30th Annual CTAHR and COE Student Research Symposium

PROGRAM SCHEDULE

Poster Session

Friday, April 6, 2018

Agricultural Science Building

2nd, 3rd and 4th Floor Hallways

Abstracts 1—109 (Undergraduate, Master's, and PhD)

11:00 am—1:00 pm	Poster set-up by students
1:00—1:15 pm	Judges orientation (AgSci 219)
1:15—3:00 pm	Viewing and judging of posters by judges (no students or symposium participants present)
3:00—5:30 pm	Viewing of posters by public
	Interviewing of students by judges
5:30—6:30 pm	Networking (refreshments will be provided in tented area near AgSci)

Note: Posters should remain on display until 3:00 pm, Friday, April 13, 2018. Students who need to remove posters before that time must discuss their plans in advance with the program coordinators.

Oral Sessions

Saturday, April 7, 2018

Agricultural Science Building

Rooms 204, 219 and 220

7:45—8:15 am	**Refreshments** 2nd Floor Lobby	
8:00—8:10 am	**Judges' Orientation** Room 219	
8:15—10:15 am	**Session I** Room 219	***PhD (Engineering)*** Abstracts 110–112
	Session II Room 204	***MS (Section 1)*** Abstracts 113–120
	Session III Room 220	***PhD (Section 1)*** Abstracts 121–125
10:15—10:30 am	**Break** 2nd Floor Lobby	
10:30 am—12:30 pm	**Session IV** Room 219	***Undergraduate*** Abstracts 126–133
	Session V Room 204	***MS (Section 2)*** Abstracts 134–141
	Session VI Room 220	**PhD *(Section 2)*** Abstracts 142–148
12:30—1:30 pm	**Networking** (Lunch will be provided)	

POSTER SESSION

Abstracts 1—109 *Undergraduate, Master's, and PhD*

(* designates presenter; ° designates non-CTAHR presenter)

Undergraduate Poster

No.	Dept.	Title, Authors
1	**NREM**	Foraging Behavior of the Black-Crowned Night Heron (*Nycticorax nycticorax hoactli*) on O'ahu, Hawai'i. Awo, Paul*, Harmon, Kristen, Cotin, Javier, Price, Melissa.
2	**FCS**	Conceptualizing branding in the modern market. Jazlyn Baptista* and Shu-Hwa Lin.
3	**MBBE**	Creating Ultra Low Cost 3D printed Graphene Fuel Cells: Testing Performance of Glucose-Driven Fuel Cell in Various Cell Designs. Saul Bernal* and Samir K. Khanal.
4	**NREM**	Moving Toward Institutional Sustainability with The University of Hawai'i at Mānoa's Nitrogen Footprint. Cristobal, J.*, Wilson, M., Ryals, R., Cox,L.
5	**MBBE**	Application of CRISPR/Cas9 gene editing technology in generating sweet basil resistance to downy mildew. Hannah Dose*, Natasha Navet, and Miaoying Tian.
6	**HNFAS**	Comparison of breadfruit and inulin prebiotic potential to promote the growth of probiotic Lactobacillus spp. Hamada, M.E.*, Saxby, S., Lee, C.N., Li, Y.
7	**HNFAS**	Development and exploration of alcohol production from fresh pineapple waste. Brian Izawa*, Yong Li, and Soojin Jun.
8	**FCS**	Denim: from past to the future. Taylor Komatsu* and Shu-Hwa Lin.
9	**NREM**	The Fork to Food of a Littorinid: Do Littorinids Smell Odors Released by Macroalgae to Find Food? Mia B. Melamed* and Kathy Van Alstyne.
10	**MBBE**	Design of Small-Scale Water Treatment Systems for the Ala Wai Canal. Niimoto, K.*, Lin, S., Kuwabara, M., Jung, G., Khanal, S.K.
11	**MBBE**	Early Detection of Urinary Tract Infections Using Novel Biomarker Indicators in Diapers. Ogino, M.*, Chong, E., Chang C., Tanaka B, Fogelgren B.
12	**MBBE**	Assessing the role of DNA methylation in the symbiotic interaction between the squid *Euprymna scolopes* and the bacterium *Vibrio fischeri*. Paterson, A.M.* and Téfit, M.A.

13 **HNFAS** Developmental Methods of Alcohol Fermentation Through the Use of Taro. Senga K.*, Lee C.N., Li Y., Jun S.J.

14 **MBBE** Cloning and characterization of Citrus flavone synthase II (FNSII). Smith, N.* and Owens, D.

15 **HNFAS** Optimizing the extraction of phenolic compounds with antimicrobial activity from acai. Takahashi, R.*, Liu, X., Wu, B., Nakamoto, S., and Li, Y.

16 **MBBE** Evaluation of lighting preference of Asian Citrus Psyllid and Coconut Rhinoceros Beetle. Truong, D.*, Watanabe, S., Melzer, M., Jenkins, D.

17 **NREM** Stress response of Mozambique tilapia, *Oreochromis mossambicus*, subjected to cyclical changes in environmental salinity. Woo, D.W.*, Celino-Brady, F.T., Pavlosky, K.P., Lerner, D.T., Seale, A.P.

18 **MBBE** *Kappaphycus alvarezii* as a Potassium Fertilizer Alternative for Pak-choi (*Brassica rapa*, Chinensis group) in Aquaponic Applications. Zhang, K.*, Radovich, T., Silvasy, T., and Ahmad, A.

19 **MBBE°** Chemical Synthesis of Novel GnRH-Like Peptides for Aquaculture of *Cellana sandwicensis*. John Paul Arios, Brandon J. Day*, and Jon-Paul Bingham.

20 **HNFAS°** In-silico analysis of Prolactin 177 and 188 promoters to identify mechanisms of osmoreception in Mozambique Tilapia (*Oreochromis mossambicus*). Head, T.*, Stoytcheva, Z., Seale, A.P.

21 **NREM°** Relationship Between Morphological Traits, Water Depths, and Foraging Behavior of the Hawaiian Stilt (*Himantopus mexicanus knudseni*). Jones, Melissa Elena*, Harmon, Kristen, Price, Melissa R.

22 **HNFAS°** Effects of replacing corn with sun-dried cassava chips in diets on the intestinal microbiota of hybrid tilapia (*Oreochromis niloticus* × *O. mossambicus*). Kiesha Rednour*, Jordan Yoshioka, Alyssa M. MacDonald, Kabi Neupane, and Rajesh Jha.

23 **MBBE°** Poisonous Island Plants: Alkaloids in the Endemic Hawaiian Prickly Poppy. Zoey Simmons*, Kasey E. Barton, and Jon-Paul Bingham.

24 **EE** Low-Cost, Low-Power Smart Sensor Nodal Network for Weather Data Aggregation. Chan, K., Amano, K.*, Lum, E., Hamada, J., Chun, J., and Lauritzen, K.

25 **EE** Wearable Physiological Sensors. Antonio M.*, Masuda L., Ben B. L. Ben, Fontanilla Z., Keeslar E., Segovia M., Boric-Lubecke, O.

26 **ME** Design, Manufacturing, and Testing Two In-Water Coral Nurseries. Asato, B.*, Goodin, J., Kinimaka, C., Mickelsen, R., Nadamoto, S., Taum, C., Zheng, J.

27 **EE** Doppler Radar Occupancy Sensing. Guzman, C.*, Boric-Lubecke, O.

28 **ME** Development of an Autonomous Surface Vehicle to Assist in the Monitoring of Ordnance Reef. Argyris, A., Huang, M.*, Jones, K., Nguyen, A., Roque, R-P.

29 **EE** Liquid-Metal Electronics VIP. Kam, K.*,Yamada, S., Cenence, R., Resurreccion, S., Wagner, W., Shimojo, T., Marcos, J., Fong, W., Akau, T., Asaoka, C., Ohta, A., Shiroma, W.

30 **EE** Unmanned Aerial Systems with Object Detection and Image Processing. Barcelo, G.*, Law, E., Kanda-Matsumoto, M.

31 **ME** Development of a Folding Recumbent Tadpole Tricycle. Cuenca, J., Duenas, R., Kahl, A., Lee, D.*, Limjap, R., Obiano, A., Segall, W., Shimizu, T., Sumera, N.

32 **CEE** Estimation of Scour Depth around Group of Piles Using Group Method of Data Handling (GMDH). Manhin Leung*, Kahai Murata, Juanito Moises.

33 **EE** Aerial Drone Wireless Penetration Testing. Ngo, V.P.*, Dong, Y.

34 **EE** Analysis, Distribution, and Visualization of Weather Data for Sustainability Applications. Cho, K., Obatake, J.*, Obatake, A., and Mukai, R.

35 **ME** Development of a Blended-Body Fixed-Wing Autonomous Unmanned Aerial Vehicle (UAV): Electrical & Electronics. Adrian Ramirez* and Mehrdad G. Nejhad.

36 **ME** Development of a Blended-Body Fixed-Wing Autonomous Unmanned Aerial Vehicle (UAV): Launch Pad & Mechanical. Brandon Sakumoto* and Mehrdad G. Nejhad.

37 **EE** Programmable Robotic Phantom for Radar Life Sensing and Subject Identification. P. Subia*, A. Sylvester, M. Angelo, B. Tomota, S. M. M. Islam and V. Lubecke.

38 **ME** Brachytherapy active needle with multi-directional nitinol shape memory alloy actuators. Apilado, D., Au, D., Fujimoto, J., Kawamoto, E., Shirokane, J., Sugita, L.*, Kristal Vidad.

39 **ME** Design Considerations of an Oscillating Water Column Spar Buoy for Operation in Intermediate Wave Zones. Wong, T.*, Bentz, A., Campbell, A., Lau, D., Lee, A.

Master's Poster

40 **PEPS** Identification of the bacterial symbiont from entomopathogenic nematode (*Oscheius*) and its biological control potential. Alhussaini, A.*, Sipes, B,. Wang, K-H., Cheng, Z.

41 **NREM** Exploring Potential Loʻi Restoration | *Historical Site Identification and Suitability Analysis for Kailua*, *Koʻolaupoko*. Andreyka, N.* and Vaughan, M.

42 **TPSS** Morphological Characterization and Diversity Analysis of *Ilima* (*Sida fallax*) Darel Kenth S. Antesco* and Orville C. Baldos.

43 **NREM** Turning a New Leaf: Engaging Local Businesses and Stakeholders in Policy to Prevent Invasive Plant Introductions. Arnott, C.*, Leary, J., Cox, L., Martin, C., Sandlin, M.

44 **MBBE** Development of a RNA-Seq-based Prognostic Signature for Colon Cancer. Bjarne Bartlett*, Mark Menor, Ting Gong, Tianying Zhao, Youping Deng, Vedbar Khadka.

45 **TPSS** Impacts of Root Competition on Growth and Productivity of Woody Species in Mixed Agroforestry Systems. Bendes, M.*, Lincoln, N.K.

46 **PEPS** Development of Genome-informed Rapid and Accurate Loop-mediated Isothermal Amplification Assay for Detection of *Xanthomonas euvesicatoria*, a Bacterial Spot Causing Bacteria. Gamze Boluk*, Upasana Dhakal, Lilly Fatdal, Adriana Larrea-Sarmiento, Anne Alvarez, Daniel Jenkins and Mohammad Arif.

47 **HNFAS** Is there a Relationship Between Protein Intake and Acanthosis Nigricans Among Young Children in the Children's Healthy Living Program in the United States Affiliated Pacific? Calabrese, A.*, Fialkowski, M.K., Boushey, C., Davis, J., Leon Guerrero, R., and Novotny, R.

48 **HNFAS** A Rapid Approach for the Quantification of Curcuminoids in Turmeric (*Curcuma longa* and *Curcuma* spp.) Grown in Hawaii. Calpito, J.*, Huang, A., Radovich, T., Bingham, J.P.

49 **NREM** Interpreting Feral Goat Movements Localized within Makaleha Valley, Oʻahu, Hawaiʻi. Char, J.*, Litton, C.M., Leary J.J.K.

50 **NREM** Exploring hydrological processes underpinning ecosystem services in Heʻeia. Ching, C.*, Oleson, K., Bremer, L.

51 **NREM** Estimating the home range of endangered Hawaiian Stilt (*Himantopus mexicanus knudeseni*) chicks on Ō'ahu and the impact of predators on fledging success. Christensen, D.L.*, Harmon, K., and Price, M.R.

52 **HNFAS** Optimization of copepods as live feed for Hawai'i larval shrimp culture. Danita Dahl*, Tally Nakamura, Isaiah Wagenman, Olivia Garcia, Jinzeng Yang.

53 **MBBE** Efficiency in peptide toxin fluorophore production – Iberiotoxin study case. Delgado, E.* and Bingham J.P.

54 **PEPS** Survey for *Ceratocystis fimbriata* on *Syngonium*. Upasana Dhakal*, Chris Kadooka and Janice Y. Uchida.

55 **MBBE** Design and Optimization of a Solenoid for Magnetic Field Treatment Using Finite Element Analysis Software. Sean Francis* and Soojin Jun.

56 **MBBE** R-Ras: a key regulator of sepsis-mediated vascular permeability. Glibetic, N.*, Shi, G-X., Anastasiadis, P., Allen, J.S., and Matter, M.L.

57 **NREM** Evaluating Impacts of Rainfall Intensity and Surface Water Levels on Hawaiian Stilt Nesting Success. Harmon, Kristen*, Tsang, Yinphan, Strauch, Ayron, Chan, Catherine, Price, Melissa.

58 **TPSS** The Effects of a Beneficial Soil Microbe Inoculant on Plant-nutrient Availability and Nutrient Flows in Hawaiian Soils. S. Heisey*, N. Nguyen, R. Ryals.

59 **NREM** Optimizing soil health and climate mitigation potential across various Hawaiian landscapes and management. Hannah L. Hubanks*, S.E. Crow, J. Deenik.

60 **NREM** Engaging Hawai‘i’s small-scale fishers to promote collaborative research and mitigate oceanic whitetip shark mortality. Iwane, M.*, Oleson, K., Leong, K., Vaughan, M.

61 **HNFAS** A simple and custom-designed electrochemical impedance bioaffinity sensor with applied mechanical vibration for on-site detection of food pathogens. Bog Eum Lee*, Inae Lee, Soojin Jun.

62 **HNFAS** Effect of in ovo injection of probiotic, prebiotic and synbiotic on growth performance and gut health of broiler chickens. Li, L.G.*, Singh, A.K., Mishra, B., Jha, R.

63 **HNFAS** Exploring quality changes of fresh asparagus when preserved unfrozen at subzero temperature using the supercooling technology. Li, M.* and Jun, S.J.

64 **HNFAS** Advanced ohmic heating for rice cooking: Quality factor assessment. Junhuang Liu* and Soojin Jun.

65 **HNFAS** Total phenolic content and antimicrobial activity of *ohelo* berry extracts. Liu, X.*, Nakamoto, S., Li, Y.

66 **MBBE** Genomic analysis of *Taro vein chlorosis nucleorhabdovirus* and development of an antibody-based detection assay. Loristo, J*, and Melzer, M.

67 Withdrawn

68 **NREM** Understanding carbon flux heterogeneity and development of a novel temperature sensor network for a Andisol deep soil warming experiment. McGrath, C.*, Glazer B., Sylva, K., Crow, S.

69 **NREM** A Symphony of Hawaiian Forest Birds: Developing and Testing an Interdisciplinary Education Program for Hawai‘i’s Youth. Nakama R.K.*, Frambaugh-Kritzer C., Itoh T., Price M.R.

70 **TPSS** Determining the role cytokinin plays in patterning the maize leaf. Dylan Oates*, Aimee Uyehara, Angel Del Valle Echevarria, and Michael Muszynski.

71 **MBBE** Raman Spectroscopy (RESpect) for Anal Intraepithelial Neoplasia (AIN) Lesions from HIV-Serodiscordant Couples. Oda, R*, Kamada, N., Milne, C., Misra, A., Acosta-Maeda, T., Shiramizu, B.

72 **MBBE** The Search for Novel Herbicidal Natural Products in Strawberry Guava. Ooka, J.K. * and Owens, D.K.

73 **TPSS** QTL mapping of resistance to Taro Leaf Blight (TLB) disease in Taro. Roshan Paudel*, Michael B. Kantar, Susan C Miyasaka, Michael Shintaku.

74 **HNFAS** Effects of waterborne exposure to nonylphenol on the growth and reproductive physiology of Mozambique Tilapia (*Oreochromis mossambicus*). Petro-Sakuma, C.K.*, Celino-Brady, F.T., Lerner, D.T., Seale, A.P.

75 **NREM** Public perceptions of the box jellyfish *Alatina alata* and other natural hazards at Waikīkī, O‘ahu, Hawai‘i. Riley, P.P.*, Cox, L.J., Holland, B.S., Leary, J.K., Lepczyk, C.A.

76 **NREM** Examining the effect of Zero-deforestation commitments on land cover change and agricultural profits. Rodrigo Rivero* and Kim Carlson.

77 **PEPS** Potential use of local strains of entomopathogenic fungus to control the coconut rhinoceros beetle, *Oryctes rhinoceros* on Oahu, Hawaii. Mason Russo*, Zhiqiang Cheng, Kelsey Mitsuda, Jing Li, and Matt Kellar.

78 **PEPS** Lovely flowers, potential problem: viral spillover among pollinators in agricultural settings. Santamaria, J.*, Villalobos, E.M., Nikaido, S.S.

79 **MBBE** Manu a Meli: the Business of Creating a ‘Local’ and ‘Original’ Ginger Beer. Nicholas Sinclair*, Elizabeth Feldeverd, Robert Oda, Christian Dye, Sophia Oak, Robinson Bucaneg and J-P. Bingham.

80 Withdrawn

81 **NREM** Quantifying the Embodied Environmental Impact of Doubling Hawaii’s Local Food Supply. Tanya Torres* and Kimberly Carlson.

82 **HNFAS** Potential of internet influence on superfood choices. Valdez, D.K.*, Titchenal, C.A., Dobbs, J.

83 **HNFAS** Expression of follistatin and myostatin in the oviduct of laying hen. Wasti, S.*, Sah, N., Kuehu, D.L., Kim, Y.S., Jha, R., Mishra, B.

84 **NREM** Community-based mangrove management on Pemba Island, East Africa. Watkins, G.* and Crow, S.

85 **HNFAS** The effect of neonatal administration of recombinant myostatin propeptide on skeletal muscle growth in mice. Xiaoxing Xu*, and Yong Soo Kim.

86 **NREM** Using Indigenous knowledge to assess past, present, and future water sources in Cho’ho’tso valley on the Navajo Reservation. Aissa T. Yazzie*, Mehana B. Vaughan.

87 **HNFAS** Analysis of probiotic yeast and probiotic bacteria using prebiotics. Beverly Yuen* and Yong Li. Department of Human Nutrition, Food and Animal Sciences.

88 **HNFAS** Reduction of School Lunch Plate Waste of Early Adolescents in the US: Identifying Barriers, Motivators and Perspectives. Chenchen Zhao*, Chloe Panizza, Kira Fox, Carol Boushey, Carmen Byker Shanks, Selena Ahmed, Susan Chen, Elena Serrano, Julia Zee, Marie Kainoa Fialkowski Revilla, and Jinan Banna.

PhD Poster

89 **HNFAS** Searching for the most affordable sources of bioavailable iron and protein among commonly consumed foods. Almeida, V.A.*, Donohoe-Mather, C.M., Dobbs, J., Titchenal, C.A.

90 **MBBE** Molecular and biochemical analysis of giant and common leucaena. Bageel, A.* and Borthakur, D.

91 **NREM** Towards sustainability: Indonesian smallholder inclusion in palm oil certification systems. Ekaputri, A.D.* and Carlson, K.M.

92 **HNFAS** Association between maternal pregravid body mass index and breastfeeding discontinuation in Hawai‘i and Puerto Rico WIC participants. Gibby, C*, Palacios, C., Lim, E., Banna, J.

93 **MBBE** Using fermentation in the classroom to teach both advanced biochemistry and the fundamentals of business development. Gong, T.*, Buchanan, J., Bartlett, B., Carlson, B., Arios, J.P., Saxby, S., Bottema, M., Doherty, J., Sinclair, N., Zhao, T., Bingham J.P.

94 **PEPS** Begomoviruses represent an emerging threat to the papaya industry in Bangladesh. Islam Hamim*, Wayne B. Borth, James C. Green, Michael J. Melzer, Dennis Gonsalves, Jon Suzuki, Marisa Wall and John S. Hu.

95 **MBBE** Exploration of electric and magnetic field emissions optimized for supercooling preservation of beef samples with diverse fat/lean compositions. Taiyoung Kang*, Raymond Hoptowit, Soojin Jun.

96 **MBBE** Effects of heat stress on the oviductal gene expression and egg qualities in the laying hen. Kuehu, D.L.*, Sah, N., Lee C.N., Jha, R., Mishra, B.

97 **HNFAS** Dietary intake of young children on Guam: The Children’s Healthy Living Program (CHL). Laguana, M.B.*, Novotny, R., Leon Guerrero, R.T., Barber L.R.

