval Sara Bower	69	Ola Paia: Developing Sustainable Food Systems in Hawai'i Ashley Ostendorf
12:45 - 12:50 PM	BREAK													
Plenary Room														
12:50 - 1:00 PM	CLOSING REMARKS													

Poster Session I
Natural Science Special Session: Connecting physical and genetic diversity through plant images
9:15 am – 10:15 am
Anuenue Room

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
1	9:15 am – 9:30 am	<p>Connecting Shoot Growth Variation to Genetic Differences in a Maize Diversity Panel. <i>Bryceson Tugade*</i>, <i>University Of West Oahu</i>, <i>Lydia Rigge*</i>, <i>Martin Luther College</i>, <i>Livvy Johnson†</i>, <i>Germaine Juan†</i>, <i>Jesse Mikasobe-Kealiinohomoku†</i>, <i>Katie Strachan†</i>, <i>Elizabeth Swantek†</i>, <i>Alycia Tausaga†</i>, <i>Michael Muszynski°</i>, <i>Michael Kantar°</i>, <i>Tai Maaz°</i>, <i>Yuriy Mileyko°</i>, <i>Nhu Nguyen°</i>, <i>UHM</i></p> <p>Maize is one of the most important global food crops, accounting for nearly 30% of global calories. Not only is maize central to food security, it is also a model species for understanding plant growth and development. We characterized the above ground morphology of a genetically diverse panel of maize inbred lines. Using morphometric and image analysis of the maize shoot system, we characterized the variation in growth and leaf size parameters among the inbred lines. We will present results of our growth-rate analysis and show how these results can provide insights into the genetic diversity within maize. In the long term, results from this project can help us predict inbred lines better suited for contrasting environmental conditions based upon differences in growth rate.</p>
2	9:30 am – 9:45 am	<p>Using Support Vector Machines to Model and Classify Phenotypic Differences in Diverse Maize Shoot Systems. <i>Elizabeth Swantek*</i>, <i>UHM</i>, <i>Alycia Tausaga*</i>, <i>Chaminade University of Honolulu</i>, <i>Michael Kantar°</i>, <i>Tai Maaz°</i>, <i>Yuriy Mileyko°</i>, <i>Michael Muszynski°</i>, <i>Nhu Nguyen°</i>, <i>Livvy Johnson†</i>, <i>Germaine Juan†</i>, <i>Jesse Mikasobe-Kealiinohomoku†</i>, <i>Lydia Rigge†</i>, <i>Katie Strachan†</i>, <i>Bryceson Tugade†</i>, <i>UHM</i></p> <p>Maize is one of the most important global food crops accounting for nearly 30% of global calories. Not only is maize central to food security, it is also a model species for understanding plant growth and development. Using morphometric and image analysis of a diverse collection of maize inbred shoot systems, we used support vector machines to classify the different inbreds based on a combination of all the phenotypic parameters measured. We will present results of our growth-rate and multivariate analysis. These data are the first steps in order to generate a model that will be able to classify phenotypic diversity in a larger set of maize inbreds. Overall, results from this project can provide clues to help identify classes of genotypes that may grow best under various climatic scenarios due to differences in growth rate.</p>
3	9:45 am – 10:00 am	<p>Quantitative high-throughput characterization of genetically diverse maize root systems. <i>Jesse Mikasobe-Kealiinohomoku*</i>, <i>University of</i></p>



Poster Session I
Natural Science Special Session: Connecting physical and genetic diversity through plant images
9:15 am – 10:15 am
Anuenue Room

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
		<p><i>Hawaii-West Oahu, Katie Strachan*, Nhu Nguyen°, Michael Kantar°, Tai Maaz°, Yuriy Mileyko°, Michael Muszynski°, Livvy Johnson†, Germaine Juan†, Lydia Rigge†, Elizabeth Swantek†, Alycia Tausaga†, Bryceson Tugade†, UHM</i></p> <p>Maize is one of the most important global food crops accounting for nearly 30% of global calories. Not only is maize central to food security, it is also a model species for understanding plant growth and development. Using high-throughput morphometric and image analysis, we quantitatively categorized the root systems of a genetically diverse panel of maize inbred lines. We showed that high-throughput root phenotyping is replicable and likely transferable to multiple plant species. These methods allow us to expand our understanding of the unique belowground characteristics of each distinct maize inbred line and how these trait differences might contribute to variation in nutrient acquisition, carbon storage, and microbiome interactions, advancing our understanding of what is hidden beneath the surface.</p>
4	10:00 am – 10:15 am	<p>Using Support Vector Machines to Model and Classify Phenotypic Differences in Diverse Maize Root Systems. <i>Livvy Johnson*, Iowa State University, Germaine Lindsay Juan*, Yuriy Mileyko°, Michael Kantar°, Tai Maaz°, Michael Muszynski°, Nhu Nguyen°, Jesse Mikasobe-Kealiinohomoku†, Lydia Rigge†, Katie Strachan†, Elizabeth Swantek†, Alycia Tausaga†, Bryceson Tugade†, UHM</i></p> <p>Maize is one of the most important global food crops accounting for nearly 30% of global calories. Not only is maize central to food security, it is also a model species for understanding plant growth and development. Using morphometric and image analysis of a diverse collection of maize inbred root systems, we applied support vector machines to classify different genotypes based on the combination of phenotypes. We will present results of our imaging and multivariate analysis to show how our models can provide classification insights not only in our eight tested genotypes, but also in unknown future genotypes. Results from this project can reveal how differences in root morphology among genotypes may influence nutrient acquisition patterns, resource use efficiency, carbon storage, and plant protection mechanisms. Ultimately, being able to classify unknown genotypes may help with the ability to place them in the optimal environment or agroecological system.</p>



Poster Session I
Arts & Humanities; Natural Science
9:15 am – 10:15 am
Breadfruit Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
5	9:15 am – 9:30 am	<p>The Lili‘u Project. <i>Caitlin Gaven*</i>, <i>Aleta Hammerich*</i>, <i>Joel Moffett^o</i>, <i>UHM</i></p> <p>There has never been a documentary film made about the music of Queen Liliuokalani. Our film not only adds to the scholarly record of the Queen, but also celebrates her work by interweaving two narratives:</p> <p>1) A historical biography. Using archival photos, recordings, film clips and interviews with experts in the field, we will tell the story of Liliuokalani’s life in music, from her early training, to her career as Hawaii’s most prolific composer.</p> <p>2) The modern interpretation of the Queen’s work. For the past 6 years we have documented celebrated local musicians Starr Kalahiki and John Signor as they researched, updated, rehearsed and performed the Queen’s songs all over the world, helping us to understand the meaning of Liliuokalani’s work in a modern context. This unique long-term creative research initiative was born out of Leeward Community College; it’s students, faculty and alumni.</p> <p>Thus, more than just a “bio-pic”, this film juxtaposes the history of Liliu’s life within the modern context of a group of musicians reimagining her songs for a twenty-first century audience. By cross-cutting between these narratives, we will help the viewer appreciate the Queen’s work from a contemporary perspective.</p>
6	9:30 am – 9:45 am	<p>The Use of Cell Lines with Raman-Enhanced Spectroscopy to Characterize Childhood Cancers. <i>Jessica Natale*</i>, <i>UHM</i>, <i>Nicholas Loi[†]</i>, <i>Dayna Sur[†]</i>, <i>Tiffany Shieh[†]</i>, <i>JABSOM</i>, <i>Anupam Misra[†]</i>, <i>Hawaii Institute of Geophysics and Planetology</i>, <i>UHM</i>, <i>Bruce Shiramizu^o</i>, <i>Melissa Agsalda-Garcia^o</i>, <i>JABSOM</i></p> <p>Introduction: Raman-enhanced spectroscopy is a novel, laser-based tool that characterizes the molecular composition of cells and tissues based on scattered light. This study characterizes two Burkitt lymphoma cell lines using the micro-Raman system to demonstrate feasibility of using cell lines to produce representative biological fingerprints for cancers.</p> <p>Methods: Roughly 0.5 x 10⁶ cells of the CA46 or RAMOS cell lines were resuspended in 0.9% NaCl, placed onto an aluminum slide and analyzed with the micro-Raman RXN system (KOSI, Inc) at 50x magnification. A Burkitt lymphoma tissue specimen was scanned and compared to the cell lines. The spectra were baselined, averaged and overlaid with GRAMS and Spectragryph using the 1003 cm⁻¹ peak as reference.</p> <p>Results: Overlaid spectra of the CA46 and RAMOS cell lines revealed three distinguishable peaks at 1343.2 cm⁻¹, 1447.7 cm⁻¹, and 1658.2 cm⁻¹</p>



Poster Session I
Arts & Humanities; Natural Science
9:15 am – 10:15 am
Breadfruit Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
		<p>corresponding to glucose and proteins. These peaks were also present in the Burkitt lymphoma tissue specimen.</p> <p>Conclusions: Identification of comparable spectral peaks in Burkitt lymphoma cell lines and tissue specimen demonstrate the feasibility of using cell lines to produce representative biological fingerprints to characterize various childhood cancers. Thus, use of cell lines in Raman Spectroscopy has the potential to complement the current diagnostic paradigm to improve pediatric cancer diagnosis. Future aims are to determine if these peaks are present in other cancer types.</p>
7	9:45 am – 10:00 am	<p>Synthesis of a Planar Chiral Ferrocene for Possible Anticancer Treatment. <i>Christian Lopez*</i>, <i>University of Hawaii at Hilo</i>, <i>Marcus Tius^o</i>, <i>Chaolun Liu[†]</i>, <i>UHM</i></p> <p>Some chiral ferrocene have a possible application towards anticancer treatment. This project utilizes various synthetic techniques to incorporate camphor with 4-(dimethylamino)pyridine (DMAP) to create a precursor of a planar chiral ferrocene derivative.</p>
8	10:00 am – 10:15 am	<p>SN 2015bo: A 1991bg-like Type Ia Supernova with a Twin. <i>Willem Hoogendam*</i>, <i>Calvin University</i>, <i>Chris Ashall^o</i>, <i>Ben Shappee[†]</i>, <i>UHM</i></p> <p>We present optical and near-infrared photometry and spectroscopy of 1991bg-like Type Ia Supernova(SN) 2015bo. Key parameters, including the distance modulus ($\mu = 34.20 \pm 0.09$ mag), absolute magnitude ($M_B = -18.35 \pm 0.14$), and two luminosity-width relations ($\Delta m_{15(B)} = 1.91 \pm 0.01$ mag and $s_{BV} = 0.48 \pm 0.01$), are derived. Light-curve and colour-curve analysis of SN 2015bo is presented. We note its interesting shape in the $V-r$ colour. SN 2015bo's photometry is compared to both other sub-luminous and normal Ia SNe. A bolometric light-curve is derived and a Nickel 56 mass of 0.30 ± 0.05 solar masses was calculated. Spectra and comparisons to other sub-types of SNe Ia and sub-luminous Ia are presented. Velocities and pseudo-equivalent widths are presented and are compared to a sample of other SNe Ia. SN 2015bo's twin, SN 1997cn, is used to calculate distance to their host galaxy NGC 5490. The distance moduli from SN 2015bo and SN 1997cn are consistent with each other when considering an extra systematic uncertainty due to the late epoch of SN 1997cn's data.</p>