98 **MBBE** Chemical Synthesis of a Novel Peptide (oGnRH) for Pheromone Stimulation of Spawning in ‘Opihi (*Cellana* spp.). Mau, A.*, Arios, J., Valdez, A., Nicodemus, P., Jha, R., Bingham, J-P.

99 **HNFAS** Assessing the prebiotic potential of taro (*Colocasia esculenta*) with probiotic *Lactobacillus* species in *in vitro* human digestion system. Saxby, S.M.*, Lee, C.N., Kim, Y.S., Li, Y.

100 **HNFAS** Effect of fiber degrading enzyme and feed’s residual fiber on cecal short-chain fatty acids production and microbial diversity as revealed by metagenomics during *in vitro* study in broilers. Singh, A.K.*, Park, T., Legaspi, J., Neupane, K., Jha, R.

101 **TPSS** Development of a High Performance Liquid Chromatography (HPLC) protocol to identify and measure anthocyanins in poinsettia bracts. Teng, E.S.*, Bingham, J.P., and Amore, T.D.

102 **TPSS** Agrobacterium infiltration for transient expression of F3’5’H, Rosea1, and Delila in anthurium. Toves, P.J.*, Fitch, M.M., He, X., Criley, R.A., Martin, C.R., Amore, T.D.

103 **MBBE** Recruitment of West Nile Virus NS3 Helicase by NS2B to the ER-Associated Replication Organelles for Efficient Virus Replication. Tseng, A.*, James, N., Nerurkar, V.R. and Kaufusi, P.H.

104 **HNFAS** FDA food recalls- should you care? Vargas, A.G.M.* and Dobbs, J.

105 **MBBE** Recombinant myostatin prodomain in treating Age-Associated Sarcopenia. Arthur Wong* and Yong Soo Kim.

106 **MBBE** A life story of nitrogen in aquaponics for resource recovery: Insights from molecular perspectives. Wongkiew, S.* and Khanal, S.K.

107 **MBBE** Identification of lncRNAs based biomarker using microarray and RNA-seq data for lung cancer. Tianying Zhao*, Vedbar Khadka, Youping Deng.

108 **HNFAS°** Genetic variations and prenatal expression patterns of myostatin in sheep. Hua Yang* and Jinzeng Yang.

109 **HNFAS°** Increased levels of exhaled carbon monoxide (eCO) in asthma & COPD: an indicator for pulmonary function testing (PFT). Kim, J.E.*, Dobbs, J., Titchenal, C.A.

ORAL SESSIONS

(* designates presenter; ° designates non-CTAHR presenter)

Session I—*PhD Engineering*

8:15–10:15 a.m., AgSci Bldg Room 219

No.	Dept.	Title, Authors
110	**EE**	Information Theory & Interference Alignment. Mirza Uzair Baig*, Anders Høst-Madsen and Aria Nosratinia.
111	**ME**	Autonomous active needle insertion. Karimi, S.*, Konh, B.
112	**CEE**	Autonomous Intersection Control Formulation and Optimization enabled by Connected and Autonomous Vehicles. Zhenning Li* and Guohui Zhang.

Session II—*Master's Section 1*

8:15–10:15 a.m., AgSci Bldg Room 204

No.	Dept.	Title, Authors
113	**MBBE**	Production and purification of nicotianamine using a recombinant enzyme from giant leucaena (*Leucaena leucocephala* subsp. *glabrata*). James Carrillo* and Dulal Borthakur.
114	**TPSS**	Tolerance of Four Native Hawaiian Peperomia Species to Interior Lighting Conditions. Aleta K. Corpuz* and Orville C. Baldos.
115	**MBBE**	Protein disulfide isomerase-9 mediates the development of healthy pollen under environmental stress. Feldeverd, Elizabeth* and Christopher, David A.
116	**PEPS**	Use of comparative genomics tools to develop robust field-deployable and lab diagnostic tests for important plant pathogens, *Clavibacter michiganensis* ssp. and *C. michiganensis* ssp. *nebraskensis.* Larrea-Sarmiento, A.*, Alvarez, A. and Arif, M.
117	**HNFAS**	Effects of Animal Behavior and Core-Body Temperature on Production Efficiency of Grass Finished Cattle. Oshiro, M.*, Thorne, M.S., Lee, C.N., Kim, Y.S., Fukumoto, G.K.
118	**HNFAS**	RNA sequencing of the shell gland reveals novel genes related to calcium remodeling during eggshell formation in laying hens. Sah, N.*, Kuehu, D.L., Khadka, V.S., Jha, R., and Mishra, B.
119	**NREM**	Small scale data, big picture extinction: Count-based population viability analysis as a tool for comparative extinction risk for rare Cyanea species in Kīpahulu Valley, Haleakalā National Park, Maui. Torigoe, S.*, Litton, C.
120	**NREM**	Soil macroinvertebrate responses to removal of feral pigs (*Sus scrofa*) across a 25-year chronosequence in tropical montane wet forests. Wehr, N.H.*, Lincoln, N.K., Hess, S.C., Litton, C.M.

Session III—*PhD Section 1*

8:15–10:15 a.m., AgSci Bldg Room 220

No.	Dept.	Title, Authors
121	**MBBE**	Chemical-binding properties of mimosine, a non-protein amino acid found in *Leucaena leucocephala*. Honda M.D.H.*, Jarrett J.T., and Borthakur D.
122	**NREM**	Fuzzy Cognitive Maps as a tool for identifying knowledge gaps to design educational technology transfer activities for smallholder potato farmers in Guatemala. LaPorte, P.*, Chan-Dentonic, J., Chan, C., Sipes, B., Melakeberhan, H., Sanchez-Perez, A., and Mejía, A.
123	**MBBE**	High rate anaerobic treatment of sulfate-laden industrial wastewater with simultaneous removal of hydrogen sulfide using biochar. Fernanda R. Oliveira* and Samir Khanal.
124	**PEPS**	Best termination methods of mustard (*Brassica juncea*) and oil radish (*Raphanus sativus*) cover crops for nematode management. Waisen, P.*, Wang, K.-H, Cheng, Z., Sipes, B.
125	**NREM**	Differential effects of lignin chemistry on conversion. Wells, J.*, Crow, S., Khanal, S., Turn, S., Hashimoto, A.

Session IV—*Undergraduate*

10:30–12:30 a.m., AgSci Bldg Room 219

No.	Dept.	Title, Authors
126		Withdrawn
127	**TAE**	Management of the Invasive Brazilian Peppertree (*Schinus terebinthifolius*) in Hawai'i. Au, M.*, Ramadan, M., Wang, K-H.
128	**MBBE**	Quantification of total phenolics in *Bidens* to estimate antioxidative capability. Barone, R.P.*, Keeley, S.C., Owens, D.K.
129	**NREM**	Nutritional Analyses of Endemic Hawaiian Fruit for Wild Foraging ʻAlalā (*Corvus hawaiiensis*). Katherine Hiu*, Becky Ostertag, Bryce Masuda, James Sheppard, Jonathan Price.
130	**MBBE**	Tuning cellular photoprotection to improve algal productivity. Kajihara, L.* and Su, W.W.
131	**MBBE**	Detection of Tobacco Streak Virus and Molecular Characterization of Novel a Tobamovirus in Sunn Hemp, *Crotalaria juncea*, Expressing Virus-Like Symptoms. Kong, A.*, Arakaki, A., Long, M., and Melzer, M.
132	**NREM**	Distribution, Impacts, Biotypes, and Viral Biocontrol Status of Coconut Rhinoceros Beetle in Palau. Masang, N.*, Adams, B., Kong, A., Watanabe, S., Kitalong, C., Miles, J., and Melzer, M.
133	**HNFAS**	Analyzation of phenolic and antimicrobial functionality in byproducts of Hawaiʻi coffee cherries for potential upscaling. Pereira, G.*, Liu, X., Nakamoto, S., Li, Y.

Session V—*Master's Section 2*

10:30–12:30 a.m., AgSci Bldg Room 204

No.	Dept.	Title, Authors
134	**HNFAS**	Survey of Disease, Management and Biosecurity Practices of Hawai'i Swine Farmers. Castle, B.A.*, Odani, J., Jha R., Ogasawara, N., Zaleski, H.M.
135	**HNFAS**	Removal of *Escherichia coli* K12 from contaminated tap water using a single-stage dielectrophoresis (DEP) device filled with glass beads. Chun, C.* and Jun, S.
136	**TPSS**	Surface applied or incorporated? Does compost and biochar placement affect plant growth and soil fertility? Cox, J.*, Hue, N., Ahmad, A., Kobayashi, K.
137	**MBBE**	Identification and Characterization of Simple Sequence Repeats in Protein-coding genes of *Acacia koa*. Christopher I. Nakano*, Michael D.H. Honda, Kazue L. Ishihara, and Dulal Borthakur.
138	**PEPS**	Molecular characterization of Ti ringspot-associated virus through next generation sequencing and bioinformatic tools. Olmedo-Velarde, A.*, Park, A., Melzer, M.
139	**NREM**	Managing invasive macroalgae in Paikō Lagoon State Wildlife Sanctuary: A partnership with the state of Hawai'i and the Maunalua community. Payne, C.E.*, Oleson, K.L.L.
140	**HNFAS**	Development of a sensitive single-tube nested PCR assay for rapid detection of *Campylobacter jejuni* in ground chicken. Wu, B.Y.* and Li, Y.
141	**PEPS**	Protecting Tree Species: Identification of pathogenic fungi from *Acacia koa* in Hawaii. Yoo, Y.H.* and Uchida, J.

Session VI—*PhD Section 2*

10:30–12:30 a.m., AgSci Bldg Room 220

No.	Dept.	Title, Authors
142	**MBBE**	*Artocarpus altilis*, the 'ulu' breadfruit, journeys thousands of miles and thousands of years to a pint glass near you – an ancient food crop resurfaces as beer of the future. Arios, J.P., Barlett, B., Bottema, M., Buchanan, J., Carlson, B., Doherty, J.*, Gong, T., Saxby, S., Sinclair, N., Zhao, T., Bingham, J.P.
143	**PEPS**	Engineering basil plants for resistance against downy mildew. Navet, N.*,Shao, D., Dose, H., Tian, M.
144	**MBBE**	Microaeration in anaerobic digester: A unique approach to improve stability and performance of the renewable energy production. Duc Nguyen* and Samir K. Khanal.
145	**HNFAS**	Effects of intermittent energy restriction with a Mediterranean diet versus the Dietary Approaches to Stop Hypertension diet on overall and visceral adiposity: A pilot study. Panizza, C.E.*, Lim, U., Yonemori, K.M., Cassel, K.D., Wilkens, L.R., Shvetsov, Y.B., Harvie, M.N., Le Marchand, L., Boushey, C.J.
146	**HNFAS**	Characterizing Eating Behaviors of Adolescents Ages 10-13 in Hawaii While Eating Alone. Suzuki, A.*, Anderson, A., Choi, Y.C., Cluskey, M., Gunther, C., Hongu, N., Jones, B., Lora, K., Misner, S., Monroe-Lord, L., Penicka, C., Reicks, M., Richards, R., Topham, G., Wong, S.S., Banna, J.
147	**HNFAS**	Nutrient profile and *in vitro* digestibility of nutrients (energy, protein and amino acids) of animal protein byproducts. Utsav P. Tiwari*, Brian Kerr, and Rajesh Jha.
148	**HNFAS**	Cassava root chips an alternative to corn in broiler diet: effect on growth performance and gut health parameters. Yadav, S.*, Singh, A., Tiwari, U.P., Mishra, B., Jha, R.

ABSTRACTS

(*designates presenter)

(1) Foraging Behavior of the Black-Crowned Night Heron (*Nycticorax nycticorax hoactli*) on O'ahu, Hawai'i. Awo, Paul*, Harmon, Kristen, Cotin, Javier, Price, Melissa. *Department of Natural Resources and Environmental Management*.

The Black-crowned Night Heron (*Nycticorax nycticorax hoactli*), or 'Auku'u, is a subspecies of *Nycticorax nycticorax* that inhabits wetlands throughout the Hawaiian Islands. The 'Auku'u is one of the few native, terrestrial predators remaining in the Hawaiian Islands. The continental population of the Black-crowned Night Heron primarily forages at night, but the little information that exists regarding the foraging behavior of the 'Auku'u in Hawai'i is contradictory. The Hawai'i state Department of Land and Natural Resources states that they are diurnal, primarily foraging during the day, while the US Fish and Wildlife Service states the 'Auku'u are nocturnal, primarily foraging at night. In this study, we conducted observational surveys to determine the time of day 'Auku'u are most likely to be seen foraging, identified and quantified available and ingested prey, and determined the potential impact on endemic Hawaiian waterbird chicks. 'Auku'u were observed foraging during both the day and night. This may be due to the abundance of prey available in Hawai'i wetlands, and a lack of competitors, compared to continental systems. Results of this study will be used to optimize survey protocols to maximize the likelihood of detection.

(2) Conceptualizing branding in the modern market. Jazlyn Baptista* and Shu-Hwa Lin. *Department of Family and Consumer Sciences*.

This project is to explore innovative and re-imaginative branding tactics used by retailers in the modern market. The four C's of power branding- commerce, curation, content and community has brought many brands to the forefront of enhancing consumer experiences and thus driving sales. Retailers today are learning that they must recalibrate their businesses and return to the core of mission statements. Retailers existing today have found branding to the modern market to be a great challenge and vast opportunity to exist and grow. To be powerful, productive, and simple to the consumer is effective branding. How can a brand make the biggest impact in the most dynamic manner? This leads to the concept of being omni-personal has driven fundamental shifts within today's market and is essential to incorporate into any successful business. Consumers are looking for the most seamless commerce experience. This need calls for blurring lines and eliminating boundaries between digital and physical. Market research has shown great growth of consumer shopping through tablets, smartphones, and even smart watches within the past decade. While technology is driving how retailers and consumers interact today, the immersion and interaction between retailers and consumers continues to be a staple in retail. This is yet another challenge of retailers to conceptualize. This directed reading and research seeks to answer the question: How are today's retailers conceptualizing branding in the modern market through enhancing the consumer experience?

(3) Creating Ultra Low Cost 3D printed Graphene Fuel Cells: Testing Performance of Glucose-Driven Fuel Cell in Various Cell Designs. Saul Bernal* and Samir K. Khanal. *Department of Molecular Biosciences and Bioengineering.*

Over the last decade, there has been revived interest in biological fuel cells; a type of fuel cell where the anode and/or cathode use biocatalyst. The biocatalyst could be a living cell (microbial fuel cell) or a subcellular bio-component (enzymatic or mitochondrial biofuel cells). One key restriction of biological fuel cells are adequate charge transfers. Novel nanomaterials and additive manufacturing (3D printing) offer the ability to incorporate new materials and diverge cell design from traditional electrochemical cells. The goals of this project are: (1) use of *Shewanella sp.* to improve the electron transfer from biocatalyst to the electrode surface, (2) test different cell compositions to simulate macro-porous properties to offer greater stability and immobilization of biocatalyst, (3) experiment with two-dimensional nanomaterial graphene to increase conductivity and surface area of the electrodes, and (4) use affordable and biodegradable polylactic acid (PLA) to reduce cell cost. Experiment consists in measuring current, voltage, and resistance over a period of five days for six different cell designs (4 graphene + PLA variances, 1 positive control

(Carbon cloth electrode + PLA), and 1 negative control (PLA only) all separated by a proton exchange membrane (PEM). Successful completion of this research will provide a way to fabricate low cost biological fuel cells.

(4) Moving Toward Institutional Sustainability with The University of Hawai'i at Mānoa's Nitrogen Footprint. Cristobal, J.*, Wilson, M., Ryals, R., Cox,L. *Department of Natural Resources and Environmental Management, Department of Tropical Plant and Soil Sciences, Department of Geography, Department of Anthropology, University of California Merced.*
Nitrogen is an essential element for life, but high levels of reactive nitrogen (N) can be detrimental to environmental and human health. The amount of reactive N in the environment has more than doubled due to anthropogenic activities, such as food production, electricity, and transportation. Reactive N cascades through the environment in gaseous and aqueous forms, and contributes to several environmental problems including smog, acid rain, ocean acidification, eutrophication, and climate change. A Nitrogen Footprint is a measure of the amount of reactive N released into the environment as a result of an entity's resource consumption. We calculated the University of Hawai'i at Mānoa's N footprint using the Institution N-Footprint Tool (NFT), part of a multi-institutional program to identify and limit sources of nitrogen pollution. We found that UH Mānoa released a total of 119,265kg reactive N in 2016 with utilities and food production being the largest contributors. Business-as-usual and reduction scenarios were applied to quantify the virtual impact of existing and future campus sustainability initiatives. The combined scenarios with the greatest impact reduced the total to 84,485 kg reactive N released. The results of this work provide a data-driven approach to institutional sustainability by identifying sources of reactive N pollution and the effectiveness of mitigation strategies.

(5) Application of CRISPR/Cas9 gene editing technology in generating sweet basil resistance to downy mildew. Hannah Dose*, Natasha Navet, and Miaoying Tian. *Department of Plant and Environmental Protection Sciences.*
Sweet basil (*Ocimum basilicum*) is an economically significant crop considered to be one of the most widely grown herbs in the world. *Peronospora belbahrii* is the oomycete pathogen threatening basil production by causing downy mildew disease. Downy Mildew Resistance gene *DMR1* has been identified as a plant susceptibility gene which encodes for homoserine kinase (HSK) and is conserved in various plant species. Previous studies show mutations in *Arabidopsis DMR1* led to elevation in homoserine and significant resistance against Arabidopsis downy mildew using a knockout approach. We are attempting to generate downy mildew resistant basil plants by disrupting the DMR1 homologous gene in basil using CRISPR/Cas9 mediated gene editing technology. CRISPR/Cas9 has been used for crop improvement because the technology allows precise gene editing and rapid generation of desirable crops free of foreign genes. Cas9 requires a single-guide RNA (sgRNA) which utilizes a 20 nucleotide recognition sequence to locate a specific site and induce a double stranded break at determined loci. In addition to one sgRNA, we also attempt modification with two different sgRNAs for the same *DMR1* gene to increase the efficiency of gene editing. *Agrobacterium* strain EHA105 was used to deliver the vector pKSE401 with the CRISPR cassettes into sweet basil by *Agrobacterium*-mediated transformation and plant tissue culture techniques. Transgenic plants are being generated and will be subjected to molecular and pathogen infection assays. If the resistance to *P. belbahrii* generated by CRISPR/Cas9 is proven successful, this advances possibilities to use gene editing technology to help reduce the need for chemicals in plant pathogen control.

(6) Comparison of breadfruit and inulin prebiotic potential to promote the growth of probiotic *Lactobacillus* spp. Hamada, M.E.*, Saxby, S., Lee, C.N., Li, Y. *Department of Human Nutrition, Food and Animal Sciences.*
Breadfruit (*Artocarpus altilis*), a culturally and economically significant food plant of the Pacific Islands, is gluten-free and a good source of carbohydrates and dietary fiber. Due to the high dietary fiber content, breadfruit may promote the growth and activity of beneficial bacteria in the human intestine. The purpose of this study was to determine the prebiotic potential of breadfruit with probiotics *Lactobacillus* spp. in comparison with inulin, an established prebiotic extracted from chicory root. Lactic acid bacteria strains, *Lactobacillus plantarum, Lactobacillus acidophilus,* and *Lactobacillus rhamnosus*, were used as representative probiotics in this study. Breadfruit concentrations between 0.5% and 3.5% (w/v), with increments of 0.5%, were

individually paired with each probiotic strain and evaluated for bacterial growth via optical density and plate count at 0, 24, and 48 h. Inulin and glucose were used as prebiotic and non-prebiotic controls respectively in this study. In addition, *Escherichia coli* was used as an enteric bacteria control and tested with the carbohydrates in a similar manner. The optical density of all three *Lactobacillus* spp. with breadfruit showed a significant increase after 24 h and a slight increase between 24 h and 48 h. The optical density of *E. coli* increased and then decreased after 24 h and 48 h, respectively. Plate count data suggested the best breadfruit concentration was 2.5% with *L. plantarum.* The breadfruit concentrations greater than 1.0% did not support the growth of *E. coli.* In conclusion, breadfruit can selectively promote the growth of probiotic *Lactobacillus* spp., which could help improve the gut microbiota and host health.

(7) Development and exploration of alcohol production from fresh pineapple waste. Brian Izawa*, Yong Li, and Soojin Jun. *Department of Human Nutrition, Food and Animal Sciences.*
Recent studies have found that food waste in Hawaii is estimated to be 237,122 tons or 26% of available food supply in 2010. Pineapple waste makes up the largest proportion of fruit waste in Hawaii. This is a large economic and environmental concern for a state that imports a majority of its food and beverage products. Pineapple waste contains large amounts of sugars and other nutrients, which could be fermented to produce ethanol or an alcoholic product from fresh food waste. The purpose of this study is to explore the development of pineapple wine, compare the effects of two fermentation starters, Nuruk enzyme powder and amylase powder, to determine if the production of a desirable alcoholic product is possible. Fresh pineapple waste was obtained at the processing factory of Dole Plantation. The pineapples were processed into a must for fermentation. Primary fermentation was completed in one week using champagne yeast and yeast nutrient. The alcohol content was measured using specific gravity readings from a hydrometer. The pineapple solids were filtered out then transferred into another container to finish fermentation. The current study suggests that the production of an alcoholic product using fresh pineapple waste is achievable. The alcohol by volume (ABV) measurement in the amylase and control sample was at 3.54% and 3.41% respectively. The trial with Nuruk had a lower ABV measurement of 2.63%. Future and ongoing studies are focused on more efficient methods, recipe improvements, desirability, and sensory evaluation. The production of a consumer alcoholic product using waste could provide an economically and environmentally beneficial solution to the food waste issue in Hawaii.

(8) Denim: from past to the future. Taylor Komatsu* and Shu-Hwa Lin. *Department of Family and Consumer Sciences.*
This project is to explore published articles that report on current trends of the textile, denim. Textile properties that are mentioned will be explaining the types of denim textiles, finishings, dyes. Etc. Research on more current denim trends, future/upcoming trends, and also future denim projects will be done while attending the 2018 Magic Trade Show in Las Vegas, Nevada. The textile, denim is a very commonly used and popular textile around the world. Denim is very classic and very controversial textile that can be created and transformed in multiple ways. Denim became a popular fashion textile in the 18th century due to its durability and strength. Denim is the only old fabric that still maintains dynamic as youth's favorite choice. This project is to explore the new denim product development from the past products and methods and examine all trends throughout time in order to easily forecast new trends and run a proper denim fashion business.

(9) The Fork to Food of a Littorinid: Do Littorinids Smell Odors Released by Macroalgae to Find Food? Mia B. Melamed* and Kathy Van Alstyne. *Department of Natural Resources and Environmental Management, Shannon Point Marine Center, Western Washington University*.
Herbivore preferences in the intertidal zone may impact algae community structure. Orienting towards or away from algal volatile compounds is one of many behaviors that might affect foraging, however behavioral responses to airborne chemicals by marine organisms are poorly understood. On many northeastern Pacific rocky shores, *Ulva* spp. and *Fucus distichus* are the dominant macroalgae. They can be consumed by the herbivorous snails *Littorina sitkana,* which occur in the mid to upper intertidal. In this study we investigated whether *L. sitkana* uses odors released by macroalgae as an orientation cue to find food. Using static y-maze assays, we quantified *L. sitkana*

orientation when given the following choices: no algae and *U. lactuc*a, no algae and *F. distichus*, undesiccated and desiccated *U. lactuca*; *F. distichus* grown at high and low light levels; and water with and without the volatile compound dimethyl sulphide (DMS), which is produced by *U. lactuca*. *L. sitkana* significantly chose the *U. lactuca,* but not *F. distichus* when no algae were in the other arm. They significantly selected *U. lactuca* dried for 2 h but not *U. lactuca* dried for 1 h, when given a choice of dried versus undried algae. Orientation was not affected by growing *F. distichus* under different light levels or the presence of DMS at different concentrations. Our results show that *L.sitkana* use odors released by macroalgae to find food in the intertidal zone and that environmental stresses, such as desiccation, affect the ability of herbivores to detect algae from a distance.

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

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

(12) Assessing the role of DNA methylation in the symbiotic interaction between the squid *Euprymna scolopes* and the bacterium *Vibrio fischeri*. Paterson, A.M.* and Téfit, M.A. *Department of Molecular Biosciences and Bioengineering, Pacific Biosciences Research Center.*

The Hawaiian bobtail squid, *Euprymna scolopes*, establishes a monosymbiotic relationship with the bioluminescent bacterium *Vibrio fischeri*. In the first hours following their initial encounter, both partners undergo extensive changes in gene transcription. DNA methylation is known to play a role in the regulation of gene expression. To determine whether this epigenetic modification is involved in the initiation of the symbiosis, levels of DNA methylation will be evaluated across different tissues of juvenile *E. scolopes*. The experimental conditions will compare (i) aposymbiotic squids (symbiont-free), (ii) symbiotic squids (associated with wild-type *V. fischeri*), and (iii) squids colonized with a mutant strain of *V. fischeri*, Δ*lux*, that is deficient for light production and fails to remain associated with the squid. Samples will be collected at different time-points during the early phase of the association between *E. scolopes* and *V. fischeri*. Changes in the levels of DNA methylation in the host genome will be measured by ELISA (Enzyme Linked Immunosorbent Assay). Further research will include the identification of genes that are differentially methylated across experimental conditions, to provide insight into mechanisms that may be applicable to other symbiotic interactions.

(13) Developmental Methods of Alcohol Fermentation Through the Use of Taro. Senga K.*, Lee C.N., Li Y., Jun S.J. *Department of Human Nutrition, Food and Animal Sciences.*
Taro is a plant crop that is common in Hawaiian and Polynesian culture. The taro root, or corm, is nutritionally dense containing a rich source of carbohydrates, relatively low in fat, and contains various vitamins and minerals making it an ideal health food. As such, the interest of this research is to determine an effective method in fermenting the taro crop, to determine potential ethanol production. Two different types of fermentation were utilized: A) fermentation involving the use of *Saccharomyces cerevisiae*a yeast which is commonly used in various beverage fermentations, and B) fermentation involving the use of mix microflora containing additional fungal microbes such as *Aspergillus* which produce enzymes to promote the saccharification process which aids in the fermentation process. Both fermentation types underwent the same fermentation methods used in alcohol production. Poi, or mashed taro, was used in both experiments and underwent fermentation for over one week with different levels of metabolic activity shown visually. After the fermentation process, a distillation process was conducted to determine final alcohol percent yields for each fermentation type to determine optimal alcohol production yields. Further studies are aimed at determining varying alcohol yields via different amounts of microbial fermenters (yeast and mixed microflora), raw poi ingredients, water amount, as well as the possibility of creating a viable alcoholic beverage.

(14) Cloning and characterization of Citrus flavone synthase II (FNSII). Smith, N.* and Owens, D. *Department of Molecular Biosciences and Bioengineering.*
Flavones are an important group of plant metabolites that aid in stress responses, UV protection, oxidation of free radicals, signaling between organisms, as well as other key plant physiological activities. Due to their diverse functions, flavones have potential applications within a wide range of fields such as plant breeding, agriculture, pharmacology, and, notably, human health. Citrus produce higher amounts of flavones than any other plant, storing them in fruit and rind. A naturally high yield of flavones and flavone derivatives make citrus ideal for large-scale production of these products. Thus far, an enzyme assay for citrus flavone synthase has not been developed nor has this enzyme been characterized in citrus. We propose to clone the citrus FNSII gene, develop an effective method to express and enrich the recombinant protein, and to thoroughly characterize the enzyme through enzyme assay. Isolation of the protein product will allow for biochemical determination of function and analysis of the predicted FNSII gene. We will demonstrate enzymatic activity through conversion of flavanone substrates to their respective flavone products, using HPLC to identify compounds. This study will aid in the biochemical and molecular characterization of FNSII, with an emphasis in citrus, as well as in the development of metabolic engineering strategies for modifications of flavone synthesis in plants to improve their nutritional, commercial, and biopharmaceutical value.

(15) Optimizing the extraction of phenolic compounds with antimicrobial activity from acai. Takahashi, R.*, Liu, X., Wu, B., Nakamoto, S., and Li, Y. *Department of Human Nutrition, Food and Animal Sciences.*
The acai berry (*Euterpe oleracea*) is known as a super fruit due to its high antioxidant level.

Phenols are a class of aromatic organic compounds that have different beneficial properties depending on the source. Some phenols are used in disinfectants and folk remedies. This study aimed to determine the phenolic content and antimicrobial activity of acai extracts. Three solvents with different polarity, including water/methanol (85:15 v/v, E1), acetone/methanol/water (40:40:20 v/v, E2) and methanol/water/acetic acid (85:15:0.5 v/v, E3), were used to extract the phenols from freeze dried acai. Each extract was measured for the concentrations of phenolic compounds and anthocyanins using the Folin Ciocalteu method and the pH differential method, respectively. All extracts were evaluated against two bacterial strains, *Staphylococcus aureus* and *Escherichia coli*, via the agar well diffusion assay. The total phenol content of E1, E2 and E3 was 86.97 mg, 94.48 mg, and 105.53 mg, respectively. The concentration of anthocyanins in the three extracts was 199.91 mg/L, 399.58 mg/L and 364.04 mg/L, respectively. E2 and E3 displayed inhibition zones against *S. aureus* of 10 mm and 18 mm, respectively. E1 did not show any inhibition against *S. aureus*. Against *E. coli*, E3 exhibited an inhibition zone of 19 mm whereas E1 or E2 did not show any effect. In conclusion, E3 had higher total phenolic content and stronger antimicrobial potential. These results can be applied to the field of food safety, preventive medicine, and enrich the understanding of the health benefits of acai.

(16) Evaluation of lighting preference of Asian Citrus Psyllid and Coconut Rhinoceros Beetle. Truong, D.*, Watanabe, S., Melzer, M., Jenkins, D. *Department of Molecular Biosciences and Bioengineering, Department of Plant and Environmental Protection Sciences.*

Introduced pest species pose a serious biosecurity challenge to agriculture. For example, the Asian Citrus Psyllid (ACP; *Diaphorina citri*) is the only vector of the bacterial pathogen that causes the disease huanglongbing (also known as citrus greening) which has resulted in billions of dollars of economic losses in Florida alone since its introduction in 2005. Current efforts to control the spread of disease in California and other citrus producing states include testing of psyllids caught in the field. Similarly, efforts are underway on the island of Oahu to control the recently introduced Coconut Rhinoceros Beetle (CRB; *Oryctes rhinoceros*) which can result in significant damage to the canopy of iconic coconut palms and could potentially vector new fungal pathogens. To improve the efficacy of surveillance efforts for these pests, we tested their lighting preferences using a customized miniature LED lighting circuit. The device can be programmed to illuminate any of 6 LEDs (UV, blue, yellow, amber, and/or red), with different modulation schemes and diurnal cycles based on ambient light. We found that UV light significantly enhanced ACP trap catch compared to any other color or non-illuminated control, but modulation of UV to mimic reflection patterns from canopies of citrus trees depressed ACP catch. We have been unable to conduct controlled experiments to determine lighting preferences of CRB foraging in the wild, but lab experiments demonstrate that they are perceptive to colors across the tested spectrum. This research may lead to more effective trap designs for these pests.

(17) Stress response of Mozambique tilapia, *Oreochromis mossambicus*, subjected to cyclical changes in environmental salinity. Woo, D.W.*, Celino-Brady, F.T., Pavlosky, K.P., Lerner, D.T., Seale, A.P. *Department of Human Nutrition, Food and Animal Sciences, University of Hawaii Sea Grant College Program.*

Changes in the environment that interfere with physiological homeostasis have been shown to elicit stress responses in vertebrates, including fish. The stress response in fish is mediated by the endocrine system and largely characterized by the mobilization of energy to resist or counteract the stressor. To that effect, an acute elevation in circulating glucose is commonly observed in many fish species following exposure to a stressor. Changes in environmental salinity, for example, can be stressful to fish according to their salinity tolerance or acclimation history. Few studies, however, have addressed the effects of continuously changing salinities on the stress response of fish. Our previous studies in Mozambique tilapia, a species native to waters in which salinity varies tidally between that of freshwater (FW) and seawater (SW), have shown that fish reared in a tidal regimen (TR) grow faster than those reared in steady-state FW or SW. In this study, we measured plasma glucose every 3 h from fish reared under a TR, FW and SW over a 24 h period. We found that plasma glucose, while initially lower than steady state FW and SW, increased over time in fish reared in TR but not in SW or FW. These results suggest that fish reared in TR are more sensitive to handling stress than the fish sampled from

steady-state salinities. Further analyses will be conducted to examine the effects of cyclical changes in salinity on markers of chronic stress. [Supported by HATCH (#HAW02051-H), NOAA/ UH-Sea Grant (#NA14OAR4170071, R/SS-12 and R/SB-18) and NIH (1R21DK111775-01)]

(18) *Kappaphycus alvarezii* as a Potassium Fertilizer Alternative for Pak-choi (*Brassica rapa*, Chinensis group) in Aquaponic Applications. Zhang, K.*, Radovich, T., Silvasy, T., and Ahmad, A. *Department of Molecular Biosciences and Bioengineering, Department of Tropical Plant and Soil Sciences.*

Aquaponics is a plant culture system that utilizes fish waste as a source of nutrient for the plants, which in turn improves water quality for the fish in re-circulating systems. As the water-enriched fish waste is pumped up to the bed media, biologically-mediated mineralization of organic matter results in nutrients, particularly nitrate-nitrogen, becoming available to plants. Aquaponic vegetable variety trials conducted 2012-2017 identified potassium deficiency as an issue in pak-choi production. Recent trials have identified invasive algae as a good source of plant-available potassium in soil-grown pak choi. A series of greenhouse trials labeled from 1-5, were conducted to identify optimal application rates to mitigate potassium deficiency in aquaponic-grown pak choi. The trials revealed treatment 3 (.0027g K/plant) yielded the highest dry weight which was 39.5% percent larger than treatment 5 and 4.67% larger than control. Tissue analysis revealed that treatment 3 contained 1.96 K^+%, which was 0.38% lower than treatment 5 and 1.51% greater than control. Findings have also concluded hydration of algae prior to application, significantly reduces salinity in soil but also decreases potassium availability of algae by 13%. These initial results will be used to determine which application rate will yield the best biomass for pakchoi for the amount of algae used in aquaponics production. The combination of these trials will help determine the proper application needed to supplement potassium deficiency in pak choi.

(19) Chemical Synthesis of Novel GnRH-Like Peptides for Aquaculture of Cellana sandwicensis. John Paul Arios, Brandon J. Day*, and Jon-Paul Bingham. *Department of Molecular Biosciences and Bioengineering.*

Gonadotropin-releasing hormone (GnRH) is essential for the chemical initiation during the pre-reproduction phase in most organisms. There are many studies that focus on the structure composition of the GnRH peptide within Phylum *Chordata*; however, there is limited information on the specific conservative regions within Phylum *Mollusca*. Here, special emphasis will be placed upon analog sequences from a known GnRH peptide, Lg-GnRH. The efficacy of these novel bioengineered analogues will be tested on local ‘opihi ‘alinalina, the yellowfoot limpet *Cellana sandwicensis,* to examine reproduction initiation. Yellowfoot limpet is most demanded by consumers within the fish market industry, however, due to the decline in overall populations, the yellowfoot limpet has become difficult to find. The development of an inexpensive and efficient product, such as a specific GnRH, would have a positive impact on aqua-farming of ‘opihi. This would alleviate the stress of harvesting wild ‘opihi, leading to the restoration of healthy populations.

(20) In-silico analysis of Prolactin 177 and 188 promoters to identify mechanisms of osmoreception in Mozambique Tilapia (*Oreochromis mossambicus*). Head, T.*, Stoytcheva, Z., Seale, A.P. *Department of Microbiology, Department of Human Nutrition, Food and Animal Sciences.*

Osmotic homeostasis is essential for life in higher vertebrates. Maintaining salt-and-water balance requires the rapid, coordinated activation of ion transport effectors, largely governed by the neuroendocrine system. Advances in knowledge of how osmotic homeostasis is regulated and integrated by the neuroendocrine system have been prevented due to the lack of suitable model systems. Mozambique tilapia tolerate extensive salinity variations and respond directly to a fall in extracellular osmolality by secreting prolactin (PRL); PRL in turn restores salt-and-water balance by stimulating ion uptake in gill. The tilapia pituitary produces two PRL isoforms, PRL_{177} and PRL_{188}, which respond similarly to osmotic stimuli. Thus, we have used the tilapia PRL cell model for osmoreception. We employed an *in-silico* approach encompassing comparative genomics and bioinformatics analysis of the gene structure and promoter regions of PRL_{177}, PRL_{188} and other osmosensitive genes to identify regulatory and coregulatory patterns. Our goal is to build a model of regulatory networks involved in osmotic tolerance in tilapia. Initial analysis of PRL_{177} and PRL_{188} 1.4kb upstream sequences resulted in 14

and 12 predicted transcription factor modules (TFM), respectively, including two common TFMs, SORY_PAX and SMAD_APF1. Predicted TFM disparities indicate that the two PRL genes may employ different regulatory mechanisms. These findings expand upon the knowledge that the expression and release of tilapia PRL isoforms is regulated through multiple factors and complex interactions. [Supported by HATCH (#HAW02051-H), NIH (1R21DK111775-01) and UROP]

(21) Relationship Between Morphological Traits, Water Depths, and Foraging Behavior of the Hawaiian Stilt (*Himantopus mexicanus knudseni*). Jones, Melissa Elena*, Harmon, Kristen, Price, Melissa R. *Department of Natural Resources and Environmental Management.*
The Hawaiian Stilt (*Himantopus mexicanus knudseni*), or Ae‘o, is an endangered subspecies of the Black-necked Stilt (*Himantopus mexicanus*) inhabits wetlands throughout the Hawaiian Islands. Hawaiian Stilts frequently move among wetlands in search of food, but are limited by habitat characteristics, such as water depth. The Hawaiian Stilt is threatened by sea level rise, which has led to an increase in flooding events by raising the water table, particularly in coastal communities. Due to this threat, it is important to determine possible impacts of increased water depths on Hawaiian Stilt foraging success. However, research on foraging behavior of stilts is limited, and optimal foraging conditions are unknown. In this study we determined optimal water depths for foraging stilts. Field surveys were conducted in wetlands on the windward side of O‘ahu island, Hawai‘i, USA. Wetland water levels were found to be negatively correlated with the number of observed foraging stilts. Tarsus length was found to be positively correlated with water depths. Our results may be used to better understand how potential future water depths may impact the foraging ability of the Hawaiian Stilt, and inform decisions for optimal management of water depth in managed wetlands.

(**22) Effects of replacing corn with sun-dried cassava chips in diets on the intestinal microbiota of hybrid tilapia (*Oreochromis niloticus* × *O. mossambicus*).** Kiesha Rednour*, Jordan Yoshioka, Alyssa M. MacDonald, Kabi Neupane, and Rajesh Jha. *Math and Sciences Division, UH Leeward Community College, Department of Human Nutrition, Food and Animal Sciences, Department of Molecular Biosciences and Bioengineering.*
The dietary fibers fermented from different substrates affects the composition of the intestinal microbiota, which in turn, affects the digestion, health, and well-being of the host animals. Cassava (*Manihot esculenta*) is rich in fiber and can be a cost-effective energy source in fish diet. The objective of this study was to investigate the effects of replacing the corn in tilapia feed with sun-dried cassava chips at different concentrations (0%, 12.5%, 25%, 50% and 75%) on the intestinal microbiota of hybrid tilapia, with the purpose of increasing healthy fish production and reducing production costs. Four hundred tilapia fingerlings (~10g initial body weight) were randomly and equally placed in 20 tanks and fed with one of the 5 diets for 12 weeks. Then intestinal digesta samples were collected monthly and DNA was extracted. Polymerase chain reaction-based denaturing gradient gel electrophoresis (PCR-DGGE) was used to determine the microbial diversity present in the intestines of the tilapia. Based on the comparison from the cluster analysis of the DGGE banding patterns of each of the different feeds containing varying concentrations of the cassava, cassava inclusion in the tilapia diet does affect the diversity of intestinal microbiota of the tilapia.

(23) Poisonous Island Plants: Alkaloids in the Endemic Hawaiian Prickly Poppy. Zoey Simmons*, Kasey E. Barton, and Jon-Paul Bingham. *Department of Microbiology, Department of Botany, Department of Molecular Biosciences and Bioengineering.*
Island plants are predicted to lack poisons and toxins due to the absence of large mammalian herbivores on islands, although this idea has rarely been tested. The goal of this study is to determine the presence of two alkaloids (sanguinarine and berberine) in the endemic Hawaiian prickly poppy, *Argemone glauca*. These alkaloids are known to have broad toxicity based on a related species, the Mexican prickly poppy, *A. mexicana*. Chemical surveys, via high performance liquid chromatography (HPLC), will be the first test for the presence of these poisons in the Hawaiian species. Leaf latex and seed samples from *A. mexicana* and *A. glauca* were extracted using 2% v/v Acetic acid and ether, and analyzed via HPLC with a gradient solvent system of 2% Acetic Acid Aq. and 90/10 v/v Acetonitrile/0.1% v/v Triethylamine /10% H_2O.

Standards of berberine and sanguinarine were run under the same conditions. All chromatograms were extracted at 300 nm, and alkaloids were identified by retention time and standard comparison. Positive identification of sanguinarine was detected for the latex and seeds from both species, providing the first detection of this poisonous compound in a native Hawaiian plant species. However, berberine was not detected. Future tests that include additional plant organs may yet reveal the production of berberine in these species. In addition, this work has yielded chemical analysis methods for future quantification of alkaloid concentrations.