Poster Session I
Natural Science
9:15 am – 10:15 am
Coconut Room

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
9	9:15 am – 9:30 am	<p>Orientation of Dark Matter Halo Symmetry Axes in Latte Galaxies. <i>Jay Baptista*</i>, Yale University, <i>Robyn Sanderson^o</i>, University of Pennsylvania, <i>Dan Huber^o</i>, UH IfA</p> <p>The macro-scale properties of dark matter (DM) haloes, such as shape and orientation, rely on the micro-physics of the dark matter particle. Yet the symmetry axes of the Milky Way's dark matter halo are often assumed to be aligned with the symmetry axes of the stellar disk. While this is the likely case for the inner regions of the dark matter halo, there is no physical reason for the outer dark matter halo to have the same alignment. In this work, we explore the evolution of the dark matter halo orientation in the presence or absence of a Large Magellanic Cloud. We restrict our analysis to various Milky Way-mass galaxies (10^{12} solar masses) from the Latte simulation. We present orientations of the dark matter axes relative to the stellar disk axes as a function of radius and as a function of time.</p>
10	9:30 am – 9:45 am	<p>High Resolution Infrared Spectroscopy of CO in the Massive Binary Mon R2 IRS3. <i>Amanda Lee*</i>, Stony Brook University, <i>Adwin Boogert^o</i>, <i>Ryan Dungee[†]</i>, UHM</p> <p>The physical processes involved in massive star formation are still not well understood. Our understanding of the stages involved in forming massive stars, as well as their environments, is inhibited in part due to the high extinction rates in star-forming regions, but also because massive stars have shorter lifetimes and are rarer than low mass stars. Studying the chemistry and formation of complex molecules in these environments may also offer insights into the processes involved in star and planet formation. We aim to address such challenging aspects of massive star formation by using high spectral resolution observations of CO gas obtained by iSHELL ($R = 80,000$) on the NASA Infrared Telescope Facility (IRTF) around the massive binary Mon R2 IRS3 to detect the presence of potential disks. Absorption by cool and hot gas is detected towards both binary components. The line profiles of the two binary components are very different, indicating different physical conditions and possibly disk or outflow characteristics.</p>
11	9:45 am – 10:00 am	<p>Analysis of ~3000 Massive High-Redshift Galaxies in the Hawaii Twenty Square Degree Survey. <i>Isabella Valdes*</i>, Colby College, <i>David Sanders^o</i>, UHM, <i>Connor McPartland^o</i>, UC Riverside, <i>Lukas Zalesky^o</i>, UHM</p> <p>The first massive galaxies to form after the Big Bang demonstrate the unique evolution and early properties of our universe. The search for</p>



Poster Session I
Natural Science
9:15 am – 10:15 am
Coconut Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
		<p>massive high-redshift galaxies at $z > 3.5$ (less than 2 billion years post-Big Bang) has thus far been limited by a lack of adequate coverage and depth in long-wavelength imaging. Using the ultra-deep Hawaii Twenty Square Degree galaxy survey (H20), a sample of massive galaxies was selected at $z > 3.5$ redshifts. The H20 survey covers 20 deg^2 on the sky and combines Subaru Hyper Supreme-Cam g-, r-, I-, z-, and y-optical wavelength band coverage with Spitzer $[3.6\mu\text{m}]+[4.5\mu\text{m}]$ deep-IR imaging. This survey provides some of the first robust measurements of massive galaxies at these redshifts. In our analysis, we find a sample of ~ 3000 galaxies at $3.5 < z < 5.8$ with masses $\geq 10^{10.5} M_{\text{sun}}$ (greater than the mass of the Milky Way) that have well-defined physical properties. With these sources, we confirm the expected physical properties of high-redshift galaxies, including the mass and magnitude distributions of the sample. Furthermore, we extend previous work investigating the relation between stellar mass and effective radii, identify candidate quiescent, star-forming, and post-starburst galaxies, and quantify the morphologies of our sample.</p>
12	10:00 am – 10:15 am	<p>From Dust to Disks: Uncovering White Dwarf Debris Disks in the UKIRT UHS Survey. <i>Anna Gardner*</i>, <i>Ben Shappee^o</i>, <i>UHM</i></p> <p>90 percent of stars in the Galaxy end their lives as white dwarfs. White dwarf stars are a representation of the final stage of stellar evolution within their composition. Studying white dwarfs will uncover the stellar lives from how they are born upto how they end their stellar lives in addition to the evolutionary history of the Galaxy. White dwarfs with infrared excesses provide ideal locations for finding ancient planetary systems and adding a novel method for understanding how planets evolve with their host star. Cooler objects such as dusty debris disks are detectable from infrared excess emissions. Our unique access to the United Kingdom Infrared Telescope (UKIRT) provides previously unexplored near-infrared observations. We create spectral energy distributions (SEDs) which indicate the existence of debris disks near some white dwarfs. We find 100 likely dust disks in our sample of about 1300 white dwarfs and confirm 20 previously-known white dwarfs with excess infrared emission. Final SEDs can tell us about deviations from white dwarfs' blackbody and environment near white dwarfs.</p>



Poster Session I
Natural Science
9:15 am – 10:15 am
Dragonfruit Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
13	9:15 am – 9:30 am	<p>A comparison of opsin diversity across four Stomatopoda species with morphologically distinct eyes. <i>Amir Van Gieson*</i>, <i>University of California Santa Barbara</i>, <i>Megan Porter^o</i>, <i>UHM</i></p> <p>Stomatopod crustaceans demonstrate some of the highest complexity of animal visual capabilities, much of which rises from the midband, an equatorial region of specialized ommatidial rows in the compound eye. The most recent ancestor of extant stomatopods most likely possessed 6 midband rows (MBR), an ancestral trait retained in most species (e.g. <i>Hemisquilla californiensis</i>, <i>Lysiosquillina maculata</i>) and reduced in others (e.g. <i>Pseudosquilla marmorata</i> - 3 MBR; <i>Oratosquilla oratoria</i> - 2 MBR). If species that evolved a reduction in their number of MBR have reduced visual capabilities, then we hypothesize a corresponding reduction in their diversity of visual opsins, the protein moiety of visual pigments. In this study, we characterize the diversity and expression of visual opsins across these four stomatopod species as a proxy for differences in visual capabilities. By analyzing transcriptome assemblies, we characterized expressed opsin sequences in each species by both categorizing their functional groups (nonvisual, long-wavelength-sensitive: LWS, medium-wavelength-sensitive: MWS, and short-wavelength-sensitive: SWS opsins).. We identified 5 expressed visual opsin sequences in <i>O. oratoria</i> (5 LWS), 11 in <i>P. marmorata</i> (6 LWS, 2 MWS, 3 SWS), 38 in <i>H. californiensis</i> (25 LWS, 10 MWS, 3 SWS), and 58 in <i>L. maculata</i> (35 LWS, 20 MWS, 3 SWS). Species with fewer MBR displayed a reduced diversity of opsin categories with <i>O. oratoria</i> lacking MWS or SWS opsins and <i>P. marmorata</i> possessing few MWS. All species possessing SWS opsins contained only 3, suggesting these opsins are highly conserved. Studies of expression levels are underway.</p>
14	9:30 am – 9:45 am	<p>A novel approach to exploring epigenetic regulation in the Hawaiian coral <i>Montipora capitata</i>. <i>Hanna Mantanona*</i>, <i>Hawaii Pacific University</i>, <i>Rob Toonen^o</i>, <i>Emily Conklin^o</i>, <i>UHM</i></p> <p>As coral reefs decline from deleterious human impacts, it is critical to investigate how reef corals will respond, and their capacity to survive in future ocean conditions. In addition to genetic inheritance, heritable epigenetic regulation in corals may modify the outlook for reefs to respond rapidly and persist amidst a changing climate. This study is the first to apply and demonstrate effectiveness of methylated DNA immunoprecipitation sequencing (MeDIP-Seq) in investigating genomic methylation in corals. In this proof of concept test, we assessed the number of high-quality coral and symbiont sequences produced by this protocol, aligned reads to reference genomes, and assigned gene function</p>



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No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>where possible. Looking to the future, this fast and efficient immunoprecipitation method will next be used to analyze differences in genomic methylation of clonal <i>Montipora capitata</i> fragments from a multi-year climate change mesocosm experiment at the Hawai‘i Institute of Marine Biology. We anticipate that clonal fragments of <i>M. capitata</i> raised in warmer environments will show patterns of differential methylation, especially in genetic regions pertaining to DNA damage and repair mechanisms, compared to those which experienced less thermal stress.</p>
15	9:45 am – 10:00 am	<p>Developing the use of stationary time-lapse photography to capture fine-scale temporal variation in wetlands in Hawai‘i. <i>Lauren Katayama*</i>, <i>Claire Atkins*</i>, <i>Kristen Harmon[†]</i>, <i>Taylor Shimabukuro[†]</i>, <i>Melissa Price^o</i>, <i>UHM</i></p> <p>Appropriate management and conservation of threatened or endangered species requires a robust understanding of how species use habitats in space and time. Hawai‘i’s native, endangered waterbirds coexist in a dynamic wetland habitat, where fractional ground cover (e.g. the ratio of water, mud, and vegetation) is highly variable across spatial and temporal scales. Currently available methods for quantifying habitat use of waterbirds (e.g. ground surveys, drones, satellites) are limited by their inability to capture fine-scale temporal variation in habitat characteristics. In this study, we utilized CoralCam, an affordable, modified GoPro-style camera, to remotely monitor waterbird habitat use in relation to changes in fractional ground cover. Five CoralCams were deployed in one pond within Hamakua Marsh, which is used by the Hawaiian Stilt (‘Ae’o), Hawaiian Gallinule (‘Alae ‘Ula), and Hawaiian Coot (‘Alae Ke’oke’o) for foraging and nesting. Cameras were mounted to modified telescoping poles, which enabled us to monitor large areas of the wetland and easily access the cameras for battery and SD card changes. Cameras were programmed to capture one image every six hours over multiple months. Images were assessed manually to quantify fractional ground cover and determine waterbird presence and behavior. We found that the constructed camera set-up effectively captured habitat use by all three waterbird species, as well as changes in fractional ground cover. Our study suggests a new method for monitoring dynamic wetland systems that support high densities of multiple waterbird species. Expanded applications of this novel method may help to inform management of threatened and endangered species habitat.</p>



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No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Author(s)†, Summary
16	10:00 am – 10:15 am	<p>Quantifying feral pig rooting across multiple Hawaiian ecosystems. <i>Wade Naguwa*</i>, <i>Melissa Price^o</i>, <i>Derek Risch^o</i>, <i>UHM</i></p> <p>Exclusion fencing protects critical watersheds across the Hawaiian Islands from feral pigs, but outside of these areas, feral pigs are managed for non-zero levels. Feral pigs are well known to cause substantial damage to soil and native flora and fauna, but to date there have been few studies that quantify the amount of damage that can be done per pig in a given amount of time across ecosystem gradients. To improve decision making regarding appropriate abundances of pigs in areas outside of fences, in this study we aimed to understand the amount of area disturbed by wild pigs, the number of pigs that could cause that damage, the size, the sex, and how long it took the pig(s) to disturb the area. To address the research question, we used AragoJ, a photogrammetry program to measure area through images that were captured by trail cameras during surveys over the last five years on Kaua‘i, Maui, and O‘ahu. We found that damages from feral pigs can range from 1m² up to over 10m², with a variance in sex and size of small, medium, and large feral pigs. Results will be used by environmental managers to guide decisions regarding appropriate abundances of feral pigs, quantify the impacts of feral pigs, and minimize impacts to our watersheds and coral reefs.</p>



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Natural Science
9:15 am – 10:15 am
Elepaio Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
17	9:15 am – 9:30 am	<p>Using receiver functions to image deep crustal structure beneath Okmok volcano. <i>Madeleine Tan*</i>, University of Michigan, Helen Janiszewski^o, UHM</p> <p>Okmok volcano is located in the eastern Aleutian arc on Umnak Island, Alaska. It is comprised of a large caldera system and is one of the most hazardous volcanoes in the Aleutians, as it historically has erupted explosively, most recently in 2008. As such, it is well instrumented with seismometers, and previous seismic imaging studies reveal complex magmatic structures in the upper 5 km of crust beneath the caldera. However, previous results have poor resolution in the deeper crust; thus, how magma is transported through the deep crust is not well constrained. Receiver function analysis allows us to seismically image the whole crust, providing new constraints on deeper magmatic structures. We calculate receiver functions from >M6 teleseismic earthquakes from January 2005 to June 2021 recorded by stations within and surrounding Okmok caldera. The receiver functions show evidence of deep crustal structure beneath Okmok. To first order, ray paths towards the volcano show evidence of arrivals indicating mid-crustal velocity discontinuities, possibly magmatic structure. Conversely, ray paths away from the volcano largely do not. This builds on previous results, indicating that receiver functions are sensitive to complex, magmatic structures in the crust and may be a viable technique to employ at other volcanoes.</p>
18	9:30 am – 9:45 am	<p>What is the origin of the highly differentiated lava that erupted from the 2018 eruption at Kīlauea? <i>Araela Richie*</i>, DVC, Aaron Pietruszka^o, UHM</p> <p>In 2018, Kīlauea Volcano erupted on its lower East Rift Zone (LERZ), causing devastation to the Leilani Estates neighborhood. Fissure 17 (F17) erupted andesite, the most differentiated lava yet erupted at Kīlauea. The F17 lava was more viscous, evolved, and cooler, and it was initially thought to represent stored magma from an earlier LERZ eruption in 1955 (Gansecki et al., 2019). This project uses the trace element abundances of F17 lava to infer its parental magma. Two questions were asked: (1) Is it possible to use trace elements to identify the F17 parent magma? and (2) What can we learn from the trace elements about the creation of the F17 lava? The chemistry of lava samples collected during the 2018 LERZ eruption was compared with samples from the 1955 LERZ eruption, summit lavas from the 1960s, and recent Pu‘u ‘Ō‘o and Halema‘uma‘u samples. Models were made to infer the type of minerals other than olivine, clinopyroxene, and plagioclase that crystallized from the F17 magma. Equilibrium crystallization and mixing calculations suggest that</p>