(24) Low-Cost, Low-Power Smart Sensor Nodal Network for Weather Data Aggregation. Chan, K., Amano, K.*, Lum, E., Hamada, J., Chun, J., and Lauritzen, K. *Smart Campus Energy Lab, Department of Electrical Engineering.*

R.H. Lasseter defined a microgrid as "a cluster of loads and microsources operating as a single controllable system that provides power to its local area". Microgrids can integrate renewable energy, but control systems are needed to provide real-time response of users and control large variability of energy production due to seasonal, time of day, and weather changes. This project is focused on the development of weather sensor networks, a critical component in the smart microgrid infrastructure. Current work proposes hardware designs for a relay node and *fifth* and *sixth* generation modules to be brought into the weather sensor network. These newer modules will include features from previous generations as well as valid hardware design. Various aspects of previous node designs have been modified to improve power consumption and overall reliability. Nodes will be placed in various locations throughout the University of Hawai`i at Manoa campus. These nodes will measure various types of environmental data, including solar irradiation, temperature, and humidity. Characteristics of the sensor nodes include self-sustainable, two-way communication capabilities, low energy consumption, and accurate measurement collection. It will also be low cost (much cheaper than commercial weather boxes), reliable, durable, and weatherproof.

(25) Wearable Physiological Sensors. Antonio M.*, Masuda L., Ben B. L. Ben, Fontanilla Z., Keeslar E., Segovia M., Boric-Lubecke, O. *Department of Electrical Engineering.*

The research objective of this project is to investigate self-powered, energy scavenging, wearable physiological sensors. Wearable health monitoring is a promising new way of collecting physiological data without inconveniencing patients. However, limited battery life is a significant drawback for most sensors and portable electronic devices, including health monitors. This presents a compliance barrier, as patients tend to stop using such devices once the batteries run out. In addition, large amounts of disposed batteries produce environmental waste. We investigated self-powered energy scavenging sensors concept using different sensor modalities, including piezoelectric and triboelectric transducers. We used various methods of data acquisition with different sensor types, especially considering required load conditions for maximum power transfer.

(26) Design, Manufacturing, and Testing Two In-Water Coral Nurseries. Asato, B.*, Goodin, J., Kinimaka, C., Mickelsen, R., Nadamoto, S., Taum, C., Zheng, J. *Department of Mechanical Engineering.*

This year's Coral Reef Nursery Senior Design Project team has modified and will be deploying an existing in-water coral nursery for a sand bottom surface. The structure was designed by last year's coral reef nursery senior design project team and is to be installed at Reef Runway, Sand Island in May/June 2018. The coral nursery created by last year's team is a hexagon, each side spanning 10 feet long, totaling up to 20 feet in length. The structure is made completely from Fiber Reinforced Plastic (FRP) and currently stands at approximately 4.5 feet tall. The modifications made by this year's team solely focused on the assembly and installation plans since any major changes made to the structure would either significantly increase the project's overall cost or compromise the structural integrity of the nursery.

This year's team also designed and will be manufacturing a second coral nursery for a hard bottom surface that is to be installed at the Atlantis Waikiki. The newly designed structure was designed using FRP and consists of nine square modules, each side spanning 4 feet long. The smaller modules will allow the overall structure to be expanded to any shape to accommodate any unevenness in the hard

bottom seafloor. The new coral nursery was also designed to eliminate the need for tools, making the structure easier to assemble underwater. PVC pegs were also designed to be placed on top of the coral nursery to help support the coral from tipping over.

(27) Doppler Radar Occupancy Sensing. Guzman, C.*, Boric-Lubecke, O. *Department of Electrical Engineering.*
As energy consumption is expected to increase 28% by the year 2040, the value of energy efficiency continues to grow. Current occupancy sensors on the market have their problems such as high false alarm rates, thus there is a need for alternative methods. With Doppler radar already being used for physiological monitoring, another potential application is in occupancy sensing. The goal of this project is to develop a more compact Doppler radar occupancy sensing system that could replace the bulky lab set up.

(28) Development of an Autonomous Surface Vehicle to Assist in the Monitoring of Ordnance Reef. Argyris, A., Huang, M.*, Jones, K., Nguyen, A., Roque, R-P. *Department of Mechanical Engineering.*
Ordnance Reef, an area within Pokai Bay off the coast of Waianae on Oahu, Hawaii, contains ocean current, salinity, and chemical composition sensors that monitor unexploded military munitions on the ocean floor. Servicing these sensors is costly and dangerous. Maritime robotic vehicles designed to service these sensors will reduce the cost and risk of monitoring these munitions. An autonomous surface vehicle (ASV) with a remotely operated underwater vehicle (ROV) can be used to accomplish this task. This research describes the development of a proof-of-concept launch and recovery systems for the Blue Robotics BlueROV2 off of the Wave Adaptive Modular Vessel (WAM-V) platform. This launch and recovery system incorporates the design and development of an automated cable management system to keep the ROV tether clear of the WAM-V's thrusters, which consisting of a servo powered spool and a scissor arm. The spool accommodates 100 meters of cable and can reel in the full distance in around five minutes. Actuated friction rollers are used to manage the cable slack above water. The scissor arm, which extends the cable origin one meter under water, and propeller shrouds are used to manage the cable slack under water. The results of this project will help extend the capabilities of the WAM-V for future applications, research, and development.

(29) Liquid-Metal Electronics VIP. Kam, K.*,Yamada, S., Cenence, R., Resurreccion, S., Wagner, W., Shimojo, T., Marcos, J., Fong, W., Akau, T., Asaoka, C., Ohta, A., Shiroma, W. *Department of Electrical Engineering.*
Liquid metal has shown the potential to realize reconfigurable radio-frequency (RF) devices. However, improvements to the antenna fabrication and automation processes are needed to achieve large-scale development of these devices. Presented are novel methods for cost-effective liquid-metal printing and precise actuation control, as well as a work-in-progress reconfigurable pixelated device. The research team was appropriately divided into three subteams to investigate automation/control, fabrication, and device development. The investigations of the three subteams contribute to creating higher fidelity liquid-metal RF devices.

(30) Unmanned Aerial Systems with Object Detection and Image Processing. Barcelo, G.*, Law, E., Kanda-Matsumoto, M. *Department of Electrical Engineering.*
Unmanned Aerial Vehicles (UAVs) are aircrafts that don't require human pilots to operate. There are currently many uses for UAVs such as remote monitoring through image processing and object detection. Using image processing, we hope to be able to identify and classify objects of interest using drones without human identification. To accomplish this we are using CNNs to train classifiers to classify plant types that we are able to identify and isolate using object detection.

(31) Development of a Folding Recumbent Tadpole Tricycle. Cuenca, J., Duenas, R., Kahl, A., Lee, D.*, Limjap, R., Obiano, A., Segall, W., Shimizu, T., Sumera, N. *Department of Mechanical Engineering.*
The 2017-2018 Human Powered Vehicle Project highlights the research, design, manufacture, and testing of a recumbent tadpole tricycle developed to compete in the 2018 ASME Human Powered Vehicle Competition. The vehicle was designed to improve upon the shortcomings faced by last year's team while implementing a highly competitive folding attribute for the Innovation Event of the competition. This folding innovation theoretically halves the length of the vehicle, which accommodates tight storage spaces and also

allows it to fit through a standard-sized doorway. Along with the folding aspect, the vehicle also highlights a direct-steering system, an intermediary sprocket, and a partial fairing to enhance performance capabilities. In the production of this vehicle, the team has carefully researched and selected optimal design concepts, material types, and manufacturing processes to create a product that best represents the University of Hawai'i at Mānoa at the 2018 ASME E-Fest West.

(32) Estimation of Scour Depth around Group of Piles Using Group Method of Data Handling (GMDH). Manhin Leung*, Kahai Murata, Juanito Moises. *Department of Civil and Environmental Engineering.*

The physical process of scour around pile groups is complex. Due to economical and geotechnical considerations, multiple pile bridge piers have become more common in bridge designs. Various empirical models have been developed to estimate scour depth at pile groups. However, these models are mostly based on the conventional statistical regression approaches, and are not able to adequately capture the highly nonlinear and complex relationship between scour depth and its influential factors. In this study, Group Method of Data Handling (GMDH) was used to estimate clear-water local scour depth at pile groups using the flow, sediment, and pile characteristics. This work used experimental datasets from 14 studies to estimate to train and test the GMDH model. The whole data set contained 347 data points, which was divided randomly into two parts: a training set including 243 data points and a testing set consisting of 104 data points. Two combinations of data were used to train the GMDH model. The first combination included dimensional variables (e.g., mean flow velocity and depth, mean grain diameter, pile diameter, etc.). The second combination contained non-dimensional parameters. The results showed that the GMBH approach can accurately estimate scour depth around pile groups. It also performed better than the existing regression-based approaches.

(33) Aerial Drone Wireless Penetration Testing. Ngo, V.P.*, Dong, Y. *Department of Electrical Engineering.*

As aerial drones have become more readily available, their applications have diversified. This increase in usage makes drone identification and drone security fields of particular interest. The initial goal of this project is to wirelessly identify a drone through the analysis of its communication signal patterns. In order to pursue this objective, the Kali Linux distribution was used as the foundation for wireless packet sniffing and spoofing. The tools available in Kali allowed for the real-time capture of drone data streams for analysis. Once drone identification has been achieved, the future objective will be to determine possible methods that will allow for the disruption, or manipulation, of the drone's control signals based on the collected signal pattern data.

(34) Analysis, Distribution, and Visualization of Weather Data for Sustainability Applications. Cho, K., Obatake, J.*, Obatake, A., and Mukai, R. *Smart Campus Energy Lab, Department of Electrical Engineering.*

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

(35) Development of a Blended-Body Fixed-Wing Autonomous Unmanned Aerial Vehicle (UAV): Electrical & Electronics. Adrian Ramirez* and Mehrdad G. Nejhad. *Department of Mechanical Engineering.*

The goal of this project is to complete the design and manufacturing of a fully autonomous electric

blended-body fixed-wing Unmanned Aerial Vehicle (UAV) for security and sustainability/environmental applications by surveying land and ocean. The UAV will have about 30 minutes flight time and take land footage using a HD camera. Our fixed-wing aircraft is made of fiberglass and carbon epoxy composite shell over the EPO foam. It will be capable of fully autonomous flight, following a GPS guided adjustable flight pattern, as well as manual RC control capabilities. The plane is also equipped with a real-time First Person (Brid-Eye) View system and high definition surveillance camera under the fuselage and mounted at a downward angle from the fuselage for surveying of land and sea using a GoPro camera. This camera is perfect for getting footage when moving at high speed without being affected by turbulence that may occur. This proposed research will build upon Dr. Nejhad's former REU students' research and will modify electronics, controllers, rechargeable batteries, and camera systems for the Autonomous UAV. The main control unit of this UAV is the Ardu-pilot mega (APM) 2.6, a versatile microcontroller with open source autopilot software, with autonomous capabilities. The APM has separate compatible GPS and telemetry radio modules. The UAV will also have the capability of manual controlled using a Futaba 6J 6-Channel 24GHz S-FHSS TX/RX Radio Controller. The ESC (electronic speed controller) and servos are standard remote control accessories, which provide the aircraft with variable speed and movement of the wing flaps.

(36) Development of a Blended-Body Fixed-Wing Autonomous Unmanned Aerial Vehicle (UAV): Launch Pad & Mechanical. Brandon Sakumoto* and Mehrdad G. Nejhad. *Department of Mechanical Engineering.*

The goal of this project is to complete the design and manufacturing of a fully autonomous electric blended-body fixed-wing Unmanned Aerial Vehicle (UAV) for security, surveillance, reconnaissance, agricultural farms, and sustainability/environmental applications by surveying land and ocean. The UAV will have about 30 minutes of flight time and will take land footage with an on-board HD camera. Our fixed-wing aircraft is made of glass/epoxy and carbon/epoxy composite shells over a PEO foam. It will be capable of fully autonomous flight, following a GPS guided adjustable flight pattern, as well as manual RC control. The plane is also equipped with a real-time First Person Bird-Eye View system and high definition surveillance camera under the fuselage. This proposed research will build upon the previous research work of Dr. Nejhad's REU students and will further develop/modify the composite shell over the high-performance EPO (Expanded Poly Olefin) foam sandwich blended-body fixed-wing structure of the UAV, with proper modifications of the airframe, wings flaps, and control surfaces for flight control. The launcher design will be modified and tested with a dummy plane that resembles the actual plane. After successful launch tests, the plane will be field-tested for flight operations with RC and autonoums flights, and further modifications will be made if needed.

(37) Programmable Robotic Phantom for Radar Life Sensing and Subject Identification. P. Subia*, A. Sylvester, M. Angelo, B. Tomota, S. M. M. Islam and V. Lubecke. *Department of Electrical Engineering.*

There is a growing need for unobtrusive methods of monitoring human vital signs for health, security, and emergency response applications. Doppler radar has been demonstrated as an effective means for measuring human cardiopulmonary vital signs. This research examines the use of radar sensors to separate the respiratory patterns for multiple subjects in the radar field of view, and for unique identification of each subject. For this research many different respiratory patterns must be examined repetitively, and with consistency between experiments. Since it is not practical to have humans repeat measurements in an exact, specified manner, a programmable respiratory phantom mover has been developed. We have tested the hypothesis that such a phantom mover system can be programmed to accurately simulate the distinct human respiratory patterns needed for research on respiratory pattern separation and identification algorithms. The phantom incorporates a remotely programmable Arduino microcontroller driving a compact high-speed linear actuator. Comparison with real and/or simulated patterns have been successful for algorithm development. The impact of this research could result in new tools for medical diagnostics and security/surveillance and continuous identification. This work was supported in part by a grant from the University of Hawai'i at Mānoa's College of Tropical Agriculture and Human Resources (CTAHR) and College of Engineering (COE) Student Research Symposium.

(38) Brachytherapy active needle with multi-directional nitinol shape memory alloy actuators. Apilado, D., Au, D., Fujimoto, J., Kawamoto, E., Shirokane, J., Sugita, L.*, Kristal Vidad. *Department of Mechanical Engineering.*

Brachytherapy is a method of internal radiation therapy that involves implanting radioactive seeds near cancerous cells. Implant location is crucial for the success of the procedure and safety of the patient. Current passive needles which are used for this procedure offer low precision and are difficult to manipulate in the tissue. Our project focuses on the design, development, and testing of an tri-directional active needle, which is able to be steered in the tissue and offers more accurate needle tip placement than single direction active needles or passive needles. The use of an active needle will mitigate procedure and recovery time, trauma sustained by the patient, and cost for both the hospital and patient. The hopes for this project are to create a needle prototype that is capable of deflecting in more than one direction and is comparable in size to currently available brachytherapy needles. Our primary objective is to attach three shape memory alloy (SMA) wires to the needle to allow bending in three dimensions. Bending is achieved through the actuation of the wires. In our project, contraction and elongation of SMA wire actuators shall cause deflection of the needle. By attaching multiple wires, the needle is able to deflect in multiple directions with varied current applied to each wire. Our secondary objective is to track the needle and measure deflection and forces with the use of sensors. The data collected from the sensors will help determine how much linear force and actuation the needle needs to puncture and navigate through the tissue, therefore improving the accuracy of the needle tip placement.

(39) Design Considerations of an Oscillating Water Column Spar Buoy for Operation in Intermediate Wave Zones. Wong, T.*, Bentz, A., Campbell, A., Lau, D., Lee, A. *Department of Mechanical Engineering.*

An oscillating water column (OWC) spar buoy extracts mechanical energy from ocean waves via pressurization of an internal chamber. The pressurization of the water chamber, via the water column, drives a self-rectifying, bi-directional turbine connected to a power take-off apparatus. The optimal design considerations of the OWC spar buoy is governed by efficiency of conversion of energy: from mechanical energy of ocean waves to hydraulic pressure generated by the water column in the chamber to mechanical/electrical power extracted by the turbine and generator respectively. The design characteristics of the device are governed by various principles, including the maximization of vertical oscillation motion (i.e limitation of “tilting”), control of the natural response characteristics, optimization of buoyancy and water column volume characteristics, and optimization of the turbine for cyclical bi-directional flow. The characteristics of the device will be tested, at scale, in a wave flume using various performance sensor apparatus (accelerometer/gyroscope, air flow/pressure sensors, ultra-sonic sensors, etc). The operation of this type of wave energy converter (WEC) in the intermediate wave zone presents unique challenges because of depth constraints that make the adhesion to governing optimization principles through design choices difficult. The methodology and rectification of the various constraints and optimization principles, shall be presented for use in an operational model.

(40) Identification of the bacterial symbiont from entomopathogenic nematode (*Oscheius*) and its biological control potential. Alhussaini, A.*, Sipes, B,. Wang, K-H., Cheng, Z. *Department of Plant and Environmental Protection Sciences.*

Entomopathogenic nematodes (EPN) are used as biological control agents due to the mutualistic bacteria that infect and kill the host insect. *Oscheius* genus belongs to the family Rhabditidae and has been known to have characteristics of EPN. Objectives of this research were to identify the symbiotic bacteria from *Oscheius* isolates from Hawaii and determine the pathogenicity of the bacteria on mealworm (*Tenebrio molitor*) larvae. Bacteria were isolated from *Oscheius* isolates (BI 1a-2, BI 12a-5, OJ 4a-5, OJ 5b-1) and compared with that of *Steinernema feltiae* MG14 control. Either nematodes, or nematode infected mealworm larvae were cut or crushed using sterile pestles under *the* dissecting microscope and gut contents or hemolymph were streaked on TZC medium. Symbiotic bacteria were identified using PCR. Results showed that *Serratia* sp. and *Enterococcus* sp. were associated with *Oscheius*. For bacterial pathogenicity assays, mealworm larvae will be fed a bacteria-inoculated diet or will be directly injected into the hemolymph. *Oscheius* isolates from Hawaii

could be potential EPN that could be used as biological control agents against insect pests.

(41) Exploring Potential Loʻi Restoration | *Historical Site Identification and Suitability Analysis for Kailua, Koʻolaupoko*. Andreyka, N.* and Vaughan, M. *Department of Natural Resources and Environmental Management.*
The Hawaiian land tenure system was integrative and highly innovative, maximizing productivity in diverse ecosystems, while actively cultivating connections of people and place. Loʻi kalo exemplified this complexity, utilizing the hydrological regime across a landscape to achieve a range of goals. This study explores the reestablishment of the cultural landscape as a management tool to create more holistic, dynamic, and inclusively beneficial outcomes in natural resource management (NREM). Using the ahupuaʻa of Kailua in Koʻolaupoko, Oʻahu as a case, associated archival land documents were compiled and translated into a geospatial representation of the native land tenure system. Coupled with existing landscape data, a geospatial information systems (GIS) -generated overlay site analysis identified suitable sites for potential loʻi kalo restoration in the context of the contemporary environment. Resulting map products create an opportunity to envision change and facilitate discussion in addressing the pressing realities of endangered species conservation, food security, and climate change in this ahupuaʻa and throughout. These ancestral knowledge systems can elevate the ways in which NREM is approached: records *of* testimony that truly are a testimony *to* the very ways in which people and place connect.

(42) Morphological Characterization and Diversity Analysis of *Ilima* (*Sida fallax*) Darel Kenth S. Antesco* and Orville C. Baldos. *Department of Tropical Plant and Soil Sciences.*
The use of native Hawaiian plants as ornamentals has grown in the last two decades due to state laws aiming to promote its use in landscaping. Despite increased awareness and use of native Hawaiian plants, species and varieties available in nurseries are limited. Ilima (*Sida fallax,* Malvaceae) is a culturally important species commonly used in leis and in landscaping. Although various forms exist ranging from the prostrate coastal to the upright mountain ecotype, cultivar development has been limited. To develop horticultural selections, collection, characterization and evaluation of plants from different islands and habitats is essential. In this study, 14 ilima accessions were collected from wild and cultivated sources in four islands (Kauai, Maui, Molokai and Hawaii) and grown in a common garden. Morphological characterization was done using a descriptor list and assessed using the Shannon-Weaver Diversity Index. Results indicate a high (>0.67) to medium (0.34-0.66) level of diversity in several quantitative and qualitative characters. Characters exhibiting a high diversity index were leaf surface (0.92), leaf pubescence (0.83), petiole color (0.77), plant height (0.73), number of branches (0.73), number of leaflets (0.73), stem diameter (0.72) and the presence of leaf wax (0.68). Morphological characters with medium level of diversity include plant canopy (0.65), number of closed flowers (0.56), number of open flowers (0.52), number of plant samples with flowers (0.51) and peduncle length (0.45). The extreme variability observed in ilima growth forms provide opportunities to develop new selections for ornamental use.

(43) Turning a New Leaf: Engaging Local Businesses and Stakeholders in Policy to Prevent Invasive Plant Introductions. Arnott, C.*, Leary, J., Cox, L., Martin, C., Sandlin, M. *Department of Natural Resources and Environmental Management, Pacific Cooperative Studies Unit.*
Hawaii's extreme isolation resulted in the evolution of over a thousand native plants, most of which are found nowhere else in the world. With human arrival, the number of naturalized plant species more than doubled with the introduction of non-native plants. There are benefits to importing non-native plants, but there are the few that become invasive and current regulations do little to prevent further invasive plant introductions. One way to address this problem is developing the Restricted Plant list written into Hawaii Revised Statutes 150-A that would restrict the import and sell of plant species listed. To determine how plant restrictions may impact stakeholders, a survey was distributed to 443 businesses and individuals throughout the state in 2017. We received a 22% response rate with the largest category of respondents (42.7%) identifying themselves as wholesale nurseries. Over 50% of respondents indicated that importing new plant species was not important to their operation. On general topics, 90% thought themselves knowledgeable about invasive plants and would not sell a plant known to be invasive. Current regulations were

considered inadequate by over half the respondents (67%), yet many were not familiar with existing regulations (60%) and voluntary practices (46%) for invasive plant prevention. With that in mind, 87.5% were supportive of the proposed policy with stakeholder participation and indicated impact by this law would not be significant. The information from this survey will guide the next steps toward creating an outreach strategy that engages stakeholders in rule-making for listing plants for restriction.

(44) Development of a RNA-Seq-based Prognostic Signature for Colon Cancer. Bjarne Bartlett*, Mark Menor, Ting Gong, Tianying Zhao, Youping Deng, Vedbar Khadka. *Department of Complementary and Integrative Medicine, Department of Molecular Biosciences and Bioengineering.*

RNA-Seq data has recently been used to successfully develop prognostic signatures to predict cancer patients who will have a worse prognosis. We designed a study to ascertain whether such a prognostic model would have clinical utility for predicting survival in patients with colon adenocarcinomas (COAD). Data from 468 COAD patients from The Cancer Genome Atlas (TCGA) were obtained and divided into training (n=312) and validation (n=156) datasets. The training cohort was used to develop a prognostic signature by using univariate cox analysis to assess the prognostic potential of each gene and subsequently building a prognostic model using multivariate cox analysis. In the training cohort, multivariate cox analysis generated a 5 gene signature ($p<0.05$) that included 2 long noncoding RNAs (lncRNAs). A threshold for high-risk patients was chosen by looking at the top 25% of risk scores, setting a threshold of 0.432. High-risk patients predicted by our 5-gene, RNA-Seq signature had significantly shorter survival in both the training ($p=0.00$) and test ($p=0.003$) cohorts. Additionally, early stage patients predicted to be high-risk had significantly shorter survival ($p=0.006$ in both cohorts).

Here we present the first RNA-Seq prognostic signature that can identify high-risk COAD patients predicted to have shorter overall survival. This signature would have clinical utility as part of an RNA-seq screening program for cancer patients.

(45) Impacts of Root Competition on Growth and Productivity of Woody Species in Mixed Agroforestry Systems. Bendes, M.*, Lincoln, N.K. *Department of Tropical Plant and Soil Sciences.*

High diversity agricultural systems such as intercropping and agroforestry have the potential to provide ecosystem services that are lost through monoculture farming methods, including increased biodiversity, higher nutrient and water use efficiency, and increased soil quality. However, the complexity of these systems makes it difficult to design for maximum efficiency and represent a barrier to entry for some farmers. Especially in agroforests, it is critical that farmers understand the competition dynamics between woody and herbaceous plants. We propose to directly examine root competition between these two groups, using Breadfruit (*Artocarpus altilus*) and Mamaki (*Pipturus albidus*), within both field and pot experiments: a root exclusionary pot-in-pot experiment, in which half of the pots have separate root environments for the tree and crop; an orchard establishment experiment under various grass competition management strategies; and an orchard establishment experiment examining the effect of tree and crop spacing on growth and productivity. Collectively, these experiements will allow us to directly investigate the effect that root competition has on each plant's ability to grow. All experiments will employ the same range of physiological and biomass measurements; including foliar nutrient analysis, root coring, and root imaging analysis. This study aims to quantify and better understand the complex underground competition dynamics between woody and herbaceous plants to better inform farmers and make the transition to high diversity systems easier for them.

(46) Development of Genome-informed Rapid and Accurate Loop-mediated Isothermal Amplification Assay for Detection of *Xanthomonas euvesicatoria*, a Bacterial Spot Causing Bacteria. Gamze Boluk*, Upasana Dhakal, Lilly Fatdal, Adriana Larrea-Sarmiento, Anne Alvarez, Daniel Jenkins and Mohammad Arif. *Department of Plant and Environmental Protection Sciences*.

Bacterial spot cause significant economic losses on the tomato and the pepper. *Xanthomonas euvesicatoria, X. vesicatoria, X. gardneri* and *X. perforans* are the causal agents of bacterial spot. The symptoms caused by all four species are undistinguishable. Currently, no point-of-care diagnostics exist to detect BS causing agents. In this study, we develop LAMP assay to rapidly

and accurately identify and differentiate *X. euvesicatoria* using a field-deployable portable BioRanger instrument. Genomes of *X. euvesicatoria, X. vesicatoria, X. gardneri, X. perforans* and other species of *Xanthomonas* genomes were retrieved from NCBI GenBank genome database and were aligned and curated using Mauve and Geneious, respectively. Unique gene *recG* was selected from *X. euvesicatoria* genome and used to design specific primers for LAMP assay. Specificity of developed assay was tested against 52 strains of *Xanthomonas* species and other closely related species in exclusivity and inclusivity panels. No false negatives and false positives were detected. Detection limits of the assay were determined down to 100 fg of genomic DNA. However, sensitivity was reduced to 1,000 fg in spiked assays. Developed assay unambiguously detected target bacterial pathogen in infected tomato plant samples. Concordant results were obtained when multiple operators performed the test independently. The developed assays have applications in accurate diagnostics at point-of-care, surveillance, disease management and epidemiological studies.

(47) Is there a Relationship Between Protein Intake and Acanthosis Nigricans Among Young Children in the Children's Healthy Living Program in the United States Affiliated Pacific? Calabrese, A.*, Fialkowski, M.K., Boushey, C., Davis, J., Leon Guerrero, R., and Novotny, R. *Department of Human Nutrition, Food and Animal Sciences, University of Hawaii Cancer Center, Biostatistics & Quantitative Health Sciences, University of Hawaii John A. Burns School of Medicine, College of Natural and Applied Sciences, University of Guam.*
Acanthosis Nigricans (acanthosis) is a dermatological condition that is characterized by a dark hyperpigmentation of the skin. Acanthosis has been reported to be linked to obesity and to be an early indicator of insulin resistance. The purpose of this study was to examine if the presence of acanthosis is related to dietary protein consumption among children in the United States Affiliated Pacific. A secondary analysis was conducted of baseline data collected on 3,468 children, 2 to 8 years old, in 11 jurisdictions participating in the Children's Healthy Living Program. This cross-sectional study examined the relationship between protein intake and acanthosis. The relationship was analyzed using logistic regression. There were 191(5.5%) children that screened positively for acanthosis. The prevalence of acanthosis was higher in overweight and obese (63.4%). The average daily intake of protein was 69 g for cases and 68 g for non-cases. The total intake for protein was not significantly associated with acanthosis. However, for every 1 oz increase in intake of meat the risk of acanthosis significantly increased (p= 0.009). Further study of the relationship of acanthosis and other components of animal meat, such as fat content, are warranted.

(48) A Rapid Approach for the Quantification of Curcuminoids in Turmeric (*Curcuma longa* and *Curcuma* spp.) Grown in Hawaii. Calpito, J.*, Huang, A., Radovich, T., Bingham, J.P. *Department of Human Nutrition, Food and Animal Sciences, Department of Tropical Plant and Soil Sciences, Department of Molecular Biosciences and Bioengineering.*
Turmeric (*Curcuma longa*), *`olena* in Hawaiian, is one of several in the genus *Curcuma* that produce a unique class of medicinal secondary metabolites known as curcuminoids. The demand for high-curcuminoid locally grown turmeric as a dietary supplement has swelled in recent years and many different cultivars are now available on the market. Using a high-performance liquid chromatography with photodiode array (HPLC-PDA) methodology, rhizomes from several *C. longa* and *Curcuma* spp. cultivars grown at the Waimanalo Research Station at Waimanalo, HI were analyzed for five curcuminoids: curcumin, demethoxycurcumin, bis-demethoxycurcumin, cyclocurcumin, and tetrahydrocurcumin. The deep orange *C. longa* 'BKK' cultivar has shown the highest curcuminoid content, while color divergent varieties such as the pale-yellow *C. mangga* 'Zed' and blue *C. caesia* 'Black' did not show detectable levels of the curcuminoids analyzed, suggesting a relationship between color and curcuminoid content. The results of our investigation and the method developed will assist in optimizing current and future turmeric crops for Hawaii's burgeoning turmeric market. This work is supported by USDA Hatch and HDOA (Hawaii department of agriculture).

(49) Interpreting Feral Goat Movements Localized within Makaleha Valley, O'ahu, Hawai'i. Char, J.*, Litton, C.M., Leary J.J.K. *Department of Natural Resources and Environmental Management*.

Endemic Hawaiian ecosystems evolved over 5 Ma without hooved, mammalian herbivores. Feral goats (*Capra hircus*), in particular, are browsers of woody vegetation, and tend to move in herds, which can result in denuding watershed tree canopies, exposing landscapes to severe and irreparable soil erosion and catastrophic sloughing. Since first introduction in 1779, watershed ecosystems have become highly degraded. Since 1993, the Division of Forestry and Wildlife has been actively suppressing feral goat populations in Mount Ka‘ala, the highest elevation on Oahu and high priority critical habitat. This study examined the movement of two feral goats (one male and one female) from the north slopes of Ka‘ala in Makaleha Valley (ele. 180-1220m a.s.l., 1600ha) to identify locations and interpret movement patterns of a small remaining population. Georeferenced locations were recorded every six hours for one year in 2015-16 using Lotek GPS/radio-telemetry collars (Lotek Wireless, Onatario, Canada). Location data was analyzed with the Optimized Hotspot Analysis tool in ArcGIS® (v.10.2.2; Esri, Redlands, CA) to estimate areas of high usage (i.e., “hot spots”) and correlate these frequented zones with influencing environmental conditions. Results indicate that seasonality (i.e., ambient temp.) was more influential than precipitation and moon phase, which had no effect. Seasonality had a strong effect on both the spatial distribution of points as well as hot spot analysis. These findings help us understand broad local patterns of feral goats within this managed area. The method of collecting data from live animals is quite useful. More robust long-term data sets from multiple subjects will eventually contribute better decision-making support in demographics and eradication efforts.

(50) Exploring hydrological processes underpinning ecosystem services in He‘eia.
Ching, C.*, Oleson, K., Bremer, L. *Department of Natural Resources and Environmental Management, University of Hawai’i Economic Research Organization.*
Ecosystem services in Hawaii, such as cultural practice or connection to place, that communities gain from natural resources often require specific environmental and social conditions. In indigenous communities, ecosystem services are also fueled by deep connection to place and knowledge passed down through generations as they have learned to use the landscape. These uses of the landscape are also dependent on the biophysical elements present. However, little has been done to reveal environmental processes behind these ecosystem services all the while preserving their integrity within a Hawaiian context. Using participatory research methods, including interviews and community engagement in the landscape, along with a novel Hawaii-based ecosystem services framework, I identified services held by community members that work to restore lo‘i kalo (taro farming) in He‘eia in collaboration with the non-profit Kāko‘o‘Ōiwi. To determine how precipitation, streamflow, and other hydrological processes are connected to these services, I asked community members about the influence of these processes on the services they identified, and I overlaid the reported services spatially with outputs of the flood model, iRIC. Community members identified that increased inundation had the highest impact on their ability to use the wetland and key hydrological processes influencing service delivery were revealed in the iRIC flood model. This research shows that specific environmental conditions are necessary to promote Hawaii-based ecosystem services and traditional uses of landscapes.

(51) Estimating the home range of endangered Hawaiian Stilt (*Himantopus mexicanus knudeseni*) chicks on Ō’ahu and the impact of predators on fledging success.
Christensen, D.L.*, Harmon, K., and Price, M.R. *Department of Natural Resources and Environmental Management*.
An endangered subspecies of the Black-necked Stilt (*Himantopus mexicanus*), the Hawaiian Stilt (*Himantopus mexicanus knudeseni)* holds both cultural and ecological value in Hawai‘i. Endemic island species are at greater risk of extinction than non-endemic taxa. In the past, chick survivorship has been calculated at 55% in the first year. This study will identify the relative impact of both invasive and native predators on Hawaiian stilt chick fledging success. This study will also identify the homerange of stilts prior to fledging. Transmitters will be attached to chicks on the 10th day or after hatching. Game cameras will be used to monitor the nests until transmitters can be attached. Chicks will be tracked and sighted three to four times each week until the first molt (~60 days). Point location data will be used to identify the individual home range for each chick. The impact of predators on the survival rate will be analyzed and cause of death will be recorded

when possible. Objectives of this study include: estimating monthly survival rates of chicks and fledging success and comparing survivorship for the first year, identifying predator types, analyzing the impact of specific predators on chick mortality, and identifying homerange of stilt chicks.

(52) Optimization of copepods as live feed for Hawai'i larval shrimp culture. Danita Dahl*, Tally Nakamura, Isaiah Wagenman, Olivia Garcia, Jinzeng Yang. *Department of Human Nutrition, Food and Animal Sciences.*
Shrimp broodstock breeding and production is a large industry in Hawai'i, which exports millions of dollar specific pathogens-free (SPF) animals for several countries. During shrimp hatchery operations, the survival rate of larvae to post-larvae (PI) stage is an important trait. Previous studies have shown that copepods as a live feed for shrimp larvae increases survivability and growth rates. However, none of the previous studies have looked into amount of copepod ingestion by shrimp larvae. Local shrimp producers on Oahu are not utilizing copepods as a feed for their larvae due to the difficulties in raising copepods and feeding to larvae. In this study, we will show the efficacy of utilizing this system by evaluating the capture success and prey selectivity of larval shrimp *Litopenaeus vannamei*. This information will assist us in developing applicable protocols for easy use. Three copepod developmental stages (nauplii, copepodite, and copepods) of the local *Euterpina acutifrons* will be used as prey types for investigation. By utilizing a copepod live feed, local producers will not only breed more successful larval generations and PI production, but also lessen the environmental impacts of shrimp farms on the island.

(53) Efficiency in peptide toxin fluorophore production – Iberiotoxin study case. Delgado, E.* and Bingham J.P. *Department of Molecular Biosciences and Bioengineering.*
Fluorescent toxin peptides derived from the venoms of spiders, snakes, and cone snail species have been pioneers in the investigation of ion channel structure and activity. Their inherent, versatile properties and the well-characterized chemistry of fluorophore conjugation are now being exploited in tandem for the purpose of therapeutic drug discovery. However, efficient pipeline production is extremely problematic and very low yielding. Incorporating improved strategies of peptide synthesis and fluorophore bioconjugation may serve to mitigate the financial, temporal, and labor-intensive burden of researchers wishing to work with these dynamic compounds. Using solid phase peptide synthesis (SPPS) as well as the implementation of an aliphatic azide linker, capable of selectively tethering a highly stable fluorescent constituent, a venom peptide analog of Iberiotoxin (IbTx) was created. Thioester-ligation of the IbTx *N*- and *C*-termini, to increase initial synthetic yields, along with the fusion of the highly selective azide linker, were executed in order to achieve maximal yields of the final target peptide-fluorophore. Thus novel approach demonstrates a combined synthetic strategy for bioengineering peptide toxin fluorophore probes designed to carry unnatural, functional modifications.
This work in part is funded by the USDA HATCH 5028H (Bingham)

(54) Survey for *Ceratocystis fimbriata* on *Syngonium*. Upasana Dhakal*, Chris Kadooka and Janice Y. Uchida. *Department of Plant and Environmental Protection Sciences.*
Ohia (*Metrosideros polymorpha* Gaud.), one of the foundation plants of the of Hawaiian rainforest ecosystem have been rapidly dying, due to a disease caused by a fungus, *Ceratocystis fimbriata*. *Ceratocystis fimbriata* was earlier reported on *Syngonium* from Hawaii. It is vital to determine if this pathogen is on other islands on diseased *Syngonium* and determine its host range. A survey of the island of Oahu and Hawaii was conducted. Washed samples were dissected into smaller pieces, surface sterilized with 10% Clorox and plated on water agar or incubated under moist conditions. Single hyphal tips of the mycelium growing out from the infected samples or ascospore masses protruding out of perithecia were transferred to vegetable juice agar. Twenty different locations in Oahu including, commercial nurseries, botanical gardens and retail garden stores were surveyed. Samples from these places were free of *C. fimbriata*. Most common symptom was the rotting of the aerial root tips. *Fusarium* species was the most commonly isolated fungus. Other fungi were also recovered less frequent. Out of three nurseries surveyed in Big island, samples from two of them were found to be infected with *C. fimbriata*. Symptoms were darkening and black rotting of the nodes and bases of the petiole and basal rotting of the plants. Pathogenicity of isolate 3474 was tested on *Syngonium* and Ohia. A spore suspension at 1x

10^5 endoconidia per ml sterile distilled water were sprayed on unwounded *Syngonium* plants, while Ohia were wounded with a sterile scalpel and sprayed. Disease symptoms were observed on inoculated *Syngonium* three days after inoculation while no symptoms have been observed on Ohia so far and Ohia plants are still under observation.

(55) Design and Optimization of a Solenoid for Magnetic Field Treatment Using Finite Element Analysis Software. Sean Francis* and Soojin Jun. *Department of Molecular Biosciences and Bioengineering, Department of Human Nutrition, Food and Animal Sciences.*
Electromagnetic fields of 15 mT are part of a proprietary treatment to prevent freezing in beef samples at -4 °C. Former studies using Monte Carlo computer simulations have shown fields ranging from 100-200 mT alter the interaction of water molecules by altering the radial distribution function and changing the internal energy up to ± 0.1 E/kJ(mol^{-1}). Modeling and simulating electromagnets provide valuable information regarding field strength as well as heat production for use in optimization of the electromagnet. Initial calculations using Maxwell's equations were used to extrapolate coil parameters before a novel design was modeled and simulated. Solidworks and Electromagnetics Simulation Software (EMS) add-on provide accurate modeling and finite element analysis of electromagnetics in both dynamic and steady state conditions. In this study, a novel electromagnet was designed and then modeled in Solidworks before it was simulated and optimized using the EMS software.

(56) R-Ras: a key regulator of sepsis-mediated vascular permeability. Glibetic, N.*, Shi, G-X., Anastasiadis, P., Allen, J.S., and Matter, M.L. *University of Hawai'i Cancer Center, Department of Molecular Biosciences and Bioengineering, Department of Mechanical Engineering.*
Triggered by an underlying bacterial infection and exacerbated by a systemic inflammatory response, sepsis is a life-threatening condition that has a mortality rate of up to 70%, with Native Hawaiians having a 2-fold increased risk of death compared to other ethnicities. Currently there are no sepsis-specific therapies. Prolonged inflammation causes vascular leakiness leading to edema, organ failure and death. This leakiness is the driving factor in the progression of sepsis to septic shock and is associated with increased mortality rates. The underlying molecular mechanisms regulating vascular permeability are incompletely elucidated. We previously reported that the small GTPase R-Ras, in its active form, is required for maintaining endothelial barrier function (Griffiths et al. 2011). To elucidate the role of R-Ras in regulating sepsis-induced vascular leak we investigated the effects of TNF-α (the most prevalent cytokine in sepsis), patient sepsis serum and active or inactive R-Ras constructs on endothelial permeability in flow-induced shear stress conditions. Inactive R-Ras expression induced leakiness comparable to TNF-α or sepsis serum treatment. In contrast, active R-Ras expression blocked both TNF-α and sepsis serum-induced vascular leak by inhibiting a Src-FAK-VE-Cadherin permeability-inducing signaling pathway. Taken together our data suggests that active R-Ras is a key regulator of vascular permeability in physiologically relevant conditions. Moreover, R-Ras is a potential therapeutic target for sepsis treatment.

(57) Evaluating Impacts of Rainfall Intensity and Surface Water Levels on Hawaiian Stilt Nesting Success. Harmon, Kristen*, Tsang, Yinphan, Strauch, Ayron, Chan, Catherine, Price, Melissa. *Department of Natural Resources and Environmental Management.*
The Hawaiian Stilt (*Himantopus mexicanus knudseni*), an endangered, native Hawaiian waterbird, inhabits wetlands across the Hawaiian Islands. Flooding and predation of nests have been identified as major threats to Hawaiian Stilt populations. Nesting success of the Hawaiian Stilt is thought to be correlated with surface water levels, as is the case for most wading bird species. Flooding of nests may result from increases in surface water levels, particularly during high intensity rainfall. Additionally, increasing surface water levels may decrease nest predation, as nests become less accessible to land predators. Recent sea level rise has increased groundwater levels, causing rises in surface water levels, particularly during high intensity rainfall. On the island of O'ahu rainfall intensity varies spatially and temporally, resulting in fluctuating hydrological conditions of wetlands. A better understanding of how changes in surface water levels impact nesting success of the Hawaiian Stilt is necessary for effective conservation of this endangered species. Observational surveys and nest

cameras were used to examine nesting success in six wetlands on O‘ahu. Rainfall data was gathered from the National Oceanic and Atmospheric Administration, and surface water data was gathered from wetland staff gauges. Rainfall intensity was positively correlated with surface water levels. Nest failures due to flooding were highest when surface water levels increased during periods of high intensity rainfall. Predation of nests by land predators decreased as surface water levels increased. Our results may be used to inform decisions for managing hydrological conditions of Hawaiian Stilt habitat given future climate predictions.