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No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>ilmenite and apatite crystallization was important. Recent Pu‘u ‘Ō‘o and Halema‘uma‘u magma can be ruled out as a parent of the F17 magma, but older magma from 1955 or the 1960s are suitable parents. A better understanding of the influence of magma crystallization and mixing on the composition of lava erupting from Kīlauea will allow for a better understanding of the magmatic processes of frequently active volcanoes and how eruptions may affect the surrounding communities.</p>
19	9:45 am – 10:00 am	<p>Analysis of Passive Acoustic Data at Station ALOHA Cabled Observatory. <i>Yuliya Kornikova*</i>, <i>Reed College</i>, <i>James Potemra^o</i>, <i>Bruce Howe^o</i>, <i>UHM</i></p> <p>The Station ALOHA Cabled Observatory (ACO) is located in the Central North Pacific Ocean and is an ocean-bottom observatory that monitors ocean processes, including sound, continuously in real-time. Since sound propagates underwater, the ACO hydrophone allows for the study of ocean acoustics over a broad scale, and this allows for studying certain marine mammals such as baleen whales that are elusive as they tend to stay in deeper water. The ocean-bottom hydrophone at the ACO can be used to investigate the occurrence of marine mammals, but also events such as glass balls (used on a nearby mooring) shattering, ships passing by, and acoustic behavior of whales in a location that is difficult to study long-term due to its remoteness. We examined 18 months of 24kHz data from the ACO (January 2020- May 2021) and found a variety of sounds that have been identified as whales and some unidentified sounds. We created spectrograms of the audio files for visualization, analysis and annotation. We hope to analyze and classify the sounds captured by the ACO hydrophone in order to be able to identify seasonal patterns and random occurrences and their causes. Preliminarily, we have identified sounds produced by minke and humpback whales as well as a glass ball popping. The ACO hydrophone has been in operation for a decade, and while we focus on the last 18 months in this study, the same methods could be used to show whether those patterns and occurrences change throughout the years. This work is meant to provide an overview of the types of sounds that the ACO is recording, and the identified signals can be used as training for machine learning for the development of a sound identification program that would be able to run in real time on the hydrophone.</p>
20	10:00 am – 10:15 am	<p>ALOHA Cabled Observatory Service Cruise. <i>Samantha Hanson*</i>, <i>Brigham Young University- Hawaii</i>, <i>Bruce Howe^o</i>, <i>Jim Potemra^o</i>, <i>UHM</i></p>



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9:15 am – 10:15 am
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No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
		<p>The ALOHA cabled observatory is the deepest plug-and-play cabled observatory in the world. The submerged cable provides power and Internet to CTDs (conductivity, temperature, and depth), lights, cameras, a hydrophone, and other instruments. This observatory has a ten-year operating history including timeseries that provide data on changing ocean conditions at 4,800 meters.</p> <p>During the most recent cruise in June 2021, the <i>Kilo Moana</i> sailed to the ALOHA Cabled Observatory. The remotely operated vehicle ROV <i>Lu'ukai</i> and elevator were lowered to depth and a new CTD and camera with lights were installed. Equipment was serviced and images were taken to construct a 3D map that will make navigating easier for future missions. The team worked smoothly and efficiently, allowing for record bottom time and all of the mission critical work to be completed. One of the new lights was used to illuminate a commemorative plaque which was put in place to honor Fred Duennebier, a pioneer of cabled observatories. The Observatory will continue to be used to monitor the changing trends in ocean conditions and the ROV <i>Lu'ukai</i> will continue to be used to maintain this station. The timeseries this observatory provides becomes more valuable as it is collected and so ensuring the series remains uninterrupted is crucial.</p>



Poster Session I
Natural Science
9:15 am – 10:15 am
Fern Room

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
21	9:15 am – 9:30 am	<p>Detecting Organization of Shallow Cumulus Clouds in the Central Pacific using Artificial Intelligence. <i>Emma Layton*</i>, <i>Columbia University</i>, <i>Giuseppe Torri^o</i>, <i>Alison Nugent^o</i>, <i>UHM</i></p> <p>Shallow cumulus clouds are the dominant cloud type over the trade-wind dominated subtropical mid-Pacific, and account for substantial variability in climate change predictions. Despite their importance, understandings of these clouds on the microphysical and mesoscale levels are limited. In this study, a machine-learning algorithm was developed for the purpose of detecting four prevalent cloud patterns in large datasets to simplify identification of temporal and spatial trends in mesoscale-level patterns of cumulus clouds.</p> <p>The algorithm was applied to four specific mesoscale cloud patterns, each with a unique dynamical source and distinct environmental profile. A convolutional neural network was trained to identify these patterns on 2019 and 2020 June-July-August daily satellite images from NASA worldview covering a 10°x 20° area northeast of the Hawaiian islands. The model was then applied to daily JJA screen captures from 2000-2018. The neural network recorded the frequency of each detected pattern, and based on the proximity and breadth of formations, categorized a certain day as dominated by one of the four patterns. Preliminary results exhibit success in the algorithm's ability to identify the four patterns accurately. This data can be compared with weather radar, rain gauge, and radiosonde data to verify the environmental profiles for each pattern type and identify correlations between the four convective organizations and subsequent weather over Hāwai'i. This algorithm's increased capacity for image data processing facilitates streamlined detection of temporal and spatial trends in the mesoscale organization of shallow cumulus clouds and their contribution to global climate.</p>
22	9:30 am – 9:45 am	<p>Identification of fault scarps for calculating M in mid-ocean ridges. <i>Silvia Alemany*</i>, <i>Bryn Mawr College</i>, <i>Garrett Apuzen-Ito^o</i>, <i>UHM</i></p> <p>This project aims to identify a critical gradient for the identification of fault scarps to calculate the fraction of plate extension accommodated by magmatism. The method was prototyped and validated using existing published measurements of the fraction of magmatic extension (M) at Chile Ridge. As part of this project, we developed a script that calculates the fraction of plate separation accommodated by normal faulting, as well as the remaining fraction, which is the amount of extension accommodated by magmatism (M) using high-resolution bathymetry data collected by seagoing surveys. To calculate M, a script in the GMT software package extracts the short-wavelength bathymetry from each</p>



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		<p>segment of the Chile Ridge using a low pass filter in the Fourier domain. Then a MATLAB script uses this as input to identify fault scarps by defining a critical slope value at which slopes will be considered fault scarps. The script estimates M by calculating the ratio of the integrated horizontal length of the fault scarps relative to the rest of the distance on the seafloor to the ridge axis. After testing a range of possible gradient values, it identifies the critical slope with the minimum misfit from the published M calculations. The identifiable patterns in this ongoing analysis of the Chile Ridge will allow for exploration of other mid-ocean ridges where M has not been previously analyzed, and how variations in M influence the segmentation style of a variety of mid-ocean ridge boundaries.</p>
23	9:45 am – 10:00 am	<p>PIDGM: Paleo Isotopic Dynamics with a Global Model. <i>Brandon Duran*</i>, <i>Georgetown University, Sloan Coats°</i>, <i>UHM</i></p> <p>Common Era paleoclimate reconstructions using water isotope proxies provide critical context for current and future environmental change. Nevertheless, our understanding of the large-scale atmosphere-ocean dynamics being recorded by these proxies is limited by a lack of observations. The isotope-enabled Community Earth System Model (iCESM) is a global coupled climate model that simulates water isotopes and can be used in lieu of observations to characterize the dynamics underlying water isotopic variability at proxy sites.</p> <p>PIDGM (Paleo Isotopic Dynamics with a Global Model) represents an effort to provide the paleoclimate community with access to output from iCESM simulations of the Common Era, for specific application to characterizing proxy site-level water isotopic variability. Over 16,000 publication-quality figures will be made available initially, spanning 4 different timescales of variability and 7 different seasonal averaging intervals, for the 606 proxy sites that are a part of the iso2k project, a global compilation of water isotope proxy records.</p> <p>Eventually we will release a supplementary graphical user interface that will allow users to generate similar figures but for any location worldwide, and with a number of other customizable options. Complimentary open-source Python and Matlab packages will also be made available to facilitate collaboration and to enable new features to be contributed.</p> <p>Our hope is that these efforts will help the paleoclimate community to address a number of formerly intractable problems including locating optimal proxy sites for future development, investigating the dynamics,</p>



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across seasons and timescales, that underlie signals in currently available proxy records, and much more.



Poster Session II
Engineering & Computer Science
10:30 am – 11:30 am
Anuenue Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
24	10:30 am – 10:45 am	<p>Implementation of Security System and Solid State Dehumidifier in ATLAS site. <i>Rommela Dimaunahan*</i>, <i>Hawaii Pacific University</i>, <i>Larry Denneau^o</i>, <i>UHM</i></p> <p>We describe the design and operation of a prototype solid-state dehumidifier for the optical tube assembly (OTA) of the ATLAS survey telescope. The concept employs a heat sink and thermoelectric module to create hot and cold heat sinks into which air will be circulated. The hot air will be released into the ambient air while the cold (and therefore drier) air will be circulated into the OTA. The dry air prevents fogging of the CCD window on the ATLAS camera, which significantly degrades image quality. Our design aims to maintain a 5% relative humidity inside the OTA.</p> <p>We also describe the design and implementation of a completely different hardware module to improve facility security and safety. This module employs a Raspberry Pi computer with sensors to: (1) detect and record movement near the facility door prior to opening, then send the recorded video via text message to ATLAS operators; (2) when the door is detected to be open, activate red lights inside the dome.</p>
25	10:45 am – 11:00 am	<p>Raising Retention with RadGrad. <i>Andre Ruiz*</i>, <i>Caliana Fortin*</i>, <i>Trey Sumida*</i>, <i>Timothy Huo*</i>, <i>Philip Johnson^o</i>, <i>Cam Moore^o</i>, <i>Shinya (Shun) Saito[†]</i>, <i>UHM</i></p> <p>In the last few decades, there has been a steady decline in the diversity of students graduating with a Computer Science degree. Therefore, the RadGrad project tackles this issue by providing an alternative perspective to the undergraduate degree program. The approach in RadGrad is to make extracurricular activities equal in importance to curricular activities when designing a “well-balanced” degree plan. To accomplish this, RadGrad presents an alternative to GPA with I.C.E. (Innovation, Competency, Experience). Additionally, RadGrad is designed to provide a “knowledge base” about the discipline including topic areas (called “Interests”) and Career Goals. The goal for this summer was to make RadGrad v2.0 ready for deployment into both the ICS Department and the Computer Engineering program starting in Fall 2021. This summer, five undergraduate interns participated in the development and evaluation of the second major version of RadGrad. So far, we improved the functionality of the system, and made progress on the integration of InternAloha, a plugin designed to help students find internships. In addition, we conducted a pilot study to investigate ways to improve the system based on real-life student perspectives. The results of the pilot study will be used to improve the design of the system. Through this</p>



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experience we learned various skills and techniques used to develop a moderately-sized application and conduct meaningful software evaluations while focusing on larger research issues surrounding diversity in Computer Science.