(58) The Effects of a Beneficial Soil Microbe Inoculant on Plant-nutrient Availability and Nutrient Flows in Hawaiian Soils. S. Heisey*, N. Nguyen, R. Ryals. *Department of Tropical Plant and Soil Sciences, School of Natural Sciences, UC Merced.*

Soil microorganisms perform pertinent functions in sustainable agriculture, and understanding how best to manage microbial communities will be key in addressing future challenges in crop production and food security. An increasingly popular management strategy employed by producers is the use of beneficial soil microbial products to increase plant nutrient use efficiency and crop productivity. Using a nutrient-poor but agriculturally significant Hawaiian oxisol and radishes as a model crop, we examined the short and long-term treatment effects of a beneficial soil microbe product (BSM) coupled with a compost or urea fertilizer. We measured soil nutrient pools, nutrient leaching, plant biomass and nutrient content, and greenhouse gas emissions. Preliminary results show a difference in greenhouses gas emissions and nutrients leached among treatments. We see a trend where the microbial product increased the total amount of nitrate and ammonium leached when compared to the compost. Long-term biomass measurements show an initial treatment effect of decreased plant biomass. We then see a shift in treatment interaction over time where the microbial product then begins to increase plant biomass. This suggests the crop may not benefit from the BSM product until the system is more limited in terms of readily available plant-nutrients.

(59) Optimizing soil health and climate mitigation potential across various Hawaiian landscapes and management. Hannah L. Hubanks*, S.E. Crow, J. Deenik. *Department of Natural Resources and Environmental Management, Department of Tropical Plant and Soil Sciences.*

Hawai‘i’s diverse landscapes and land management practices produce a spectrum of soil health and carbon sequestration potential (SH&CS potential), the understanding of which can assist our efforts to sustain island agriculture and mitigate climate change through optimized soil management. Currently, there is no existing framework to quantify the benefits of soil health and ecosystem services in Hawai‘i, while the demand for such knowledge increases with the state’s recent mandate (House Bill no.1578) for a sustainable future and local food production. The existing database of soil carbon in Hawai‘i is limited and outdated, which inhibits an accurate estimation of SH&CS potential in Hawai‘i. This study will develop the framework for a SH&CS potential assessment system by using state-of-the-art carbon and soil health measurement techniques. Soil samples for the SH&CS potential assessment were collected from Oahu, Maui, and Moloka‘i, from a variety of management practices including organic, conventional, pasture, forest, and unmanaged lands, and were tested for total carbon to compare to the existing data available. Further results from physical, chemical, and biological soil tests will be plotted with multivariate analysis (PC-ORD) to evaluate indicators of SH&CS potential. This research, in addition to the social dimensions of land management in Hawai‘i, will be used to improve projections of SH&CS potential at different temporal and spatial scales for the islands. This will allow Hawai‘i to take inventory for carbon stocks and fluxes and develop a pathway to payment for ecosystem services and the framework to support the state’s environmental goals.

(60) Engaging Hawai‘i’s small-scale fishers to promote collaborative research and mitigate oceanic whitetip shark mortality. Iwane, M.*, Oleson, K., Leong, K., Vaughan, M. *Department of Natural Resources and Environmental Management, Pacific Islands Fisheries Science Center.*

Many fishing regulations fail to achieve their goals because they are poorly attuned to local socio-ecological conditions. Fishers’ perspectives and experiences provide valuable context for the benefit of region-specific fisheries management. Further, the stakeholder discourse involved in understanding these perspectives can foster trust between actors, identify common

goals, improve the perceived legitimacy of scientific and management agencies, and benefit the implementation success of resulting management strategies. I work with Hawai'i Island's small-scale fishers to explore their relationships with one another, with fisheries management, and with pelagic sharks. The oceanic whitetip shark's (*Carcharhinus longimanus*, abbreviated OWT) recent listing under the Endangered Species Act (ESA) presents a unique opportunity to explore these themes. Preliminary results suggest that awareness campaigns may affect fisher attitudes and OWT handling practices, given the infrequency of OWT encounters and recency of its ESA listing. Fishers' preference for passive shark deterrence and willingness to participate in research highlight opportunities to collaboratively mitigate shark mortality. Finally, fisher frustration with scientists' and managers' disconnect from on-the-water processes reinforce the need for a sustained dialogue between these actors. The nature of this work, which seeks to amplify the voices of fishermen, engage them early, and assign them an active role in developing solutions, has implications for improving fisheries stakeholder communication and informing management strategies that better achieve their social and ecological goals.

(61) A simple and custom-designed electrochemical impedance bioaffinity sensor with applied mechanical vibration for on-site detection of food pathogens. Bog Eum Lee*, Inae Lee, Soojin Jun. *Department of Human Nutrition, Food and Animal Sciences*.

Over the past decade, various detection methods have been developed for use in the identification of target bio-analytes. Biosensors have been proposed as a promising detection technology owing to its rapid, simple, and low-cost operation. In this study, a custom designed microwire-based electrochemical immunosensing device was developed for the detection of *Escherichia coli* K12 for the purpose of replacing conventional bench-top systems designed for use by trained personnel in laboratories. Gold tungsten wires were coated with single-walled carbon nanotubes (SWCNTs) to enhance sensing mechanisms and functionalized with polyethylenimine, streptavidin, biotinylated antibodies, and bovine serum albumin at the wires to impart specificity for *E. coli* K12. Serial dilutions of the target bacteria were added to a microcentrifuge tube to allow for the bioaffinity reaction with the functionalized wire. To enhance the binding of *E .coli* K12, mechanical vibration was applied to the centrifuge tube for 1 minute using a plate vibrator. The changes in the electron transfer resistance by bioaffinity interactions were measured with a frequency response analyzer. The sensitivity of the sensor in detecting *E. coli* K12 significantly improved from 10^4 CFU/mL to 10^2 CFU/mL with the assistance of the mechanical vibration. In addition, minor changes in impedance signals were measured when the sensor was tested with *Salmonella* Typhimurium which validated the sensing specificity towards *E. coli* K12.

(62) Effect of *in ovo* injection of probiotic, prebiotic and synbiotic on growth performance and gut health of broiler chickens. Li, L.G.*, Singh, A.K., Mishra, B., Jha, R. *Department of Human Nutrition, Food and Animal Sciences.*

Due to the claimed public health concern, use of antibiotics as growth promoters in the chicken feed is banned or regulated in several jurisdictions. Therefore, probiotics, prebiotics, and synbiotics are being evaluated as effective alternatives to antibiotics to improve growth performance and health of poultry. This study aimed to investigate effects of *Bacillus coagulans*, Raffinose family oligosaccharides (RFO) and their combination on growth performance and gut health of broilers when injected *in ovo*. A total of 285 fertilized eggs were divided into 5 groups: i) No-injection group with intact shell, ii) 0.5 ml 0.85% normal saline, iii) Probiotic (*B. coagulans)* (4×10^6 cfu/g) in 0.5ml 0.85% normal saline, iv) Prebiotic (4.5mg RFO) in 0.5ml 0.85% normal saline, and v) Synbiotic (4×10^6 cfu/g *B. coagulans* + 4.5mg RFO*)* in 0.5ml 0.85% normal saline. The injection solution was deposited into the amnion on the 17d of incubation. The *in ovo* injection did not affect hatchability of chicks across the treatments. Altogether, 42 day-old chicks from each treatment post-hatch were randomly allocated 6 replicate floor pens. All birds were raised on a standard commercial diet and management for 42 days. Body weight and feed intake of birds were measured weekly. There was no significant effect on body weight, average daily gain and feed intake among any treatment. However, normal saline treatment had significantly better (P>0.1) feed efficiency and RFO group had the poorest in the first week. No significant difference was found on relative organ weight of d 21 and d 42 birds. Also, blood,

spleen, liver, ileum and cecal samples were collected for further histological, immunological and microbial studies to reveal other physiological changes that is expected to occur besides growth performance.

(63) Exploring quality changes of fresh asparagus when preserved unfrozen at subzero temperature using the supercooling technology. Li, M.* and Jun, S.J. *Department of Human Nutrition, Food and Animal Sciences.*

Cold storage is one of the most popular methods to preserve perishable produce. However, there are still numerous circumstances that can occur when fresh produce is exposed to cold storage conditions, resulting in undesired changes in color, odor, texture, enzymatic activity and sensory values. Therefore, it is beneficial to develop a new technology for shelf life extension of fresh produce without quality degrading and spoilage. Supercooling is a technique to maintain food products unfrozen below their equilibrium freezing temperature. A supercooling technique combining pulsed electric fields (PEF) and oscillating magnetic fields (OMF) was able to extend the original freshness for a longer storage than refrigeration of seafood, meat, and fruits without freezing damages.

In this study, the supercooling technique was applied to test asparagus (*Asparagus officinalis*, L.) for quality factor analysis. The asparagus was chosen because it is popular and is considered highly perishable. Asparagus has one-week shelf life at refrigeration condition and the goal of the study is to enhance its shelf life up to 2 weeks while maintaining the fresh quality factors, including chemical analysis (lignin and anthocyanin), enzyme activity analysis, color measurement, weight loss, and texture measurement. These parameters were compared with those of fresh, refrigerated and frozen asparagus. It was observed that supercooled asparagus preserved for 2 weeks did not show significant quality changes compared to fresh samples.

(64) Advanced ohmic heating for rice cooking: Quality factor assessment. Junhuang Liu* and Soojin Jun. *Department of Human Nutrition, Food and Animal Sciences.*

Rice is one of the world's cereal crops next to wheat and maize, and is one of the most important staple foods for the world population. Asian people consume cooked rice at almost every meal. Cooking rice is a process in which a mixture of rice and water is heated, leading to starch gelatinization of the rice starch. The cooking process is complete when the water diffuses into the whole rice grain and no white core is observed. An electric rice cooker is commonly used in domestic daily rice cooking. However, the process requires a long cooking time which is possibly due to several heat transfer steps. Moreover, existing cooking methods are about 10-15% thermally efficient. The ever increasing population will need more amount of energy and water to be spent on rice cooking. In this study, an alternative cooking method that offers both high energy efficiency and short cooking time was developed. The energy consumption, textural characteristics, and simulation of electrical field in ohmic heater were investigated. Two types of rice were used in this study: white rice and brown rice respectively. The electrical conductivities of various mixtures of rice samples and water at different ratios were measured. The results showed that the rice cooked by the ohmic heating method has significantly different textural properties from rice cooked by an electric rice cooker. The magnitude of texture difference was dependent on the type of rice. The estimated amount of energy consumed by the entire ohmic heating process was about 1/4 of the total energy consumed by electric rice cooker. The developed ohmic heating technique showed a great potential over the conventional electrical cooker in terms of the high energy efficiency, shorter cooking time, and lower water usage.

(65) Total phenolic content and antimicrobial activity of *ohelo* berry extracts. Liu, X.*, Nakamoto, S., Li, Y. *Department of Human Nutrition, Food and Animal Sciences.*

Ohelo berry, a wild relative of cranberry, is an endemic plant in Hawaii. Previous research indicates that *ohelo* berry is a rich source of phenolic compounds, which may hold antimicrobial potential. This study aimed to determine the total phenolic content and antimicrobial activity of *ohelo* berry. *Ohelo* berry crude extract (F0) was separated using a C-18 Sep-Pak cartridge into three fractions, including sugar plus organic acids (F1), monomeric phenolics (F2), and anthocyanins (F3). The concentrations of phenolic compounds and anthocyanins in the fractions were determined by the Folin Ciocalteu method and the pH differential method, respectively. Each fraction was further evaluated against two bacterial strains, pathogenic *Staphylococcus aureus* and

probiotic *Lactobacillus rhamnosus*, via the agar well diffusion assay. The total phenolic content of F0, F1, F2, and F3 was 15.20, 0.03, 6.59, and 9.67 mg /mL (gallic acid equivalent), respectively. The concentration of anthocyanins in the four fractions was 354.02, 0, 13.06, and 362.84 mg/L (cyanidin-3-glucoside equivalent), respectively. In the antimicrobial test, F0, F2, and F3 showed high acidity with pH 3.26, 2.57 and 2.11, respectively. They generated inhibition zones of 18 mm, 15 mm and 17 mm against *S. aureus*, respectively. None of the four fractions inhibited the growth of *L. rhamnosus*. In addition, neutralized F0, F2, and F3 yielded inhibition zones of similar sizes against *S. aureus* as those at their native pH. In conclusion, the phenolic compounds and anthocyanins in *ohelo* berry have strong antimicrobial effect on *S. aureus*, but show no inhibition against *L. rhamnosus*. This study lays the groundwork for exploring the potential of *ohelo* berry as a healthy food and as a natural preservative to enhance food safety.

(66) Genomic analysis of *Taro vein chlorosis nucleorhabdovirus* and development of an antibody-based detection assay. Loristo, J*, and Melzer, M. *Department of Molecular Biosciences and Bioengineering, Department of Plant and Environmental Protection Sciences.*

Taro vein chlorosis nucleorhabdovirus (TaVCV; family *Rhabdoviridae*) is a disease-causing virus found in taro (*Colocasia esculenta*) throughout much of the South Pacific, and more recently, Hawai`i. A TaVCV isolate from Fiji represents the only fully sequenced genome of this virus to date. Partial genomic data of TaVCV suggests high genetic diversity in this virus species. For example, a TaVCV isolate from Molokai revealed the polymerase and nucleocapsid (N) genes were only 79% and 84% identical to the Fijian isolate, respectively. Such diversity may hinder the development of robust PCR-based detection assays. To better understand the genetic diversity of TaVCV and develop improved diagnostic assays, the genomes of isolates from other regions must be sequenced. To accomplish this, double-stranded RNA was extracted from symptomatic taro leaf tissue collected from Hawai`i and Samoa, then used to construct a cDNA library to be characterized by high-throughput sequencing. In addition, a synthetic construct using the putative N gene was made for protein expression and purification. Efforts to use the purified protein for the development of antibody-based assays for TaVCV are currently underway. An antibody-based assay may be more robust than current PCR-based detection assays, and would represent a technology readily transferable to locations which may have limited resources for PCR-based diagnostics.

(67) Withdrawn

(68) Understanding carbon flux heterogeneity and development of a novel temperature sensor network for a Andisol deep soil warming experiment. McGrath, C.*, Glazer B., Sylva, K., Crow, S. *Department of Natural Resources and Environmental Management, Department of Oceanography.*

Soils have high potential to drawdown carbon and reduce atmospheric greenhouse gas concentration, given that the mechanisms for stabilizing and storing carbon are not overwhelmed by the interactive effects of rapid warming on multiple soil processes. Volcanically-derived Andisols with a high concentration of poorly and non-crystalline minerals have a strong affinity to stabilize C and offer a unique study system to test hypotheses about mineral control on carbon stabilization and protection from disturbance losses. Heterogeneity of C flux on the landscape and technology required for real-time monitoring of soil temperature were two challenges addressed prior to implementation of a quantitative manipulative deep soil warming experiment. Biweekly static chamber measurements of soil CO_2 flux taken from September 2017 to February 2018, at the Lyon Arboretum, showed a loss of 50-200 mg C-CO_2 m^{-2} hr^{-1} within “homogenized” areas compared to losses of 275-500 mg C-CO_2 m^{-2} hr^{-1} within “hotspot” areas. This data informed stratified random sample design for heating probes and temperature sensor network locations to ensure non-biases of initial high rates of respiration. Following exploring the heterogeneity of carbon flux, the novel temperature sensor network was developed. Sensors showed stabilized temperatures, within 0.1℃ of the paired temperature probe, when subjected to a week-long water bath test for conductance. Moving forward, the probes will be deployed into the field summer of 2018, to mimic the conditions of for the IPCC RCP-8.5 scenario and to monitor its effect it has on the soil.

(69) A Symphony of Hawaiian Forest Birds: Developing and Testing an Interdisciplinary Education Program for Hawai'i's Youth. Nakama R.K.*, Frambaugh-Kritzer C., Itoh T., Price M.R. *Department of Natural Resources and Environmental Management, College of Education, Music Department.*

Environmental education programs represent a crucial component of disseminating scientific knowledge throughout communities, fostering public understanding and appreciation for the natural world. One of the preeminent conservation concerns in the state of Hawai'i is the preservation of our native forest bird species, many of which are currently threatened by an imminent extinction crisis. Representatives from the Natural Resource & Environmental Management (NREM), the Music Department, and the College of Education at the University of Hawai'i have recognized an opportunity to collaborate on an unprecedented interdisciplinary project that synthesizes science curriculum and visual & performing arts. Aimed at educating thousands of students through this approach, our team recognized the need to develop structured curriculum for participating school groups that comply with the Hawai'i State Department of Education's standards. Assessments designed to gauge understanding and comprehension of natural science concepts and local conservation issues are given both before and after the curriculum. Measuring the impact of these materials on students' perceptions of imperiled native species is essential for determining the effectiveness of this interdisciplinary approach. The myriad of cumulative educational benefits from this collaborative environmental and artistic project demonstrate the untold potential of interdisciplinary partnerships in bringing together community groups to support mutually beneficial ventures.

(70) Determining the role cytokinin plays in patterning the maize leaf. Dylan Oates*, Aimee Uyehara, Angel Del Valle Echevarria, and Michael Muszynski. *Department of Tropical Plant and Soil Sciences.*

Spatially organized patterns of cells and tissues are one of the driving forces behind organ formation (organogenesis). Understanding the signals that regulate this spatial organization is important in order to gain insights into the molecular networks guiding organ formation. We use the maize leaf as a model to understand the molecular signals underlying spatial organization (patterning), since it is composed of four distinct segments polarized in a specific proximal-distal (P-D) pattern. The sheath is proximal, the blade is distal, and the auricle and ligule separate the two. Our previous analysis of the semi-dominant *Hairy Sheath Frayed1 (Hsf1)* mutant revealed that altered cytokinin signaling can influence P-D leaf patterning. *Hsf1* mutant plants have ectopic outgrowths from the margin of the leaf blade termed "prongs" that consist of sheath, ligule, and auricle tissue. Thus, *Hsf1* plants have proximal tissues growing in a distal segment. To understand how CK drives prong formation, we used laser-capture microdissection (LCM) coupled with whole transcriptome sequencing (RNA-seq), and identified approximately 800 differentially expressed (DE) genes in initiating prongs compared to samples from adjacent normal (no prong, NP) margin and wild type (W) margin. Enriched among these DE genes are transcription factors (TFs) associated with different developmental processes. My poster outlines my strategy for determining the function of a subset of these DE TFs and the role they play in prong formation.

(71) Raman Spectroscopy (RESpect) for Anal Intraepithelial Neoplasia (AIN) Lesions from HIV-Serodiscordant Couples. Oda, R*, Kamada, N., Milne, C., Misra, A., Acosta-Maeda, T., Shiramizu, B. *Department of Molecular Biosciences and Bioengineering, Department of Tropical Medicine, Medical Microbiology and Pharmacology, Hawaii Center for AIDS, Hawaii Institute of Geophysics and Planetology.*

Anal dysplasia is a potentially chronic disease that affects HIV-seropositive and-seronegative men who have sex with men (MSM) and transgender women. Novel approaches to AIN screening could improve healthcare through access to timely care and treatment since appropriate training and equipment are currently required for screening and follow-up. Recently, Raman spectroscopy (RESpect), a laser-based technology, has identified unique anal tissue fingerprints. We assessed anal tissue for RESpect phenotypes for differences in HIV-serodiscordant couples. HIV-serodiscordant couples were enrolled in a clinical study to assess anal biopsy specimens as per IRB guidelines. Anal tissue was flash-frozen and mounted onto aluminum reflective slides and subjected to RESpect point scans accumulations. RESpect information was processed using asymmetric least squares to baseline the data and subjected to principal

component analysis (PCA). Data from 2 couples showed that PCA distinguishes between HIV+ and HIV- individuals of the couples. In HIV+ individuals, PCA also distinguishes AIN from normal tissue. RESpect was shown to identify not only AIN amongst all individuals but also suggested there may be a unique HIV effect in the RESpect data from anal tissue. Further work on RESpect could provide groundbreaking information towards the design of a RESpect monitoring instrument to diagnose and follow patients for AIN. Supported in part by R21CA216830 and U54MD007584.