- 26 11:00 am – 11:15 am **Autonomy Software and Simulation Environment for a Resident Underwater Robot.** *Brandon Yee**, *Zhuoyuan Song^o*, *UHM*
This study explores various methods of implementing machine learning-based docking control algorithms for a custom AUV, or autonomous underwater vehicle. Unlike remotely operated underwater vehicles (ROVs), AUVs must autonomously navigate to a seafloor docking station to fetch power and network. We analyze the performance of different autonomy strategies on a modified Blue Robotics BlueROV2 controlled by ArduSub, an open-source firmware package for ROVs and AUVs. Some of the software used to perform this analysis include Robot Operating System (ROS), a widely-used set of open-source middleware libraries for robotics applications; Gazebo, a 3D robotics simulator; and a ROS package mavros, used to communicate with the MAVlink-based ArduSub firmware. To aid in the testing of docking control procedures, we utilize simulation software to display and evaluate the results of various machine learning methods. Taking advantage of simulation-based environments enables us to test proof of concept under a controlled setting and increase the efficiency of assessing multiple strategies. The results of this study will contribute to the foundation of a shared, open-access marine collaborative robot testbed at Kilo Nalu Observatory. The long-term vision includes establishing a first-of-its-kind open-water test site for resident AUVs to accelerate research of related disciplines, including oceanography, marine biology, and ocean and coastal engineering at the University of Hawaii.
- 27 11:15 am – 11:30 am **Design of Seafloor USBL Modem Mount.** *Christian Pak**, *Zhuoyuan Song^o*, *UHM*
This project focuses on the design of a sensor mount for Evologics USBL modem. The USBL modem will be used for communication and positioning between an autonomous underwater robot and a novel docking station being designed by RAN lab. To prevent acoustic interference the modem will be mounted on a separate structure from the docking station. Potential designs are tested using Solidworks flow simulations to determine expected performance. Also by using parametrical CAD designs, different parameters (support angles, beam lengths, etc.) can be varied and simulated to be optimized.



**Poster Session II
Natural Science
10:30 – 11:30 am
Breadfruit Room**

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
28	10:30 am – 10:45 am	<p>Revisiting Antlia 2’s Effect on the Outer Disk. <i>Tetsuto Nagashima*</i>, <i>University of Southern California</i>, <i>Sukanya Chakrabarti^o</i>, <i>Rochester Institute of Technology</i>, <i>Dan Huber^o</i>, <i>UH IfA</i></p> <p>Antlia 2 is a low surface-brightness satellite galaxy to our Milky Way that was recently discovered using data by the Gaia Mission. Previous publications suggest that Antlia 2 may be responsible for observed perturbations in the outer HI disk. Earlier calculations have used Gaia DR-2 proper motion measurements to constrain the stars within Antlia 2 and determine its orbit. It was found that low pericenter orbits (~10 kpc) produce disturbances that match the observed perturbations. We use newly calculated Gaia EDR3 proper motions of Antlia 2 to create pericenter distributions. We also independently recalculate the Gaia EDR3 proper motions of Antlia 2 using our own selection criteria and compare it to the range needed to produce the requisite low pericenter orbits. Since Gaia EDR3 has significantly less error, our results should not vary as much between different selection criteria. By exploring how these various proper motion calculations affect the orbit, we can reevaluate Antlia 2’s role in the history and formation of the Milky Way.</p>
29	10:45 am – 11:00 am	<p>Searching for Oscillating M Giant Stars in Eclipsing Binary Systems. <i>Madison Hara*</i>, <i>Hawaii Pacific University</i>, <i>Dan Huber^o</i>, <i>Aleezah Ali^o</i>, <i>UHM</i></p> <p>Distances to stars are critical for the understanding of the Milky Way galaxy and how it was formed. Asteroseismology, or the study of stellar oscillations, is a useful method for determining star distances. We can measure a star's luminosity and consequently its distance by detecting these frequencies. Eclipsing binaries are also used to determine the stars' luminosities and distances. We aim to combine these two methods by finding oscillating M giants in eclipsing binary systems using light curves from two ground-based surveys: the Asteroid Terrestrial-impact Last AlertSystem (ATLAS) and the All-Sky Automated Survey for Supernovae (ASAS-SN). Out of the 17 ASAS-SN stars analyzed, 3 of them show clear eclipses, and 1 out of those 3 show a promising periodic signal. We are currently following up on whether that signal stems from stellar oscillations. Currently, we are looking through an ATLAS target list of eclipsing binary systems for a light curve that contains at least one clear eclipse and a period of about 10-100 days.</p>
30	11:00 am – 11:15 am	<p>Group Equivariant Neural Networks for Spectropolarimetric Inversions in Solar Astronomy. <i>Michael Ito*</i>, <i>Peter Sadowski^o</i>, <i>Ian Cunnyngham[†]</i>, <i>Xudong Sun[†]</i>, <i>UHM</i></p>



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Breadfruit Room**

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>The upcoming Daniel K. Inouye Solar Telescope (DKIST) will produce unprecedented high-cadence, high-resolution, and multi-line spectropolarimetric observations of the Sun. New computational techniques are needed to infer the state of the Sun's atmosphere from these observations. Deep learning is a promising approach to this spectropolarimetric inversion problem that can both provide real-time visualizations to astronomers and potentially improve upon existing algorithms by combining spatial, temporal, and multi-spectral information. Here we investigate group equivariant deep learning as a method for inferring the three-dimensional photospheric structures, training on magnetohydrodynamic (MHD) simulations of two types of solar features: sunspots and active regions. Our results demonstrate that including multiple lines improves the mean relative error from 18.6% to 14.4%, averaged over all MHD state variables, and that using group equivariant convolution architectures further improves the mean relative error to 12.5%.</p>
31	11:15 am – 11:30 am	<p>Light It Up! High-mass galaxies with High Star Formation Rates in High Density Environments at High Redshift. <i>Finn Giddings*</i>, <i>Rhodes College</i>, <i>Roy Gal^o</i>, <i>UHM</i>, <i>Brian Lemaux[†]</i>, <i>UC-Davis</i></p> <p>Using galaxy cluster samples drawn from the Observations of Redshift Evolution in Large-Scale Environments (ORELSE) Survey, we present a study on the relationship between star formation rate (SFR) and environmental overdensity in galaxy clusters around redshift $z \sim 1$. With data from the 15 fields of the ORELSE survey, we examine the dependence of two different star formation indicators, $[\text{O II}] \lambda 3727 \text{ \AA}$ and UV+IR emission, on two different overdensity indicators, $\log(1 + d_{\text{gal}})$ (local overdensity) and $\log(h)$ (distance from the cluster center). We bin our sample by cluster redshift and mass to investigate the impact of environment on star formation. We find that high- and intermediate-mass galaxies at higher redshifts and in more dense environments exhibit both higher SFRs and higher SFR efficiency relative to field galaxies, as well as to similar mass galaxies at lower redshift. Galaxies in clusters in our lower redshift sample have suppressed SFR relative to field galaxies (as is the case locally), but at higher redshift we do not see this trend. We also observe a population of high-mass galaxies in the highest density environments at high redshift, with high star formation rates, which have not been previously seen. We dub these “4H” galaxies and examine their properties for clues to their origin.</p>



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Coconut Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
32	10:30 am – 10:45 am	<p>Uniform Forward-Modeling of Ultracool Dwarfs Using BT-Settl. <i>Spencer Hurt*</i>, <i>University of Colorado Boulder</i>, <i>Michael Liu^o, UHM</i>, <i>Zhoujian Zhang^o, UH IfA</i></p> <p>Massive directly-imaged exoplanets and non-irradiated, self-luminous brown dwarfs show many atmospheric properties that overlap. However, brown dwarf atmospheres are typically easier to observe, providing more opportunities to understand the various physical and chemical processes occurring in exoplanet atmospheres and allowing us to constrain how massive planets form and evolve. The atmospheric properties of these objects are typically derived by fitting theoretical grid models such as BT-Settl to high-quality spectra. To test the accuracy of this methodology, we develop a uniform forward-modeling framework and apply it to ~100 benchmark ultracool dwarfs. We then compare the retrieved parameters to values obtained via highly accurate evolutionary models, searching for systematics in the BT-Settl models and spectroscopic modeling.</p>
33	10:45 am – 11:00 am	<p>Uncovering Dwarf AGN With TESS. <i>Helena Treiber*</i>, <i>Amherst College</i>, <i>Benjamin Shappee^o</i>, <i>Jason Hinkle^o, UHM</i>, <i>Michael Fausnaugh[†]</i>, <i>MIT</i>, <i>Patrick Valley[†]</i>, <i>Christopher Kochanek[†]</i>, <i>Krzysztof Stanek[†]</i>, <i>OSU</i></p> <p>Active galactic nuclei (AGN), which are accreting supermassive black holes, provide a window into black hole and galaxy co-evolution. We present the results of a systematic search for AGN in TESS light curves of dwarf galaxies. Evidence of short-term flux changes in dwarf galaxies can reveal an AGN even when other detection methods fail to do so. The timescale of variability correlates with black hole mass, which in turn is lower in dwarf galaxies. Thus, the month-long, high-cadence TESS light curves provide a unique tool for the identification of dwarf AGN. We demonstrate a methodology that accounts for systematics and contamination by nearby bright stars. The resulting AGN candidates will help populate scaling relations at the low-mass end and demonstrate the crucial role of TESS in studies of dwarf AGN and AGN in general.</p>
34	11:00 am – 11:15 am	<p>Uncovering the Origins of Infrared Emission in ULIRGs using Far-Infrared Fine-Structure Lines and a Cutting-Edge Model. <i>Maya Joyce*</i>, <i>Michigan State University</i>, <i>Duncan Farrah^o, UHM</i></p> <p>Ultraluminous Infrared Galaxies (ULIRGs) are galaxies with an IR luminosity of greater than $10^{12} L_{\odot}$. ULIRGs are rare in the local universe, with a space-density of <1 per ~ 100 square degrees at $z < 0.3$, but they harbor extreme examples of obscured AGN, starbursts, and mergers. At high redshifts, ULIRGs are common, with a few hundred per square degree at $z \sim 1$, but they differ from local ULIRGs in major merger</p>



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		<p>fraction (~40% lower at $z > 1$ than $z < 1$), and have a wider range of temperatures. Local ULIRGs are accessible laboratories for studying AGN and starbursts with greater spatial resolution. Because these features are obscured in ULIRGs, far-infrared (FIR) fine-structure lines, which are minimally affected by obscuration, provide a deeper look into the underlying processes. For a sample of 42 ULIRGs at $z < 0.27$, we present observations from PACS aboard Herschel of 6 FIR fine-structure lines: [OIII]52μm, [NIII]57μm, [OI]63μm, [NII]122μm, [OI]145μm, and [CII]158μm. We compare the lines to the results of a cutting-edge radiative transfer model that breaks down IR luminosity of ULIRGs into three components (starburst, spheroid, and AGN luminosity) and derives the physical properties of the components. We compute scaling relationships between the line luminosities and IR luminosity components, considering how the physical properties impact these relationships. With this analysis, we aim to understand the origins of the FIR lines and what they reveal about the IR emission of ULIRGs.</p>
35	11:15 am – 11:30 am	<p>Multi-Wavelength and Morphological Properties of Galaxies Hosting X-ray Luminous AGN in the GOODS Fields. <i>William Jarvis*</i>, <i>University of Wisconsin - Madison</i>, <i>David Sanders^o</i>, <i>Connor Auge[†]</i>, <i>UHM</i></p> <p>Active Galactic Nuclei (AGN) are supermassive black holes (SMBH) located at the center of most galaxies that are accreting new material. They emit across the entire electromagnetic spectrum from the X-ray to the radio. We present an analysis of spectral energy distributions (SED) and morphological classifications for 129 X-ray luminous AGN (Intrinsic $\text{LogLX} > 42.5$) in the Great Observatories Origins Deep Survey (GOODS) North and South field from $0.5 < z < 1.5$. Sources are sorted by four characteristic SED shapes dependent on the ultraviolet (UV) and mid-infrared (MIR) emission to better grasp how AGN emission correlates to galaxy morphology and evolution. Strong MIR (1–6μm) emission appears to be linked with bulge growth as sources with low MIR emission tend to be preferentially classified as disks, while sources with strong MIR emission are more likely to be classified as spheroids. All sources with strong UV emission are classified as point sources and are dominated by the AGN.</p>