(72) The Search for Novel Herbicidal Natural Products in Strawberry Guava. Ooka, J.K.* and Owens, D.K. *Department of Molecular Biosciences and Bioengineering.*

There is a growing interest in alternatives to commercial herbicides and increased enthusiasm for organic farming practices. This is particularly true in Hawaii where the protection of land, water and its residents are of the highest concern. The search for new herbicidal compounds is continuing utilizing strawberry guava (*Psidium cattleianum). Strawberry guava is one of the most widespread invasive species to Hawaii due in part to its lack of native predators and proposed allelopathic properties.* A plant having allelopathic compounds, or having the property of allelopathy, is defined as one which can produce its own natural herbicides to compete against other plants for desired resources such as nutrients or sunlight. *The common or American guava, Psidium guajava*, is a close strawberry guava relative that has previously been shown to have these allelopathic properties. As such, Strawberry guava *represents an as of yet uninvestigated* source of potential new herbicidal compounds. *We intend to establish the allelopathic profile of P. cattleianum, and investigate any identified compounds with weed killing activity as potential new herbicide leads. Furthermore, the molecular target sites of any newly discovered compounds will be investigated, which has the potential to contribute additional herbicidal modes of action to aid in combatting evolved herbicide resistance.*

(73) QTL mapping of resistance to Taro Leaf Blight (TLB) disease in Taro. Roshan Paudel*, Michael B. Kantar, Susan C Miyasaka, Michael Shintaku. *Department of Tropical Plant and Soil Sciences, College of Agriculture, Forestry & Natural Resource Management, University of Hawai'i at Hilo.*

Taro (*Colocasia esculenta*) is a clonally propagated root crop that is a staple of Pacific Islanders. Taro leaf blight (TLB) is the most devastating disease of taro in Hawai'i and the world. This disease is typically controlled using fungicides, which are costly. Genetic resistance has been identified in taro populations from Palau. Here we explore the genetic architecture of TLB resistance in several breeding populations with the resistant material being incorporated into the existing University of Hawaii taro breeding program. We have developed an F_1 mapping population based on crossing '230' with another breeding cultivar '255' [(Hawaiian landrace Red Moi x TLB resistant Papua New Guinean landrace PH15) x TLB resistant Indonesian landrace Sawahn Kurasae]. We used two isolates of *Phytophthora colocasiae* to challenge our mapping population. Quantitative trait mapping identified seven QTL for the two isolates. Five QTL accounted for 46.8632% of the phenotypic variation for the isolate from Pepeekeo, Hawaii and two QTL accounted for 14.53% of the phenotypic variation for the isolate from Pana'ewa, Hawaii.

(74) Effects of waterborne exposure to nonylphenol on the growth and reproductive physiology of Mozambique Tilapia (*Oreochromis mossambicus*). Petro-Sakuma, C.K.*, Celino-Brady, F.T., Lerner, D.T., Seale, A.P. *Department of Human Nutrition, Food and Animal Sciences, University of Hawai'i Sea Grant College Program.*

Global population increase and the use of chemical compounds in many industrial practices have resulted in widespread contamination of aquatic ecosystems. Endocrine disrupting chemicals (EDCs) have been shown to negatively affect the basal endocrine functions of many species. The EDC nonylphenol (NP) is an alkylphenol found in industrial surfactants used in agriculture. The actions of NP on the endocrine system mimic that of the hormone estradiol 17-beta (E2), thereby interfering in reproduction. In cold-water species, such as salmon, NP was shown to inhibit growth. Little is known, however, on how NP exposure affects the physiology of warm-water species, such as tilapia. In teleost fish, the growth hormone (GH)/ insulin-like growth factor (IGF) system directs growth, while E2 stimulates the production of the yolk-precursor protein, vitellogenin (VTG), in liver. We hypothesized that NP stimulates vitellogenesis and suppresses growth through the GH/IGF system

in tilapia. Yolk-sac fry were exposed to waterborne E2 (0.1 µg/L, 1.0 µg/L; positive control) and NP (10 µg/L, 100 µg/L) for 21 days and the pituitary, liver and gonad were sampled 120 days later. Hepatosomatic index was lower in fish exposed to 100 µg/L NP compared with controls, suggesting that NP has adverse effects on liver metabolism. To determine the extent of the effects elicited by waterborne NP, additional endpoints will be analyzed, including the pituitary expression of GH, and hepatic expression of VTG, E2 receptor, IGF-I and II, and GH receptor [Supported by HATCH (#HAW02051-H) and NOAA/ UH-Sea Grant (#NA14OAR4170071, R/SB-18)].

(75) Public perceptions of the box jellyfish *Alatina alata* and other natural hazards at Waikīkī, Oʻahu, Hawaiʻi. Riley, P.P.*, Cox, L.J., Holland, B.S., Leary, J.K., Lepczyk, C.A. *Department of Natural Resources and Environmental Management, Hawaii Pacific University, Auburn University.*

Coastal hazards can present risks to beach users and their associated risk perceptions may alter their behavior and activities relative to using the beach. Given the major role tourism plays in Hawaiʻi's economy, understanding and managing the risk perceptions of visitors is warranted. On Oʻahu, coastal hazards include bacterial infection from poor water quality, drowning due to high surf or rip currents, and injury from rocks, sharks, or jellyfish. Waikīkī is the most popular beachfront on the island of Oʻahu. Sharks are sighted occasionally in the area and stinging jellyfish are present every month 8-12 days after a full moon. This study seeks to investigates public perception of risk due to marine coastal hazards at Waikīkī Beach using an in-person, intercept survey. In total, 347 complete surveys were collected. As part of the survey, participants were provided information regarding box jellyfish ecology, sting intensity, and how to avoid stings. Participants indicated any changes in risk perception, the impacts of jellyfish hazard information on their satisfaction with Waikīkī, impacts on their decisions to revisit Waikīkī, and preferences for dissemination of jellyfish hazard information. Hazard concern was found to be moderate for all categories, with *a priori* information decreasing concern for sharks or jellyfish. Information had little to no impact on plans to revisit Waikīkī and the impact on satisfaction was either neutral or positive. Information panels at the beach and social media dissemination were the dissemination methods preferred by most residents and visitors. These methods of dissemination are therefore recommended to increase awareness of jellyfish influx, alleviate concerns regarding stings, and ensure that beach users have a more positive experience.

(76) Examining the effect of Zero-deforestation commitments on land cover change and agricultural profits. Rodrigo Rivero* and Kim Carlson. *Department of Natural Resources and Environmental Management.*

Tropical deforestation is driven by demand for agricultural commodities such as soy, cattle, and palm oil. To mitigate forest loss and its subsequent negative impacts like biodiversity loss and increased carbon emissions, companies that produce, trade, and sell tropical commodities have made commitments to source only from responsible producers that do not contribute to increased deforestation. In South America's Amazon forest, the implementation of such commitments by soy exporters, which handled 78 million tons of soy in 2015, has been deemed successful at reducing deforestation. However, these commitments may lead to displacement of deforestation to regions, actors, or commodities not covered by a commitment, which may limit commitment success.

To understand the effects of these zero-deforestation commitments on land cover in major soy-producing regions of South America, we will build a land use and land cover simulation model. This model will be created using Dinamica EGO, a spatial simulation software platform. We will use land cover maps, soy agricultural data, and detailed information about commitments to determine potential leakage effects from commitments. This model will also allow us to understand how different commitment characteristics, such as implementation dates and forest definitions, might alter land cover outcomes. This will allow us to understand the commitments' potential scale of impact, unintended consequences of the commitments (in terms of leakage), and effect on land use patterns.

(77) Potential use of local strains of entomopathogenic fungus to control the coconut rhinoceros beetle, *Oryctes rhinoceros* on Oahu, Hawaii. Mason Russo*, Zhiqiang Cheng, Kelsey Mitsuda, Jing Li, and Matt Kellar. *Department of Plant and Environmental Protection Sciences.*

Many islands throughout the Pacific have had their palm trees devastated by *Oryctes rhinoceros*, the coconut rhinoceros beetle. *O. rhinoceros* primarily feeds on coconut palms, *Cocos nucifera*, but also feeds on a variety of other palms and plants. Integrated pest management is often used to control *O. rhinoceros*, with a combination of mechanical, cultural, chemical, and biological control methods. *O. rhinoceros* spread across the pacific was influenced by agriculture, shipping, war, and tropical storms helped increase its spread. In Hawaii, it was first detected on the island of Oahu in 2013. Due to the regulations associated with bringing in biological control agents to the Hawaiian Islands, a survey was conducted to identify local entomopathogenic fungus strains to test on the *O. rhinoceros* larvae. Soil samples from around Oahu were collected and 73 strains of *Beauveria spp.* and *Metarrhizium spp.* were tested on lab reared *O. rhinoceros* first instar larvae. The larvae were reared in the University of Hawaii Arthropod Containment Lab (UH-ACL), with field caught specimen brought into the colony weekly. The top 6 *Metarrhizium spp.* strains were then assessed and tested to a greater extent in this study. These were from the University of Hawaii Campus, Lyon Arboretum, and Koko Head District Park. Results so far indicate highest mortality occurs with the Koko Head and Lyon Arboretum strains, exceeding 60% mortality.

(78) Lovely flowers, potential problem: viral spillover among pollinators in agricultural settings. Santamaria, J.*, Villalobos, E.M., Nikaido, S.S. *Department of Plant and Environmental Protection Sciences.*

Crop pollination by insects is an integral part of sustainable agriculture, however, with the increase in diseases affecting the European honey bees, (*Apis mellifera*), researchers are now looking more closely at the spread of emerging infectious diseases among beneficial insects. Diseases once thought to be solely associated with *A. mellifera* are being detected in other important pollinators, including bumble bees, hover flies, and wasps. We screened two farming communities on Oahu (Waimanalo and Kunia) for diseases, with a particular focus on the prevalence of Deformed Wing Virus (DWV) in flower visiting insects in those areas. Preliminary results suggest that DWV is found in six non-*Apis* flower visitors, including *Ceratina smaragdula*, *Ornidia obesa*, and *Megachile umbripennis*.

(79) Manu a Meli: the Business of Creating a 'Local' and 'Original' Ginger Beer. Nicholas Sinclair*, Elizabeth Feldeverd, Robert Oda, Christian Dye, Sophia Oak, Robinson Bucaneg and J-P. Bingham. *Department of Molecular Biosciences and Bioengineering.*

This past spring (2017), six students, along with Dr. J-P. Bingham started a pilot class in Molecular Biosciences and Bioengineering (MBBE) entitled: Fermentation Biochemistry (MBBE 691). This was intended as a pilot class for future semesters (see additional posters). In this class students learned about the science of brewing, business models, planning and decision making, and had a great time making many different products such as mead, ginger beer, and apple cider. The selection of these specific drinks/brews had been promoted by their absence in the local market, as Hawaiian-made products; we decided as a class that the best way to establish ourselves as a new brewery would to create a unique product line that is immediately recognizable as Hawaiian. This led us to create an alcoholic ginger beer that was well received at events we catered. Surveying consumers provided a clear indication that these beverages were marketable, and compatible to local tastes and demands.

(80) Withdrawn

(81) Quantifying the Embodied Environmental Impact of Doubling Hawaii's Local Food Supply. Tanya Torres* and Kimberly Carlson. *Department of Natural Resources and Environmental Management.*

Hawaii imports about 90% of its food, resulting in an extremely low degree of food self-sufficiency. Thus, if food imports to the islands are disrupted, Hawaii will be subject to major food stress and shortages. To address this vulnerability, Hawaii's governor recently proposed to double local food production by the year 2020. While an increase in local food production may address Hawaii's food self-sufficiency issues, expanding or intensifying local agriculture while reducing imports is also likely to affect local and global environmental services.

To understand differential impacts of locally produced versus imported foods, here we present a methodological framework to quantify the embodied environmental qualities of Hawaii's current food system. We focus on comparing banana, lettuce, taro, beef, and milk, which were chosen to represent the five main

USDA food groups that are both grown locally and imported to Hawai'i. Through a life cycle analysis (LCA), we will assess the environmental burdens and resource use at every 'life' stage of these foods from farm to plate. The LCA will be applied to Hawaii's current food system as well as scenarios of doubled local food production, to explore the effects of increased agricultural production in Hawaii. This assessment will provide novel data on the global warming potential of Hawaii's food supply chain, as well as the eutrophication and acidification potential from nutrient runoff to the islands' nearshore ecosystems. Understanding the relative impacts of using Hawaii's lands for agriculture versus relying on imports will aid the State of Hawaii in identifying and adopting policies likely to encourage more sustainable agriculture.

(82) Potential of internet influence on superfood choices. Valdez, D.K.*, Titchenal, C.A., Dobbs, J. *Department of Human Nutrition, Food and Animal Sciences.*

Superfood is an increasingly popular Internet marketing term to assist individuals in choosing healthier food options. The goal of this study was to determine what foods are considered superfoods and the frequency a consumer would see these on Internet websites. The Google search engine was used to search the term "superfood list." On a single day, data were obtained from the top 50 sites and foods within each site were assigned two levels; one level indicating google order and the second indicating within site order. Foods were then categorized into modified USDA food groups. Additionally, websites were categorized by organization, media type, and author credentials. Sites recommended 0 to 111 foods with the median of 50 foods. A list of 1215 food items was downloaded representing 385 unique foods. Plant sources represented more than 90% of unique foods. Animal-based products represented (120) 9.9% of unique foods. Conventional foods (1150) represented 94.7%; processed foods (54) 4.4%, and medicinal foods (11) 0.9%. Fruits and vegetables were the most commonly encountered; fruits represented (300) 24.7% and vegetables (353) 29.1%. Results show that a high proportion of the commonly recommended superfoods are predominantly high sugar plant-based foods and not necessarily essential nutrient-based. The influence of the Internet can shape food perception of what constitutes a healthy food. The strong bias toward sugary plant-based foods can influence people to decrease the dietary value of other nutrient-rich foods, especially animal-based foods. By understanding what types of foods are being recommended via Internet sources, this information will allow the development of more targeted and effective public health education interventions.

(83) Expression of follistatin and myostatin in the oviduct of laying hen. Wasti, S.*, Sah, N., Kuehu, D.L., Kim, Y.S., Jha, R., Mishra, B. *Department of Human Nutrition, Food and Animal Sciences*, *Department of Molecular Biosciences and Bioengineering*.

After ovulation, the egg yolk spends 24-28 hours in the oviduct to transform into a complete egg. In the magnum, the egg yolk spends 3 hours for albumin deposition and 15-24 hours in the shell gland (uterus) for egg shell formation. The entire process requires luminal and glandular epithelial proliferation and differentiation in the magnum and the shell gland of the oviduct. In our preliminary RNA-Sequencing data, Follistatin was highly expressed in shell glands of laying hen compared to non-laying hens. Follistatin regulates cellular proliferation and differentiation in several tissues, while Myostatin inhibits cellular growth and differentiation. Expression and function of follistatin in the chicken oviduct is completely unknown. Based on our preliminary RNA-seq data, we hypothesized that Follistatin may play an important role in cellular proliferation and differentiation of the luminal and glandular epithelium in the laying hen oviduct. To test the hypothesis, magnum and shell gland were collected from laying hens (3h and 20h postovulation, n=5/group), molters (n=5), non-layers (n=4). Expressions of *Follistatin* and *Myostatin* mRNA in the magnum and shell gland were analyzed using quantitative real-time PCR. In the shell gland, expression of the *Follistatin* was significantly higher in laying hens at 20 h after ovulation whereas expression of the *Myostatin* was significantly higher in non-laying hens. In the magnum, the expression of *Follistatin* and *Myostatin* mRNA remained unchanged. These results suggest that Follistatin in the shell gland of laying hens around eggshell formation may have functional role in the shell glands morphogenesis directly or through inhibiting the Myostatin.

(84) Community-based mangrove management on Pemba Island, East Africa. Watkins, G.* and Crow, S. *Department of Natural Resources and Environmental Management.*

The seaweed farming communities on Pemba Island, East Africa use mangroves in their farming practices and recognize their value for carbon sequestration and protection from coastal erosion and natural disasters. However, they require support to sustainably manage these forests and maintain their livelihoods. Since the 1980s, seaweed farmers were using mangrove wood for stakes to anchor the cultivated seaweed, causing subsequent island-wide coastal mangrove deforestation. The objective of this project was to identify adaptive management practices, including options for replanting, use of alternative tree species, sustainable harvests, and preferred funding structures for outreach programs in collaboration with the Pemba Foundation, a local non-profit. A community-based participatory management methodology involved the farmers in decision-making through questionnaire surveys and group interviews. A quantitative stakeholder multi-criteria decision analysis determined optimal adaptive management practices and outreach program leadership structure. Among the potential adapted management practices, farmers ranked replanting efforts first and sustainable cutting last. However, a diversified approach that combined all three practices was ranked second. Stakeholders strongly preferred that the Dept. of Fisheries and Forestry fund government outreach and education activities. These results suggest that collaborative outreach programs, funded by the government, may help educate seaweed farming communities about the benefits and methods to integrate sustainable cutting with replanting efforts and using alternative tree species. These adaptations are likely to succeed in changing farmer harvesting practices, maintaining livelihoods, and restoring mangroves on Pemba Island's deforested coastlines.

(85) The effect of neonatal administration of recombinant myostatin propeptide on skeletal muscle growth in mice. Xiaoxing Xu*, and Yong Soo Kim. *Department of Human Nutrition, Food and Animal Sciences.*

Studies have shown an increase in muscle growth by inhibition of myostatin (MSTN), a negative growth factor for muscle growth. MSTN propeptide (MSTNpro), the N-terminal peptide cleaved from proMSTN, binds MSTN and inhibits its action. The objective of study was to generate bioactive recombinant MSTNpro and examine whether neonatal administration of the MSTN inhibitor improve subsequent skeletal muscle growth in mice. A truncated form of flatfish MSTNpro fused to mouse IgG Fc domain and maltose binding protein (MBP-fMSTNpro45-100-mFc) was expressed in E. coli and purified by amylose and protein-A affinity chromatography. The MSTN-inhibitory capacity of the protein was confirmed by pGL3-$(CAGA)_{12}$-luciferase reporter assay. Female mice were mated to 2 males, and the females were randomly divided into control (4) and treatment (4) groups. At birth and 1 day post-birth, 0 or 10 ug of MBP-fMSTNpro45-100-Fc in 10 ul of PBS was orally delivered to pups. Growth was monitored by weekly body weight measurement. At 10 weeks, muscle and organs were sampled and weighed. In another experiment with the same experimental design as the above, the same dose of MBP-fMSTNpro45-100-mFc was injected intraperitoneally (IP)at birth and 1 day post-birth. The administration of MBP-fMSTNpro45-100-mFc, either orally or IP injection, had no significant effects on body weight, skeletal muscle or organ mass. In conclusion, current results indicate that the neonatal administration of MSTN inhibitors is not likely an effective strategy to improve skeletal muscle mass in animals.

(86) Using Indigenous knowledge to assess past, present, and future water sources in Cho'ho'tso valley on the Navajo Reservation. Aissa T. Yazzie*, Mehana B. Vaughan. *Department of Natural Resources and Environmental Management, Navajo Tribal member*.

Water security is a major concern for the Navajo Nation. Over 30% of Navajo's living on the reservation live without running water and 40% have to haul water to meet their daily needs. In the southwestern part of the United States, tribal people are facing severe droughts, shifts in seasonal climate, increases in storm surges, and regional temperature increases. Grounded in Indigenous methodologies and developed using a Diné research paradigm, this project used ancestral knowledge, ground surveys, water quality testing and a living memory map to understand past, present, and future water sources within the Cho'ho'tsoi Valley in St. Michaels, Arizona on the Navajo Nation. Ancestral knowledge was used to identify past

water sources and ground surveys were conducted to take visual assessments, gps coordinates, and photographs of the current state of these once flourishing water sources. The data was then used to create a living memory map of past and current water sources to learn how the landscape has changed. The Cho'ho'tsoi valley has an elevation of 6,500 to 7,500 feet and 11 inches of precipitation a year resulting in a semi-arid, high desert plateau and canyon environment, typical of Arizona and New Mexico. Located within the canyon is Cienega Creek. Once a flourishing and perennial creek known for its yellow meadows, today Cienega Creek is intermittently fed by rainwater. With no permanent water sources found, there is a major concern for the water security of the Cho'ho'tsoi community, whom already have limited access to regulated water systems.

(87) Analysis of probiotic yeast and probiotic bacteria using prebiotics. Beverly Yuen* and Yong Li. *Department of Human Nutrition, Food and Animal Sciences.*
Probiotic yeast has gained popularity because of their diverse potentials in delivering health benefits to humans, such as treating diarrhea, enhancing digestion and nutrition absorption, and treating bacterial infections. Probiotic yeast has exhibited higher survivability than probiotic bacteria in the digestive tract. However, probiotic bacteria metabolize carbohydrates from prebiotics more effectively, to improve their probiotic potentials, than probiotic yeast. This research compares the probiotic potentials of yeast and bacteria when each probiotic is supplemented with prebiotics. Probiotic yeast, including *Saccharomyces boulardii* CNCM I-745 and *Saccharomyces cerevisiae*, and probiotic bacteria, including *Lactobacillus acidophilus* (LA) and *Lactobacillus rhamnosus* GG (LGG), were each supplemented with or without 3% inulin. Probiotics were analyzed for pH tolerance. During incubation of 30°C for 2 h at a pH of 2.0, *S. boulardii* CNCM I-745 retained 89.5% of cells with addition of inulin and retained 80.6% of cells with addition of glucose. When LGG was incubated at 37°C for 10 min with a pH of 2.0, LGG retained 0.0027% of cells with addition of inulin and 0.057% of cells with addition of glucose. Overall, *S. boulardii* CNCM I-745 showed a greater resistance to acidic conditions than LGG. Ongoing efforts are centered around bile tolerance, cholesterol assimilation, and auto aggregating ability. Utilizing yeast as a probiotic would be a better alternative than bacteria in colonizing the colon.