**Poster Session II
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Dragonfruit Room**

- | No. | Time | Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary |
|-----|------------------------|--|
| 36 | 10:30 am –
10:45 am | <p>Visual Identification and DNA Bar-coding to Resolve Diet Of Endemic and Invasive Baitfishes in the Main Hawaiian Islands. <i>Nicholas Camacho*</i>, <i>Stanford University</i>, <i>Brian Bowen°</i>, <i>Nakoa Goo°</i>, <i>HIMB</i></p> <p>Declining populations of Hawai'i's endemic clupeid species present major cultural and economic concerns for the local communities and skipjack tuna (aku) fishing industry, which utilize them as their primary sources of baitfish. Additionally, this decline appears to have coincided with the appearance of an alien species, gold spot herring (<i>Herklotsichthys quadrimaculatus</i>), which has become established in nearshore habitats throughout the Hawaiian Archipelago since its introduction in the 1970's. Although baitfish are an important resource for the local fishing industry and a vital component of Hawaiian island ecosystems, little is known about the distribution and diet of baitfish populations surrounding the Main Hawaiian Islands. For this project, we investigated the diet composition of two endemic baitfish, nehu (<i>Stolephorus purpureus</i>), and Hawaiian silverside, or 'iao (<i>Pranesus insularum</i>) and gold spot herring to determine the potential for interspecific competition for prey. Visual identification and DNA bar-coding was used to elucidate diet composition. The gut contents of <i>S. purpureus</i> and <i>H. quadrimaculatus</i> were largely comprised of zooplankton, indicating some degree of overlap in diet between these two species. In contrast, <i>P. insularum</i> appeared to feed exclusively on phytoplankton. Nehu diet contents from multiple sites in the Main Hawaiian Islands will yield a better understanding of the impact of competition and local prey availability on their diet and may improve management practices and conservation efforts focused on preserving Hawai'i's fisheries and other marine resources.</p> |
| 37 | 10:45 am –
11:00 am | <p>Generating a DNA fingerprint for the traditional Hawaiian Crop Kalo (Taro). <i>Carter Zamora*</i>, <i>Gettysburg College</i>, <i>Michael Kantar°</i>, <i>Bjarne Bartlett†</i>, <i>UHM</i></p> <p>Taro is one of the most widely consumed crops in the world, with many areas in Southeast Asia and the Pacific relying on it as a staple food source. Throughout the 20th century, the decline of Hawaiian taro varieties has motivated efforts to conserve Hawaiian taro cultivars. An outbreak of taro leaf blight in the early 20th century increased commercial demand for the crop led to the crossing of Hawaiian taro varieties with germplasm from other regions. The genomic sequences of 15 advanced breeding lines and 73 Hawaiian cultivars were aligned to the Taro reference genome to develop a common set of molecular markers. Marker genotype sets were then filtered to identify the minimum number of</p> |



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		<p>markers needed to differentiate individuals. This identified the new cultivars as descendants of the novel germplasm. This has important implications for commercialization and benefit sharing with the community. These markers can then be turned into assays that can be conducted by other laboratories.</p>
38	11:00 am – 11:15 am	<p>Indirect Assessment of Biodiversity with eDNA. <i>Brian Van Lee*</i>, <i>Rice University</i>, <i>Patrick Nichols[†]</i>, <i>Peter Marko^o</i>, <i>UHM</i></p> <p>Coral reefs are among the world’s most diverse ecosystems. Unfortunately, they are diminishing at high rates. Due to their rapid decline, nondestructive assays to rapidly discover and document biodiversity are potentially valuable conservation tools. Traditional visual photographic surveys are time-consuming and expensive. Instead, coral reef biodiversity can be rapidly assessed indirectly through the analysis of environmental DNA (eDNA), DNA that is sloughed and excreted by all organisms in the ambient seawater. Through careful primer design, PCR-based methods can be developed to detect and document diversity at multiple levels of biological organization. In this study, we are developing two nondestructive eDNA biodiversity survey techniques, one aimed at documenting species diversity across entire communities while the other is aimed at discriminating and documenting morphologically similar species within a single nominal species. First, we are analyzing eDNA in sea water sampled from within the reef, which contains the vast majority of coral reef organisms, many known but some unknown. These data will allow us to survey the hidden invertebrate communities that we were unable to directly assess with visual methods. The second eDNA application involves testing the utility of eDNA to detect morphologically similar but genetically distinct “cryptic” species. Here, the focus is on limpet species <i>Siphonaria normalis</i>, a single nominal taxon that consists of several different species that are highly morphologically similar. This second application of eDNA methods will allow us to document spatial patterns of species diversity and potentially discover species previously unknown to science.</p>
39	11:15 am – 11:30 am	<p>Genome size estimates for a threatened endemic flora. <i>Cuyler Yafuso*</i>, <i>Karolina Heyduk^o</i>, <i>UHM</i></p> <p>Understanding the evolution of genomes across flowering plants is still limited by the relatively poor sampling of genome sizes across angiosperms. Knowing the genome size, also known as C-value, of a species enables future research on a plant’s evolutionary history and on the key adaptations that allow it to survive in new environments.</p>



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However, limits on genome size do exist. Enough time has passed for plant genomes to become large, but unregulated genome changes can sometimes have negative effects on a plant's fitness. The endemic flora of Hawai'i is particularly unique: Hawaiian plants have evolved from their progenitor species, though our understanding of genome size evolution in Hawaiian plants is lacking. C-values of select Hawaiian species have been estimated, but not on a scale that accurately represents the many plant species here in Hawai'i. To increase the representation of Hawaiian plant genome sizes, specific plant species were collected from the Campus Arboretum to be analyzed via flow cytometry. Genome sizes of collected plants were compared to those of their non-Hawaiian relatives to observe changes or differences between the two relatives. Plant samples were chosen based on data already collected from past research and missing or overlooked species whose genome size has not been estimated. Moving forward, we will continue to estimate and map the C-values of additional species, with the goal of establishing a database of C-values for all Hawaiian plant species. Readily available genome sizes will enable future research on evolution, genomics, and the ecology of the Hawaiian flora.



Poster Session II
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10:30 – 11:30 am
Elepaio Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
40	10:30 am – 10:45 am	<p>Characterizing of Volcanic Features with Drone and Satellite Data at Sierra Negra. <i>Johanna Alén-Bella*</i>, <i>Cal Poly Pomona</i>, <i>Meghan Jones^o</i>, <i>UHM</i></p> <p>Drone- and satellite-derived digital elevation models (DEM) enable detailed study of areas and support hazard mapping and emergency responses. To understand the potential use for high resolution satellite DEM products, we must understand their capabilities for mapping. We use drone and satellite DEM to study Sierra Negra, identify volcanic features, and to perform a statistical comparison between the products. Sierra Negra is a shield volcano on Isabela Island in the Galápagos archipelago. This study focuses on volcanic features from Sierra Negra's 2018 eruption. The eruption occurred on the volcano's northern flank and had two phases along five fissures, producing over 30 square km of lava flows. We created DEMs and orthomosaics using Agisoft Metashape based on five Phantom 4 drone surveys collected from the caldera rim in October 2018. We are using QGIS and PyGMT to identify and map volcanic features in the DEMs and orthomosaics. We will use PyGMT and QGIS to compare the DEM products. Preliminary results show that the higher resolution drone DEM can be used to identify a range of volcanic features, and for detailed studies of locations and changing environments. Smaller-scale features are difficult to identify in satellite DEMs, making them less useful for granular characterization, but they can be used for overviews of a larger region and to put drone footage in context.</p>
41	10:45 am – 11:00 am	<p>Micro-Raman Spectroscopy of Sulfur Compounds Present in Volcanic Aerosols (Vog). <i>John Fast*</i>, <i>Shiv Sharma^o</i>, <i>UHM</i></p> <p>The Kīlauea Volcano on the Big Island of Hawaii Islands emits Vog in the form of SO₂ gas which reacts with sunlight, oxygen, and water in the atmosphere to form acidic sulfuric acid aerosols. The Vog resides in a region known as the non-cloudy atmosphere, which properties are determined by the molecular gases and aerosol particles present in a parcel of air and resides in the stratospheric background aerosol layer. In this region, vog has forms type I polar stratospheric clouds (PSCs) which produce acid rain, as well as deplete ozone. The coalescence of vog particles emitted pollute the atmosphere, producing enormous opportunity for studying the atmospheric physics and chemistry, as well as helping understand potential health risks vog presents to the Hawaii. Micro-Raman spectroscopy can be used as a method of identifying sulfuric compounds present in vog aerosols. Micro-Raman spectroscopy utilizes a laser of a single wavelength focused onto a sample that shoots photons at</p>



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		<p>the sample and are scattered. The scattered photons are collected, and a spectrum is generated. Each peak along the Raman spectrum indicates a unique molecular compound that can be used as a signature for identification. Using 785 and 514 nanometer lasers, we analyzed various sulfuric compounds; sulfuric acid, ammonium sulfate, ammonium hydrogen sulfate, and methanesulfonic acid. The application of micro-Raman spectroscopy will help identifying and understanding the chemical makeup of surface aerosols formed from emission from the Hawaiian volcano, and stratospheric sulfate aerosols and potentially make inferences regarding chemical interactions present that form PSCs.</p>
42	11:00 am – 11:15 am	<p>Atmospheric Variables and Their Relation to Rain on Oahu. <i>Jacob Flores*</i>, <i>Alison Nugent^o</i>, <i>Giuseppe Torri^o</i>, <i>UHM</i> Hawaii holds the special honor of being the wettest place in the US, seeing a greater volume of rainfall throughout the year than anywhere else in the country. This is due to the north-easterly trade winds that bring moisture in from the ocean, forming clouds, and thus rain as these clouds move over the islands. This general concept of the easterlies' influence on weather is understood, what is not is how the variabilities within trade-wind weather, such as the influence of sea salt aerosols or cloud typing, has not received much attention. The objective of this study is to correlate rainfall patterns with atmospheric conditions in order to have an understanding of how these factors relate. To do this, several time series have been examined in order to recognize significant patterns. Vertical soundings (balloons recording variables such as atmospheric pressure, wind speed and direction, temperature, etc.) collected from Hilo and Lihue (1990-2021) to show atmospheric conditions on any given day. Rain gauge data collected (1990 to 2020) from 158 stations scattered throughout Oahu will provide total rainfall of that given day. In conjunction with fellow research looking at cloud formation types and radar scans, we will attempt to find any significant relationship between cloud type, weather condition, observed rainfall, and measured rainfall. With this research, we hope to be able to provide a better understanding of conditional factors that lead to precipitation over Hawaii.</p>
43	11:15 am – 11:30 am	<p>Connecting Radar Derived Rainfall in Hawaii with Weather Conditions. <i>Lena Fleischer*</i>, <i>Colorado College</i>, <i>Alison Nugent^o</i>, <i>Giuseppe Torri^o</i>, <i>Katie Ackerman[†]</i>, <i>UHM</i> Fresh water on the Hawaiian Islands comes almost exclusively from rainfall. A considerable portion of precipitation events are trade-wind showers where north-easterly trade winds result in orographic lifting,</p>



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		<p>forming clouds and precipitation on the windward side of each island. This process is well understood, however there are many unknowns regarding trade wind variability and correlations between precipitation and other atmospheric conditions. In this project, raw radar data collected from 2016-2019 at four sites across the main Hawaiian Islands were processed in hourly segments using LROSE to produce an estimate of quantitative precipitation from radar reflectivity. A Python script was created to semi-automatically plot radar data, producing visualizations of precipitation accumulation over the Islands. By creating a framework to sort radar rainfall days based on a given atmospheric condition, for example cloud cover type and wind speed, analysis can be conducted to promote understanding of how these meteorological changes influence rainfall patterns over the Islands. The program produces an image displaying precipitation accumulation for a specified time frame. Applications for these images include correlating radar-derived rainfall patterns with wind speed, wind direction, observed rain gauge measurements, and cumulus cloud cluster type. Findings from these analyses could improve atmospheric dynamic modeling and climate change projections, both locally and globally.</p>



Oral Session
Social Science; Arts & Humanities
11:45 am – 12:45 pm
Anuenue Room

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
44	11:45 am – 12:00 pm	<p>Reproductive Injustice in the Territory of Hawai‘i. <i>Sarah Hamid*</i>, <i>Lani Teves^o</i>, <i>UHM</i></p> <p>Reproduction is at the core of nation building; women birth and build nations. Social norms of reproduction and medical interventions greatly shape the landscape in which reproduction operates for women, as was the case during the territorial period of Hawai‘i, which lasted just under 60 years. During this period as a territory of the United States, western medical systems were imposed which shifted reproductive health practices and trends considerably. While considerable historical documentation of alarmingly high maternal mortality and infant mortality rates and sterilization/birth regulating programs does exist, little contemporary scholarship exists regarding the overall health disparity trends during this period. Through analysis of archival medical journals detailing the often coercive and violent reproductive practices, this work brings to light a period of history of gendered violence against the women of Hawai‘i that has not been previously uncovered.</p>
45	12:00 pm – 12:15 pm	<p>Discrimination in Hawai‘i: Experiences and Perceptions of Latinx. <i>Emerson Abreu*</i>, <i>Jayme Scally^o</i>, <i>Samuel Spender[†]</i>, <i>UHM</i></p> <p>Racial discrimination towards Latinx individuals is displayed within American society in various ways. The mechanisms by which these discriminatory attitudes affect people’s lives have been widely studied and research has shown that Latinx Americans report facing discrimination in nearly every aspect of their lives. However, examining this discrimination within the unique sociocultural context of Hawai‘i has yet to be done. This research seeks to discover whether or not Latinx Americans’ perceptions and experiences of discrimination within the U.S. as a whole reflect those of Hawai‘i residents.</p> <p>Latinx students at UHM were surveyed using key questions from a study titled: “Discrimination in America,” by Harvard School of Public Health on Latinx experiences with discrimination, in light of the hypothesis that Latinx students experience comparatively less discrimination in Hawai‘i. This prediction is based on the unique context of Hawai‘i that is hypothesized to influence Latinx individuals' experiences.</p> <p>As the fastest growing ethnic group in Hawai‘i, insight on Latinx experiences of discrimination is crucial as it can strengthen our understanding of how perceptions of race impact life with potential implications for the quality of treatment in medical, professional, and other relational settings for Latinx individuals. This research may provide novel findings to add to the literature on discrimination among Latinx individuals in Hawai‘i, a relatively understudied topic.</p>



Oral Session
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No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
46	12:15 pm – 12:30 pm	<p>Allyship: Reckoning with Learned Histories. <i>Alessandra Talabong*</i>, <i>Sarah Allen°</i>, <i>UHM</i></p> <p>Racism and discrimination thrive on the silence of others. If we desire to at least alleviate these problems in our society, they require us to reexamine our histories and our conversations with other people. The main purpose of this work will be to rewrite parts of the false histories that have been written for me by those in power. As someone who has lived in Manila, Guam, and Oahu, I can attest to the differing ways history has been taught to me by those in authority. I write about the many ways that I inherited different forms and narratives of history and how I fight back against those stories to bring about a better and true account of those narratives for better allyship.</p> <p>This work of creative non-fiction is a hybrid of my autobiographical experience as well as a narration of histories that have brought me and the cultures in which I am entangled to where we are now. This work incorporates narratives, realizations, reflections and information I have learned from my classes. The project includes three vignettes that feature stories from the Philippines, Guam, and Oahu—stories about my attempts at connecting with each place, in order to ally with the cultures that have been oppressed and whose histories have been silenced. All these vignettes reflect on not only the stories that I inherited from histories of colonialism, but also how I continue to reckon with the decolonial histories that I have learned as a student. A proper examination of lived experience, transformative moments, and interaction with learned history can bring greater awareness of our social upheavals and possibilities for change today. The main purpose of this work is to reconstruct my “self” as an ally in relation to the histories of those who have been silenced and/or oppressed.</p>
47	12:30 pm – 12:45 pm	<p>Developing an English-Hawaiian Classical Dictionary. <i>Kali Konopko*</i>, <i>Cody Powers*</i>, <i>Vivian Hurney*</i>, <i>UHM</i>, <i>Mariko Jurcsak*</i>, <i>Notre Dame</i>, <i>Daniel Harris-McCoy°</i>, <i>UHM</i></p> <p>In this talk, we will describe the continued development of a digital Hawaiian-English classics-themed dictionary by a team of undergraduates and how the dictionary can be used to study the reception of classical culture in 19th century Hawai‘i. We will start by providing some examples of classical reception in 19th century Hawai‘i--e.g. the Punahou School curriculum and the use of the Prima Porta Augustus as the primary model for the Kamehameha statue in Downtown Honolulu--and the cultural and political forces that contributed to their creation. We will then turn to the rationale behind the creation of a Hawaiian-</p>



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		<p>English classics-themed dictionary and how we are continuing to expand and improve the dictionary for scholarly use. The dictionary responds to a lack of specialized tools for the study of classics in Hawai‘i, which reflects a parallel lack of such tools in non-European and American contexts. The dictionary is also valuable because it will allow scholars to access Hawaiian-language resources for the study of Hawaiian history that have only recently become available. We will describe how the dictionary was built and organized, and how it can be used by scholars to search digital repositories of the many Hawaiian-language newspapers published in the 19th and early-20th centuries (see Mookini 1974). We will close with examples of the kinds of classics-related materials found in these newspapers, along with some broader observations about the value of the project in light of current trends in the field of classics.</p>



SOCIAL SCIENCE



ARTS & HUMANITIES

**Oral Session
Social Science
11:45 am – 12:45 pm
Breadfruit Room**

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
48	11:45 am – 12:00 pm	<p>Interviewing Zen Buddhists on the Mindful Attention Awareness Scale Validity. <i>Tiare Sabellano-Tsutsui*</i>, <i>Jane Onoye°</i>, <i>UHM</i></p> <p>Mindfulness practice, an ancient Eastern tradition, has become popular in the West in such areas as research, clinics, medicine, education, business, justice system, and media. One of the most highly cited mindfulness measures in current research is the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003); however, along with this popularity comes many validity concerns. Among the concerns are past studies with Zen Buddhist practitioners observing gaps in self-report mindfulness measures, including the MAAS. The proposed study aims to gather qualitative data on Zen Buddhists' perspectives on possible gaps and strengths of the MAAS using cognitive virtual interviews. The sample will consist of up to 20 adult practitioners with at least ten years of experience. The purpose of this project is to assess the construct validity of the MAAS and potentially guide future study design and improvements to other self-report mindfulness measures.</p>
49	12:00 pm – 12:15 pm	<p>Bringing Food to the Table: Exploring the Potential of Urban Agriculture in Honolulu. <i>Seraphina King*</i>, <i>Priyam Das°</i>, <i>UHM</i></p> <p>The growing interest in local food production coupled with the social, environmental and economic benefits associated with agricultural uses in urban areas has spawned numerous small-scale agriculture projects. These range from individuals' backyards to community gardens and commercial urban farms. Consequently, local governments have devised policies and plans to support such endeavors, or in some cases, regulations to sanction them (e.g., local zoning codes that do not permit urban agriculture). This project explores the potential for urban agriculture to contribute to local food production and the associated implementation challenges. Drawing on stakeholder interviews, a review of existing literature and case studies, and policy and planning documents on the topic, it looks at how different stakeholders (state and non-state) are engaging in urban agriculture in Honolulu. The findings will deepen understanding of urban agriculture within the broader context of local food production.</p>
50	12:15 pm – 12:30 pm	<p>Are All Eyes The Same? Eye Gaze Cue Processing Differences in People with Autism Spectrum Disorder. <i>Maximillian Soares Miehlsstein*</i>, <i>Scott Sinnett°</i>, <i>Jonas Vibell†</i>, <i>UHM</i></p> <p>This study evaluated eye gaze as an effective social cue to orient attention in adults with Autism Spectrum Disorder (ASD), and also addressed the effectiveness of schematic or real faces in their ability to orient attention. Participants responded to the presence of a target that was validly or</p>



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		<p>invalidly cued by either a realistic or schematic face in a Posner-like (1980) gaze cueing task. Reaction time (RT) and accuracy were compared between subjects with ASD (n=33) and without ASD (n=32). Results displayed an attentional cueing effect across all subjects, where congruent trials (i.e., the eye gaze cue correctly indicated the side that the target appeared) were faster than incongruent trials (i.e., the eye gaze cue looked to the opposite side that the target appeared). Neither RT nor accuracy differed significantly between the groups indicating that autistic people do not take longer to process eye gaze cues for either face type. Despite this unexpected finding, participants had faster RTs among congruent trials at 100ms SOA than at 300ms SOA, and among congruent schematic faces at 100ms SOA than congruent realistic faces at 100ms SOA. More errors were made among incongruent trials when participants responded to schematic faces as compared to realistic faces. Ultimately, the findings suggest that realistic faces are processed similarly despite the relative increase in complexity compared to schematic faces. Findings are discussed in the context of our current understanding of eye gaze cues as social vs. symbolic cues, with the implication of gaze cues being an exogenous cue.</p>
51	12:30 pm – 12:45 pm	<p>Understanding Oahu’s Reentry Support System for the Formerly Incarcerated. <i>Madison Sweaney*</i>, <i>Ashley Rubin^o</i>, <i>UHM</i></p> <p>Every day, individuals are released from our prisons and return to the community. Given our alarmingly high recidivism rate in the United States, there is a general consensus that prisons do not have enough rehabilitative programs and that the overcrowded and underfunded programs we do have produce questionable results. Instead, much of the responsibility of rehabilitating our incarcerated population is left to the community where they will return. This research project surveys all reentry resources that are present on Oahu so that we may better recognize the gaps in our own community. To that end, the author collected information from reentry-related organizations’ websites and interviewed individuals who work at these organizations to better understand the services they offer. Additionally, the author surveyed older guides created by both criminal justice organizations and the State of Hawaii to determine how up-to-date and accurate the information is. The author concluded from this survey that an updated reentry-specific guide is desperately needed. This information was then used to create an all-inclusive reentry guide for formerly incarcerated individuals and their family to use so that they may be more aware of the wide variety of resources available to help them rebuild their life after incarceration.</p>



**Oral Session
Social Science
11:45 am – 12:45 pm
Coconut Room**

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
52	11:45 am – 12:00 pm	<p>The First-Year Experience and Honors: Exploring Successes and Challenges During Pandemic. <i>Abigail Jones*</i>, <i>Jayme Scally°</i>, <i>UHM</i></p> <p>The first-year college experience has been shown to have a pivotal impact on the retention, persistence, and overall experience of undergraduate learners. This study seeks to understand the first-year experience during the COVID-19 pandemic at the University of Hawai‘i at Mānoa (UHM), specifically if and how participation in the Honors Program (HP) may have influenced it. Honors seeks to guide undergraduates through meaningful learning experiences that connect to their local and global communities and draw on the unique resources and cultures of our campus. Traditionally, online learning has been seen as antithetical to HP pedagogy, which prizes high interaction and creativity. However, the COVID-19 pandemic has brought challenges to higher education and left wide gaps in the existing data to be filled. This study will include both a quantitative questionnaire administered independently online and a qualitative one-to-one interview conducted via Zoom. The questionnaire data will provide a broad quantitative understanding while the interviews will provide deeper qualitative insight to these issues and others the participants desire to share. The potential implications of this project relate broadly to the university experience, and more specifically to HPs, and the benefits of a research-intensive academic program on the development of a sense of community or belonging in a virtual environment. This presentation will share preliminary data collected from this study.</p>
53	12:00 pm – 12:15 pm	<p>Ke Ho‘i A‘ela ka ‘Ōpua i Awalau: Reconnecting K-12 Students to Hawai‘i. <i>Donavan Albano*</i>, <i>Tara Sutton*</i>, <i>Keali‘i Kukahiko°</i>, <i>Lahela Kaulukukui†</i>, <i>UHM</i></p> <p>Through working with the Office of Hawaiian Education (OHE) within the Hawai‘i Department of Education (HIDOE), we are conducting research around the Hawaiian Language Immersion Program (HLIP) using the OHE Theory of Change: a research model designed from a Hawaiian ontological framework. The following research questions that will guide their work: Where is the desired futurity for Kaiapuni (the desired goals and outcomes of HIDOE’s stakeholders)? What are the outcomes found within current data sets (KA‘ĒO, KAF, ‘Āina Ulu, etc.)? What are the outcomes (undesired and desired) that do not show up in the current data sets? Why do those outcomes exist, and How are educational P4 (practices, projects, programs and policies) mitigating or enhancing the conditions that produce them? How are the P4 outcomes moving stakeholders closer or further to their desired futurity? How is student</p>



**Oral Session
Social Science
11:45 am – 12:45 pm
Coconut Room**

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>success and academic achievement measured, and How are they tracked after transfer, or graduation? This investigation will require student-researchers to: 1) conduct a historical analysis to understand the context to contemporary issues, or observed outcomes; 2) conduct constant comparative analyses to determine interrelationships between data points, and 3) evaluate educational P4 intended to improve learning conditions that optimize desired outcomes.</p>
54	12:15 pm – 12:30 pm	<p>Technology and K–12 Teaching During COVID-19. <i>Janet Breckenridge*</i>, <i>UH Hilo</i>, <i>Kimiko Smith*</i>, <i>Kelley Ho*</i>, <i>Truc Nguyen^o</i>, <i>Ku‘ulei Serna^o</i>, <i>UHM</i></p> <p>The COVID-19 pandemic forced school closures, which imposed a sudden shift in the way teachers delivered instruction to their students. Online educators can spend years learning different strategies to sustain relationships and a sense of community. The struggles and success of teachers in Hawai‘i, like many who suddenly had to become distance learning educators, were the focus of this study. We used a phenomenological study approach aimed to describe the common experiences of Hawai‘i teachers teaching during COVID-19. Phase one of the study was a survey sent to all public and private school principals to send to their teachers. As of March 25, 2021, 468 educators responded to the survey. The survey consisted of 25 questions that addressed their challenges and improvements since transitioning to online teaching. Phase two of the study will consist of focus group interviews of about 15 to 20 teachers. In this phase one focus paper, t-test and chi-square analysis on preliminary survey results showed that teachers were significantly more comfortable a year into teaching online compared to prior the pandemic and were more likely to be higher on a technology adoption spectrum. Preliminary analysis of open-ended responses indicated most respondents had very little time in preparing their transition to online teaching as part of institutional responses to the COVID-19 pandemic.</p>
55	12:30 pm – 12:45 pm	<p>Project KUALIMA: Transforming an Innovative Professional Learning Series into Research. <i>Jessica Lau*</i>, <i>Vanessa Liang*</i>, <i>David Royer^o</i>, <i>Roxanne Bristol^o</i>, <i>Tristan Setzer[†]</i>, <i>Kristina Brown[†]</i>, <i>UHM</i></p> <p>Project KUALIMA was a year-long five-part online professional learning series that supported the ability of local educators and school staff to effectively manage challenging behavior. Our audience averaged 100 participants per session. 50 participants working for the Hawai‘i Department of Education completed additional requirements to earn 6 professional development credits.</p>



**Oral Session
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Coconut Room**

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>We used Qualtrics to collect pre- mid- and post-project data including social validity (SV), behavior expectations, and knowledge, confidence, usefulness (KCU), and use of key concepts and strategies. We collected treatment integrity and evaluation data for each session, and semi-structured interviews prior to Session 3 and after Session 5. Results showed our communication, objectives, and evidence for content met participant expectations with a gradual increase over time. Participant SV grew from pre- to post-project, indicating we exceeded expectations for project goals, procedures, and outcomes. Growth in participant confidence in their ability to respond effectively to or manage challenging student behavior was statistically significant. Contrary to hypothesis there was significant growth in perceived percentage of students with challenging behavior. Analysis of KCU data revealed statistically significant growth in educator perceived KCU plus actual knowledge and use of course skills and concepts, such as components of a comprehensive, integrated, three-tiered model of prevention and low-intensity behavior strategies. Qualitative analysis of interviews provided themes related to future course improvements, high rigor, high engagement, and overall appreciation for the series' organization and content.</p>



Oral Session
Natural Science; Engineering & Computer Science
11:45 am – 12:45 pm
Dragonfruit Room

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
56	11:45 am – 12:00 pm	<p>Prediction of Same Day Discharge in Unicompartmental Knee Arthroplasty Patients using the Outpatient Arthroplasty Risk Assessment Score. <i>Ryan Nguyen*</i>, <i>Samantha Andrews°</i>, <i>UHM</i>, <i>Cass Nakasone°</i>, <i>Straub Medical Center</i></p> <p>Pursuing same-day discharge following unilateral unicompartmental knee arthroplasty (UKA) is safe and cost-effective; however, risk stratification for patients undergoing UKA at a community hospital, who often have greater comorbidities, remains unclear. Therefore, this study evaluated the efficacy of three commonly used comorbidities indices in detecting same-day discharge from a community hospital following unilateral UKA. Data were retrospectively evaluated for 100 consecutive UKA patients. All patients received a mobile bearing UKA except two patients, who were excluded. Additionally, a surgical start time of 4:26pm was deemed insufficient time to achieve same day discharge and the patient was excluded. The American Society of Anesthesiology (ASA) comorbidity classification was assigned by the anesthesiologist prior to surgery and data were collected via chart review to complete both the Charlson Comorbidity Index (CCI) and Outpatient Arthroplasty Risk Assessment (OARA).</p> <p>Overall, 97 patients were included in data analysis, with 77 achieving same-day discharge. Failure to achieve same-day discharge was best predicted by gender (Odds Ratio (OR): 4.45, 95% Confident Interval (CI): 1.307-15.147) and use of an assisted walking device (OR: 3.633, CI: 1.218-10.832). The ASA, CCI, and OARA demonstrated similar positive predictive values, with the OARA score having the lowest specificity. Despite similar predictive values, the low sensitivity of the OARA score would limit the application in this cohort. However, as this cohort consisted of nearly 66% Asian patients, more studies are required to evaluate the OARA cutoff scores in multiple demographics, especially in more ethnically diverse populations.</p>
57	12:00 pm – 12:15 pm	<p>Calibration of Silicon Detectors for the GAPS Experiment with Atmospherically-produced Muons. <i>Hershel Weiner*</i>, <i>Philip von Doetinchem°</i>, <i>Johannes Stoessel°</i>, <i>UHM</i></p> <p>This project aims to obtain an energy spectrum of atmospherically-produced muons for the General AntiParticle Spectrometer's (GAPS) detector modules. GAPS is an antimatter detector set to launch in our upper atmosphere from Antarctica for the first time in late 2022. Theoretical models have predicted that certain antimatter nuclei are strong indications of dark matter within our Galaxy, making GAPS a leading front in the investigation of dark matter. When GAPS flies it will be</p>



Oral Session
Natural Science; Engineering & Computer Science
11:45 am – 12:45 pm
Dragonfruit Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
58	12:15 pm – 12:30 pm	<p data-bbox="467 415 1406 846">composed of 1000 individual lithium-drifted silicon detectors, all of which need to be calibrated. The GAPS team at UH Manoa is responsible for about 50% of these calibrations, utilizing an X-ray source of known energy. Measuring the responses of the detectors to X-rays of known energy will allow the GAPS team to identify some of the types of particles the detector interacted with. Since muons cause greater energy depositions than the X-rays used in the routine calibration sequence, they will induce a different response in the detector modules, which further aids in the calibration of these detectors. This project aims to provide a characterization for these higher energies from atmospherically produced muons and aid GAPS in its goal of expanding our knowledge of the universe.</p> <p data-bbox="467 873 1370 940">High precision 3D-printed molds for soft lithography of epidermal microfluidic devices. <i>Faith Rolark*</i>, <i>Tyler Ray^o</i>, <i>UHM</i></p> <p data-bbox="467 947 1417 1785">Microfluidic systems offer powerful analytical capabilities for a diverse range of applications including biomolecular sensing, physiological monitoring, and pharmaceutical manufacturing. Traditional manufacturing processes require lengthy processing—hours to days—in highly controlled cleanroom environments using expensive, complex equipment. The rise of alternative manufacturing pathways that leverage recent advances in additive manufacturing permit rapid design iterations of microfluidic devices in minutes or hours under an inexpensive mode of operation. However, the capabilities of commonly employed printing technologies, such as resin-based stereolithography (SLA), are limited by the effective X-Y resolution to print features on the order of tens or hundreds of microns. Here, we investigate the feasibility of utilizing additive manufacturing to produce molds for the fabrication of an emerging class of microfluidic devices, characterized by a conformal interface to the skin (epidermal microfluidics), via soft lithography. We provide detailed insight into the lower limits of printing both channel and valve features by comparing dimensional accuracy of printed master molds and the resultant molded microfluidic device. We compare performance of common consumer printers with industry leading printers to assess the full scope of this technology in producing microfluidic devices. Finally, we offer processing strategies to mitigate the typical cure-inhibition challenges encountered with using elastomeric materials (poly(dimethylsiloxane), PDMS) with printed resin molds.</p>



Oral Session
Natural Science
11:45 am – 12:45 pm
Elepaio Room

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
59	11:45 am – 12:00 pm	<p>Protection or production? Using QTL mapping to isolate how stomatal ratio affects photosynthesis and pathogen defense. <i>Genevieve Triplett*</i>, <i>Christopher Muir°</i>, <i>UHM</i></p> <p>Stomata are microscopic pores on a leaf's surface that regulate CO₂ gain and water loss during photosynthesis. <i>Solanum</i> var. <i>lycoperscum</i> is the species of domesticated tomato that has the majority of its stomata on its lower (abaxial) leaf surface, while <i>Solanum pennellii</i> is a wild species that has almost equal amounts of stomata on its lower and upper (adaxial) surfaces. Stomata on the upper surface of a leaf increase the rate of photosynthesis, but may be more susceptible to foliar pathogens than stomata on the lower surface because many pathogen propagules are deposited by gravity or rain on the upper surface. Because of this, a trade-off may be established, affecting the number of stomata a plant may have: more stomata, and higher productivity, or fewer stomata, but a stronger pathogen defense (Dutton <i>et al.</i> 2019). This project aimed to take a first step towards determining if this is true by fine-mapping the genomic locations of genetic loci that affect stomatal ratio. To do this, we planted known Backcross Inbred Lines (BILs) and for each, counted the number of stomata on both surfaces to determine if its stomatal ratio more closely resembled <i>S. lycopersicum</i> or <i>S. pennellii</i>. We found that several of the BILs indeed resembled <i>S. pennellii</i>, meaning that there was a gene in the given chromosome bins that increased the number of adaxial stomata. However, given the obtained data alone, we were unable to map the gene to any specific gene bin, so further research must be done.</p>
60	12:00 pm – 12:15 pm	<p>Effects of Agricultural Intensification on Climate in the Midwest. <i>Eleanor Yuan*</i>, <i>Michael Roberts°</i>, <i>UHM</i></p> <p>Global warming is a current important issue that affects communities across the globe. It is predicted that the planet will warm at least 2°C on average since the benchmark set around 1800. However, in more recent years, data has shown that a portion of the midwestern United States actually has an average decreased maximum surface temperature during the summertime. The exact cause of this “warming hole” is unknown, however, research has discussed the importance of aerosols, atmospheric circulation, and agriculture. In this research project I find the effect of corn and soybean production area in the midwest on the maximum temperature anomalies using gridded data. I test the hypothesis, motivated by the research of Mueller <i>et al.</i> (2016) and Nikiel and Eltahir (2019), that the unusual cooling is a result of changes in agriculture via the biological process of evapotranspiration (ET), which removes energy from the ground. Using fine-gridded data, I compare trends in maximum</p>



**Oral Session
Natural Science
11:45 am – 12:45 pm
Elepaio Room**

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
		temperature anomalies in nearby areas with different cropping intensity during peak crop ET. I also examine whether differences in trends exist during low-ET time periods.
61	12:15 pm – 12:30 pm	<p>Investigating Epizotic Growths on Planktonic Crustaceans in Kāneohe Bay, HI. Daniel Cervantes*, Daniel Hartline^o, Petra Lenz^o, Andrea Jani^o, UHM</p> <p><i>Labidocera madurae</i>, is an ecologically-important copepod (a type of planktonic crustacean) that inhabits the waters in and around Kāneohe Bay, O‘ahu. In recent years, at the bay’s north end, adult members of the <i>L. madurae</i> population have been observed to be infested with mysterious growths - possibly representative of harmful microbial infections – on their tails and antennae. Sequencing of the 16S gene (a genetic marker for bacteria) was used to identify the members of the <i>L. madurae</i> microbial community and observe any possible differences between infected and non-infected individuals. Over a two-month period in 2019, members of the <i>L. madurae</i> community were collected via vertical net tows off of the He‘eia Pier. These individuals were then examined under a light microscope for visual signs of growths and were categorized as either ‘infected’ or ‘non-infected,’ yielding a comprehensive population infestation ratio on each collection date. Next, the two dates with the highest and lowest respective infection ratios were singled out. Polymerase chain reaction was then used to amplify the 16S gene present in each of the samples and the resulting gene sequences were used to determine the bacterial species present. From this, it was found that infected individuals hosted a more diverse microbial community than non-infected ones. In addition, the communities were found to be different between the highest and lowest observed infection dates.</p>



Oral Session
Natural Science
11:45 am – 12:45 pm
Fern Room

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
62	11:45 am – 12:00 pm	<p>Category Learning in Honeybees: The Search for Visual Categories. <i>Joseph Caldwell*</i>, <i>Patricia Couvillon^o</i>, <i>UHM</i></p> <p>The study of learning in honeybees has focused on the detection and discrimination of simple stimuli such as colors and odors. In this study, honeybees were trained with more complex pattern stimuli to determine if they are discriminable and suitable for work on categorization. Free-flying bees were trained to fly between the hive and laboratory to choose between two patterns. Choice of one was rewarded with sucrose, and choice of the other was punished with stevia. There were two types of patterns, each composed of two colors. One type was two differently colored semi-circles (splits), and the other was alternating two-color quadrants (quads). The colors were green (G), orange (O), yellow (Y), and blue (B). The bees in Groups 1 and 2 were trained with two quads; for Group 1 there was a common color (<i>e.g.</i>, BO vs BY) and for Group 2 there was not (<i>e.g.</i>, BO vs GY). The bees in Groups 3 and 4 were trained with two splits; for Group 3 there was a common color and for Group 4 there was not. All possible two-color patterns were balanced across bees. First choice was recorded on each of 8 training trials. All four groups learned to discriminate with correct choice greater than chance (50%). The bees in Groups 2 and 4, trained with no common color, showed significantly better discrimination than Groups 1 and 3. Nonetheless, the results demonstrate that these patterns are discriminable, and the next step is a category discrimination experiment with split and quad patterns.</p>
63	12:00 pm – 12:15 pm	<p>Adipocyte Area and Index in North Pacific Humpback Whales. <i>Hannah Fuchser*</i>, <i>Kristi West^o</i>, <i>Jana Phipps[†]</i>, <i>UHM</i></p> <p>Blubber is a unique and multifunctional form of adipose tissue found in marine mammals. Measurements of blubber such as thickness or adipocyte count can be used to make predictions about energy reserves, diet, or other health indicators. In cetaceans it is well documented that blubber and body condition are connected. As such, it is important to have an accurate and standardized way of measuring blubber in a way that can be compared to body condition in order to more effectively compare results across studies. Adipocyte measurements may show a more accurate image of actual body condition than other blubber metrics. Since adipocyte number is set at an early age, a change in adipocyte volume may more accurately reflect a change in body condition. A correlation has previously been found in Southern hemisphere humpback whales between three adipocyte measurements, area, index, and lipid-percent, with the strongest correlation being between adipocyte area and index. They also found that adipocyte area and index were sensitive enough measurements</p>



Oral Session
Natural Science
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Fern Room

No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		to correctly predict the migratory state in humpbacks using biopsy samples. In this study, I will measure adipocyte area and index from North Pacific humpback whale biopsy samples of blubber. I will use the program FIJI, a subset of ImageJ, to measure both adipocyte area and index and then compare the two blubber metrics in North Pacific humpback whales. I am looking to confirm the linear relationship between adipocyte area and index in North Pacific humpback whales that has previously been described from this whale species in the Southern hemisphere.
64	12:15 pm – 12:30 pm	<p>An Assessment of the Variability of Hormones Between Baleen Plates in a Pregnant Humpback Whale. <i>Sabrina Nicole Haverly*</i>, <i>Kristi West^o</i>, <i>Cody Clifton^o</i>, <i>UHM</i></p> <p>Humpback whales are a migratory species of filter-feeding baleen whales that travel to Hawaii during the winter months to give birth to their calves. Similar to hair, baleen is made of keratin, a protein that can store biological information, such as hormone concentrations, resulting in a preserved historic record of hormone levels over time. In January of 2020, a female humpback whale stranded on the island of Molokai. A necropsy was performed in the field, where it was discovered to have been pregnant with a full-term fetus. As a breeding member of the humpback whale population that visits the Hawaiian Islands, it is important to assess the possible factors that contributed to this stranding event. The goal of this project is to examine variation in hormone levels preserved in different baleen plates within the same animal. This will also provide insight into the health of this individual for the past five years. Selected baleen plates were prepared following published methods, taking samples at 1 cm intervals along the length of the plate by drilling into the baleen and following the baleen growth rings. Hormones were extracted from the samples using methanol and then measured via enzyme immunoassays for a spectrum of hormones. The results of these analyses will provide insight into the variability between different baleen plates of the same individual and allow for better understanding of the physiological state of this animal in its recent lifetime.</p>
65	12:30 pm – 12:45 pm	<p>DNA Degradation in Marine Mammals for the Estimation of Post-Mortem Interval. <i>Sara Bower*</i>, <i>Kristi West^o</i>, <i>Cody Clifton^o</i>, <i>UHM</i></p> <p>Determination of the time of death of a stranded cetacean provides important insight into marine mammal conservation. Accurate estimation of the post-mortem time interval (PMI), or the time elapsed between the death of the animal and the time of carcass recovery, allows for better</p>



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No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>evaluation of the cause of death and determination of contributing factors. When dead marine mammals are reported by the public and carcasses are subsequently recovered for examination, the PMI is typically unknown. Quantifying degradation of DNA over time has the potential to provide a useful estimate of the time of death, as DNA begins to break down after an animal dies. The purpose of this project is to develop a quantitative tool based on the rate of DNA degradation, to provide an estimate of the PMI calculated from DNA concentration in various tissues at the time of that carcasses are recovered. Archived tissues from marine mammals will be left to degrade in conditions mimicking land and sea strandings to address variabilities caused by environmental conditions. Tissues will be sampled at known time intervals of decomposition over a 30-day period, extracted, and analyzed using a Qubit Fluorometer to determine DNA concentration. We expect a negative linear trend in DNA concentration over time in both land and sea condition samples. We will also investigate factors that may influence DNA concentration obtained by comparing results from different DNA extraction protocols and different weights of the same target tissues. The results of this study will provide insight into the feasibility of estimating the PMI in marine mammals based on remaining DNA concentration when the date and time of death is unknown.</p>



Oral Session
Natural Science
11:45 am – 12:45 pm
Guava Room

No.	Time	Title, Student Presenter(s)*, Mentor ^o , Non-presenting Authors [†] , Summary
66	11:45 am – 12:00 pm	<p>Submarine Groundwater Discharge and Related Contaminants in Shark’s Cove Kapo’o Tide Pools. <i>Aston Ramos*</i>, <i>University of Hawaii at Hilo</i>, <i>Henrietta Dulai^o</i>, <i>UHM</i></p> <p>Submarine Groundwater Discharge (SGD) is known to transport nutrients that have degraded water quality. The source of these nutrients can be traced via wastewater tracers, specifically pharmaceuticals, that are classified as contaminants of emerging concern (CECs). We conducted an investigation at Shark’s Cove Kapo’o tide pools on the North Shore of O’ahu with insights from the Mālama Pūpūkea-Waimea (MPW) organization, to confirm SGD and to quantify nutrient and CECs fluxes. Our hypothesis is that the presence of pharmaceuticals in groundwater discharging into the pool would confirm that elevated nutrients may be linked to a comfort station or other wastewater sources located in the vicinity of the pool. During the field investigation, water samples were collected at 14 sites. RAD-7 radon monitors were deployed at 2 sites in the southern zone and 1 site at the northern zone. The analysis of geochemical tracers (radon, radium, salinity) were used to confirm SGD and quantify discharge rates. Groundwater samples were collected to compute pharmaceutical and nutrient fluxes. Tidally averaged mean groundwater discharge rates were 1.42, 1.19, 0.98 m³/m²/day in their respective zones. In the northern zone, nutrients were 2-3x higher with elevated CECs compared to the southern zone, suggesting that the comfort station or other wastewater sources contribute to the degradation of water quality. In conclusion, elevated CECs in the northern zone are likely linked to nearby wastewater sources. This identifies an issue that needs further monitoring to recognize the persistence and temporal trends in nutrient fluxes.</p>
67	12:00 pm – 12:15 pm	<p>Deletion of Alternative ribosomal proteins in <i>Mycobacterium Smegmatis</i>. <i>Ariana Sosa*</i>, <i>Leah Ghazali*</i>, <i>University of Richmond</i>, <i>Sladjana Prusic^o</i>, <i>UHM</i></p> <p>The overall goal of our research is to determine the importance of each of the four alternative ribosomal proteins (AltRPs) in <i>Mycobacterium smegmatis</i>, which are only transcribed in a zinc-deplete environment. In Dr. Sladjana Prusic’s laboratory, it was discovered that by removing all 4 genes in the operon, the deletion mutant fails to undergo morphogenesis including cell elongation that is seen in the wild type. It is unknown if this change is caused by the absence of one specific AltRP or a combination of AltRPs. Our goal is to see whether all four genes are required for morphogenesis and determine if they will have a wild type or the deletion mutant (ΔaltRP) phenotype when they are deleted individually. This goal</p>



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No.	Time	Title, Student Presenter(s)*, Mentor^o, Non-presenting Authors[†], Summary
		<p>will be accomplished by deleting each AltRPs to see the morphology of the bacterium when these proteins are in a zinc-deplete environment; for our study, we will be focusing on AltRPs L28-2 and S14-2. The bacteria will be cultured on a Zeocin-containing medium since the AltRPs will be replaced with a zeocin resistance gene (ZeoR) following deletion. This will ensure that only bacteria with the substituted AltRP grow. The entry vector, PENTR221, will then be inserted into <i>M. smegmatis</i>, and the bacteria will be allowed time for growth prior to being analyzed under a microscope. We expect that the bacteria will have the wild-type phenotype, as more than one AltRP must be absent for the cells to possess the ΔaltRP phenotype. This study will help us better understand the morphology of AltRPs so that we can apply what we've learned to <i>Mycobacterium tuberculosis</i>, which shares many characteristics with <i>M. smegmatis</i>.</p>
68	12:15 pm – 12:30 pm	<p>Synthesis of L-Alanine 3,3-D2 and L-Alanine-3-D. <i>Nathaniel Hogsten*</i>, <i>Joseph Jarrett^o</i>, <i>UHM</i></p> <p>This project aims to synthesize two isotopically-labeled compounds known as dideuterated alanine (L-Alanine 3,3-D2) and monodeuterated alanine (L-Alanine-3-D). These particular compounds are essential to a larger research project currently being conducted by Prof. Joseph T. Jarrett at the University of Hawaii at Mānoa that aims to understand biotin biosynthesis and use this knowledge to find treatment for tuberculosis. The objective of this experiment is to start with the amino acid serine and to process it through a series of chemical reactions until the deuterated alanine products are produced. This project is set within a biochemistry lab on the campus of University of Hawaii at Mānoa and incorporates modern organic chemistry methods to achieve this goal. Thus far I have reached the final steps of producing monodeuterated alanine(L-Alanine-3-D). It has been proven that the step to deuterate alanine is possible, so now I will refine the process and increase the yield of the reaction. All that is left after this is to deprotect the groups attached to serine in the initial steps to obtain the final product. Therefore it can be concluded that this project thus far has been a success. After the completion of the monodeuterated alanine the process for dideuterated alanine, which has the same preliminary reaction steps as monodeuterated alanine, will begin.</p>
69	12:30 pm – 12:45 pm	<p>Ola Paia: Developing Sustainable Food Systems in Hawai‘i. <i>Ashley Ostendorf*</i>, <i>Mark Glick^o</i>, <i>UHM</i></p>



Oral Session
Natural Science
11:45 am – 12:45 pm
Guava Room

No.	Time	Title, Student Presenter(s)*, Mentor°, Non-presenting Authors†, Summary
		<p>The issue of food security in the Hawaiian islands has been a longstanding and complicated one, made only more so by the recent Coronavirus pandemic. With 80% of the food consumed in Hawaii being imported, these islands would be extremely vulnerable in the face of a natural disaster or any other crisis. This research project sought to gain a clearer understanding of the food security issue by acquiring data from farmers on food production as well as involvement with local distribution networks.</p>



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Acknowledgments

Mahalo to all of the following organizations and individuals who made the 2021 SURE Symposium possible. We thank our generous funders and donors, whose financial support enables UROP and its staff to help undergraduate students pursue research and creative work endeavors. We also thank our volunteers, who have donated their valuable time and energy. Mahalo to our academic partners for sharing their expertise and resources. Finally, we thank all the mentors who share their knowledge, and guide the next generation of researchers and creatives.

Funding

Office of the Vice Provost for Research and Scholarship	Harold K. L. Castle Foundation	Douglas S. Yamamura Scholarship
Office of the Provost	Mānoa Tuition Scholarship	

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Minority Health Research Training (MHRT) Program in Health Disparities	Brian Richards, Hamilton Library	Thomas Tsutsumoto, Mānoa Career Center

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Mentors

The research and creative work that students conduct with faculty mentors is often the students' first opportunity to do work in their field of interest. Faculty provide crucial access to resources, works spaces, and information that students may otherwise not be able to attain. Mahalo to all of the mentors, for enriching students' academic experiences.

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