(88) Reduction of School Lunch Plate Waste of Early Adolescents in the US: Identifying Barriers, Motivators and Perspectives. Chenchen Zhao*, Chloe Panizza, Kira Fox, Carol Boushey, Carmen Byker Shanks, Selena Ahmed, Susan Chen, Elena Serrano, Julia Zee, Marie Kainoa Fialkowski Revilla, and Jinan Banna. *Department of Human Nutrition, Food and Animal Sciences, University of Hawai'i Cancer Center, Montana State University, Virginia Polytechnic Institute and State University.*
This research was undertaken to identify barriers, motivators, and perspectives regarding reduction of early adolescents' plate waste in the National School Lunch Program (NSLP) in Hawai'i, Montana and Virginia. Early adolescents (n=47, 9-13 yr) from families receiving Supplemental Nutrition Assistance Program benefits were recruited at each location. Using a pilot-tested semi-structured interview guide, trained interviewers conducted audio-recorded interviews that were transcribed verbatim. Using a study specific codebook, two researchers independently coded three transcripts using NVivo software to assess interrater reliability and achieved a mean Cohen's Kappa coefficient of 0.68. They then coded all transcripts independently. The two coders evaluated key themes separately, then collectively agreed upon final themes and summarized results regarding main barriers, key motivators, and key participant perspectives. Results indicate food quality improvement; food preparation and processing in NSLP; allowing food choice in schools; and allowing students to save, share, compost, or feed animals leftovers may help minimize school lunch plate waste. Additional focus should be placed on what specific foods are served and how they are served, as well as obtaining additional feedback from children on other barriers and motivators regarding plate waste reduction. Reporting on factors contributing to plate waste is essential in maximizing the NSLP's impact on the nutritional status of youth.

(89) Searching for the most affordable sources of bioavailable iron and protein among commonly consumed foods. Almeida, V.A.*, Donohoe-Mather, C.M., Dobbs, J., Titchenal, C.A. *Department of Human Nutrition, Food and Animal Sciences.*

Consuming adequate amounts of essential nutrients is required to maintain homeostasis and health. Iron deficiency is the most common nutrient deficiency worldwide; it is required for hemoglobin and as a cofactor for over 60 chemical reactions in the body. Protein is needed for structural components such as muscle and bone, enzymes to catalyze essential reactions, and hormones which coordinate bodily functions. Typically the highest levels of bioavailable iron and essential amino acids come from animal protein sources. However, the cost of animal protein sources is usually higher than other food groups and therefore may not be affordable to individuals with limited financial resources. The purpose of this project was to create an index to evaluate and rank commonly consumed foods by their ability to meet bioavailable iron and protein needs in an affordable diet. Using nutritional information from the USDA national nutrient database for standard reference (Release 28, revised May 2016) and cost information from local Oahu markets, over 300 commonly consumed foods were separated into food group clusters according to USDA categories. These were systematically evaluated and ranked based on least cost per available nutrient and per 100 kilocalories. While incorporating animal source foods may be considered expensive, this study shows that animal products are less expensive sources of bioavailable iron and quality protein and could be a cost-effective way to meet nutrient needs based on the Dietary Recommended Intake (DRI) for iron and protein.

(90) Molecular and biochemical analysis of giant and common leucaena. Bageel, A.* and Borthakur, D. *Department of Molecular Biosciences and Bioengineering.*

The tree-legume leucaena (*Leucaena leucocephala*) can be broadly classified into two major groups: common leucaena (*L. leucocephala* subsp. *leucocephala*) and giant leucaena (*L. leucocephala* subsp. *glabrata*). Common leucaena, which is a small bushy shrub, is widespread and invasive because it produces large quantities of seeds, whereas giant leucaena is a large arborial tree that forms relatively fewer seeds and is not invasive. An important feature of giant leucaena is that it can be grown as a large tree or maintained as shrub for fodder by repeated harvest of the foliage. The goal of this research is to characterize these leucaena at molecular and biochemical levels so that the results can be used in in leucaena breeding programs. For molecular analysis, 36 mitochondrial gene sequences were isolated from a transcriptome library of giant leucaena K636. By aligning these gene sequences with corresponding genes from five legume species, three genes were selected that showed high variability among the reference legume species, expecting that cultivars of giant and common leucaena may also have variation in the sequences for these genes. Using the gene sequences from giant leucaena corresponding to conserved regions of these genes, PCR primers were developed to amplify segments of these genes from both giant and common leucaena. The purified PCR fragments were sequenced to determine the sequence differences between giant and common leucaena within the gene fragment between the primer sequences. Four species of giant leucaena and nine isolates of common leucaena were also selected for biochemical analysis. Concentrations of protein, tannin, mimosine, and wax are being analyzed to determine differences among these species and isolates. Results obtained from these molecular and biochemical analyses will be useful in leucaena breeding programs for selection of cultivars with highest nutrition values and lowest toxicity.

(91) Towards sustainability: Indonesian smallholder inclusion in palm oil certification systems. Ekaputri, A.D.* and Carlson, K.M. *Department of Natural Resources and Environmental Management.*

Almost half of the production of palm oil, the world's leading edible oil, is produced by smallholder farmers. The Roundtable on Sustainable Palm Oil (RSPO) offers a certification system that in theory helps producers, including smallholders, to achieve more sustainable practices. Proponents of certification claim that for smallholders, certification supports market access, increases profitability, and enhances environmental responsibility. Yet, smallholders are thought to face several barriers to certification including a lack of understanding regarding good agricultural management practices, low technical and organizational skills, limited access to financial capital, and the inability to demonstrate legal land ownership. This study aims to analyze the degree to which Indonesian oil palm smallholders are included in RSPO certification. To do so, we compare smallholder certification rates derived from published audit reports with government statistics on smallholder oil palm

production. In Indonesia, the top global palm oil producer, around 40% of all oil palm area is managed by smallholder farmers. However, to date, only 10% of total RSPO certified area are under smallholders and just 4% of the total area under smallholders in Indonesia are RSPO certified. Moreover, there are only seven RSPO certified smallholder grower groups. Nevertheless, we found a positive relationship between total areas of smallholders with total RSPO-certified areas of smallholders. The limited inclusion of smallholders in certification schemes may restrict potential benefits of certification by missing these small producers. This is a challenge for Indonesia, which faces growing pressure from the international market for a sustainable palm oil production.

(92) Association between maternal pregravid body mass index and breastfeeding discontinuation in Hawai'i and Puerto Rico WIC participants. Gibby, C*, Palacios, C., Lim, E., Banna, J. *Department of Human Nutrition, Food and Animal Sciences, Florida International University, John A. Burns School of Medicine.*

Minority and low-income children are particularly at risk for obesity, and high maternal pregravid body mass index (BMI) has been shown to be a risk factor for obesity, while breastfeeding is protective. This study investigated the association between pregravid BMI and breastfeeding discontinuation at four to six months postpartum in Hawai'i and Puerto Rico participants from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Secondary data analysis was conducted from a text message-based intervention and included 87 mothers who initiated breastfeeding and whose breastfeeding status was known at the end of the study. Pregravid BMI and breastfeeding discontinuation were assessed using questionnaires. The association between pregravid BMI and breastfeeding discontinuation was not significant in the unadjusted odds ratio model or in the adjusted multivariable logistic regression model. However, Native Hawaiian or Other Pacific Islanders (NHOPIs) showed significantly higher odds of discontinuing breastfeeding (adjusted odds ratio [AOR]=7.12; 95% confidence interval [CI]= 1.34, 37.97; p=0.02) compared to all other races/ethnicities, as did older women aged 32-39 years versus women who were 25-31 years old (AOR=4.21; 95% CI=1.13, 15.72; p=0.03). Women who took vitamins while breastfeeding had lower odds of discontinuing breastfeeding (AOR=0.15; 95% CI=0.05, 0.46; p=0.0009). The results of this study may inform strategies for breastfeeding promotion and childhood obesity prevention, such as increasing education, outreach, and support efforts that are tailored to women in WIC who are older or NHOPI.

(93) Using fermentation in the classroom to teach both advanced biochemistry and the fundamentals of business development. Gong, T.*, Buchanan, J., Bartlett, B., Carlson, B., Arios, J.P., Saxby, S., Bottema, M., Doherty, J., Sinclair, N., Zhao, T., Bingham J.P. *Department of Molecular Biosciences and Bioengineering, Department of Complementary & Integrative Medicine.*

University courses are responsible for introducing current trends and techniques in scientific research to prepare students to enter the workforce. The past 40 years have seen a steady decrease in the number of recently graduated doctoral students with positions as full-time faculty members at academic institutions and increases in both post-doctoral fellowships and employment outside academia. Despite an increasingly competitive job market for PhD's, the number of US students pursuing doctoral degrees continues to grow at a fast pace. In order to produce graduate students for a 21st century job market, the MBBE department aims to pair the traditional academic toolkit with versatile, business-development skills.

The graduate-level course in fermentation biochemistry offered by the MBBE department is a hands-on innovation lab for learning the product development pipeline – to practice this, students start a mock business venture from scratch at the beginning of each semester with the goal of bringing multiple products to the marketplace by final exams. In order to be successful in this class, students are required to form a company with a detailed business plan, conduct market research, and develop prototypes, with the end goal of producing 2 products worthy of the marketplace. Previous iterations of this course have produced 4 viable products, attuned to local consumption, that have gained campus-wide recognition.

(94) Begomoviruses represent an emerging threat to the papaya industry in Bangladesh. Islam Hamim[12*], Wayne B. Borth[1], James C. Green[1], Michael J. Melzer[1], Dennis Gonsalves[3], Jon Suzuki[3], Marisa Wall[3] and John S. Hu[1]. *[1]Department of Plant and Environmental Protection Sciences, [2]Department of Plant*

Pathology, Bangladesh Agricultural University, [3]USDA-ARS, Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center.
Papaya (*Carica papaya*) is a well-known fruit crop in tropical countries. Recently, papaya plants in Bangladesh exhibited severe leaf curl symptoms that were different from those produced by Papaya ringspot potyvirus symptoms. These distinct symptoms and the presence of whitefly infestations suggested the possibility of begomovirus infection. Forty-five leaf samples with typical leaf curl symptoms were collected from seven districts in Bangladesh. A degenerate primer set targeting the partial coat protein and the transcriptional activator protein gene of the DNA-A component of begomoviruses was used for PCR detection of begomoviruses in these samples. A 1.3-kb fragment was amplified from 43 out of 45 tested samples. Sequencing and BLASTn analyses of these amplified sequences indicated that the virus isolates could be classified into three distinct groups (groups 1, 2, 3). Twenty-nine isolates from group 1 tested positive for *Tomato leaf curl Bangladesh virus (*ToLCBV). Ten isolates from group 2 tested positive for *Tomato leaf curl Joydebpur virus* (ToLCJoV) and 4 isolates from group 3 tested positive for *Tomato leaf curl New Delhi virus* (ToLCNDV). These three begomoviruses had previously been identified associated with leaf curl diseases on tomato in Bangladesh. Our findings suggest that several begomoviruses are associated with leaf curl symptoms of papaya in Bangladesh, where they may represent a significant threat to papaya industry.

(95) Exploration of electric and magnetic field emissions optimized for supercooling preservation of beef samples with diverse fat/lean compositions. Taiyoung Kang*, Raymond Hoptowit, Soojin Jun. *Department of Molecular Biosciences and Bioengineering, Department of Human Nutrition, Food and Animal Sciences.*
Supercooling has the potential to maintain the quality attributes of foods due to subzero storage temperatures and no ice crystals growth in the food structure; however, the supercooling behavior of food products is highly affected by the different intrinsic properties of food. In this study, the operational parameters of the external electric field (EF) and magnetic field (MF), which are employed to ensure the maintenance of supercooling of food products were optimized to preserve beef steaks with different compositions in a supercooled state. Top round and sirloin beef steaks were placed in a cooling chamber set at -5˚C and the EF and MF were applied during the entire experiment. The EF and MF treated beef samples were preserved for 7 days and the beef quality factors were compared to samples subject to the conventional refrigeration and freezing conditions. While the beef with low fat content treated with the EF were successfully preserved in a supercooled state at -4˚C, the supercooling in the beef with high fat content was maintained at -4˚C only when the samples were exposed to the EF and MF combination treatments. The beef samples preserved in the supercooled state showed significantly lower values in drip loss (0.4%) compared to the refrigerated (2.1%) and frozen samples (3.2%). In addition, the color changes, shear force, microstructure observations showed that there were no significant differences between the supercooled beef and fresh samples. In conclusion, the EF and MF technology allowed the beef steaks with different compositions to preserve in the supercooled state and maintain the same quality as its fresh counterparts.

(96) Effects of heat stress on the oviductal gene expression and egg qualities in the laying hen. Kuehu, D.L.*, Sah, N., Lee C.N., Jha, R., Mishra, B. *Department of Molecular Biosciences and Bioengineering, Department of Human Nutrition, Food and Animal Sciences.*
Heat stress is one of the most challenging environmental stressors in the livestock industry including poultry which accounts for a huge economic loss. Heat stress is known to have a negative impact on the laying hen health, egg production and qualities. To mitigate the effects of heat stress, it is important to understand the mechanism by which heat stress exerts its biological effects on the egg production. Therefore, the purposes of this study is to determine 1) the effect of heat stress on the egg production and qualities, and 2) expression of the oviductal genes (layers vs heat stressed). To understand the effects of heat stress on the oviduct, hens were housed at 21-22 °C and 50% relative humidity (control), and at 32-35 °C with 42-50% relative humidity (heat stress treatment) for three weeks. The body weight, egg weight, egg size and eggshell thickness were significantly decreased in the heat stressed hen. Egg production was decreased by 10% at week-1, and 25% at week-3 compared to control. The expressions of calcification related genes such as Calbindin 1, Salophospho-Protein 1,

Calcineurin 1, Cytochrome P45026A1, and Proenkephalin in the shell gland were significantly decreased in the oviducts of heat stressed hens. These results suggest that heat stress partly impair the egg shell formation because of decreased egg calcification related genes. It is important to note that these impacts on health and egg qualities were evident within a three-week period, and further investigation is necessary to understand the longer term effects on egg laying and declining hen health and egg production. However, it is clear that early intervention on the effects of heat stress through mitigating efforts will be highly beneficial to the poultry and livestock industry.

(97) Dietary intake of young children on Guam: The Children's Healthy Living Program (CHL). Laguana, M.B.*, Novotny, R., Leon Guerrero, R.T., Barber L.R. *Department of Human Nutrition, Food and Animal Sciences, University of Guam.*

The goal of this research is to describe dietary intake of young children from Guam who participated in the CHL study at baseline. A cross-sectional sample of children (n=865), ages 2-8 yrs., were recruited on Guam. Data included measured body size, food logs, and questionnaire data on physical activity, other lifestyle behaviors, and demographics. Parents/caregivers completed food logs of everything their children ate and drank for two randomly assigned days. Among 667 children with food logs, 655 had valid measurements of body mass index (BMI) and were included in this analysis. The breakdown of ethnicity for the 667 children with food logs includes: Chamorro n=444 (66.5%), Other Pacific Islander (Other PI) n=156 (23.3%), Filipino n=61(9.1%), and Others n=6 (0.8%). Among all 655 children with BMI data, 464 (70.8%) children were healthy weight, 84 (12.8%) were overweight, 88 (13.4%) were obese, and 19 (2.9%) were underweight according to US reference data. Data indicated high intakes of sugar sweetened beverages, grains, meat (oz/d), total energy intake, protein (g/day), total carbohydrates, total fat, saturated fat, iron, zinc, vitamin A, and sodium, compared to US guidelines. Overall, intakes were low in fruit, vegetables, milk, dietary fiber and calcium intake. Chamorro children consumed 206 g/d of sugar-sweetened beverage, higher than other ethnic groups, and compared to a recommendation to consume none. Filipinos had high intake of grain, total energy expressed in kcals, protein, total carbohydrates, total fat, saturated fat, and sodium, compared to other ethnic groups. These findings will provide a basis from which to build nutritional interventions appropriate for these young ethnic populations.

(98) Chemical Synthesis of a Novel Peptide (oGnRH) for Pheromone Stimulation of Spawning in 'Opihi (*Cellana* spp.). Mau, A.*, Arios, J., Valdez, A., Nicodemus, P., Jha, R., Bingham, J-P. *Department of Molecular Biosciences and Bioengineering, Department of Biology, Department of Human Nutrition, Food and Animal Sciences.*

Gonadotropin releasing hormone (GnRH) is a well-studied peptide known to regulate vertebrate and invertebrate reproduction. Recently, a commercially-available salmon GnRH (sGNRHa) was found to induce spawning in 'opihi (*Cellana* spp.) via intramuscular injection. In this study, an 'opihi GnRH (oGnRH) was derived by proteomics, chemically synthesized, and administered as a hormone/pheromone. We hypothesized that this peptide 1) is bioactive and 2) can stimulate spawning in 'opihi as a pheromone. GnRH sequences from NCBI database were analyzed via ClustalW multiple sequence alignment and Neighbor-joining method with bootstrapping in MEGA7. The selected amino acid sequence (pGlu-H-Y-H-F-S-N-G-W-K-S-NH2) was manually synthesized using solid phase techniques, purified, and identified by LC-MS/MS; and side-by-side bioassays were performed. In Bioassay A, 'opihi (n=36) were administered with PBS (control), sGnRHa or oGnRH via a two-step intramuscular injection at 250 and 500 ng g-1 body weight. In Bioassay B, 'opihi (n=35) were exposed to various concentrations (0, 0.05, 0.25, and 0.50 mg L-1) of sGnRHa or oGnRH in seawater. For both bioassays, 'opihi groups administered oGnRH peptide resulted in the release of eggs or sperm or both gamete types as confirmed by microscopy and fertilization. Future work will be done to optimize pheromone concentrations. This work was supported by the Center for Tropical and Subtropical Agriculture through a grant from the National Institute of Food and Agriculture of the U.S. Department of Agriculture under Award No. 2014-38500-22241, UROP, and The Hawaiian Malacological Society.

(99) Assessing the prebiotic potential of taro (*Colocasia esculenta*) with probiotic *Lactobacillus* species in *in vitro* human digestion system. Saxby, S.M.*, Lee, C.N., Kim,

Y.S., Li, Y. *Department of Human Nutrition, Food and Animal Sciences.*

Taro (*Colocasia escuknta*), a culturally important staple food of the native Hawaiian diet, is gluten free and high in fiber content, reaching 5.1 g/100 g. Due to taro's high fiber content, it was hypothesized to have prebiotic potential. Prebiotics are carbohydrates that are indigestible by the digestive tract, which can selectively stimulate probiotic growth and/or activities in the colon. As such, a healthy microbiome in the colon can be established through the inclusion of taro in the diet.This study aimed to evaluate the effect of taro on the growth and adherence of probiotic *Lactobacillus* species in an *in vitro* human digestion system. Four probiotic *Lactobacillus* species, including *L. acidophilus*, *L. paracasei*, *L. rhamnosus*, and *L. plantarum*, were individually paired with 2% (w/v) taro. In addition to taro, 2% (w/v) glucose and inulin were used as controls. The pairings were subjected to an *in vitro* human digestive tract simulation of the mouth, stomach, and intestinal conditions to assess the fate of tested probiotics. Furthermore, an auto-agglutination assay was conducted to evaluate the effect of taro on self-agglutination of the individual probiotics. Lastly, the Caco-2 cell line was used to determine whether taro could influence the ability of tested probiotics to adhere to human intestinal epithelial cells. Results indicated that *L. acidophilus*, *L. paracasei*, and *L. plantarum* experienced greater growth in the simulated intestinal tract when paired with taro than with inulin or glucose. In addition, *L. paracasei* showed strong self-agglutination ability and had the greatest adherence percentage to Caco-2 cells. In conclusion, taro is a strain-specific potential prebiotic that can likely be utilized to aid in the formation of a healthy gut microbiota.

(100) Effect of fiber degrading enzyme and feed's residual fiber on cecal short-chain fatty acids production and microbial diversity as revealed by metagenomics during *in vitro* study in broilers. Singh, A.K.*, Park, T., Legaspi, J., Neupane, K., Jha, R. *Leeward Community College, Department of Human Nutrition, Food and Animal Sciences.*

This study evaluated the effect of *in vitro* fermentation of ileal residue of fibrous diets without or with xylanase enzyme on the production of cecal short chain fatty acids (SCFA) and variation in cecal microbial profile in broilers. The ileal residue contained fermentable carbohydrates which was obtained after two steps *in vitro* enzymatic digestion. The experiment consisted of a 6-treatments combination of 0%, 5% & 10% wheat bran (WB) without or with xylanase (0.01% Econase XT) in 3×2 factorial arrangement. Inulin and blank were used as experimental controls. After 48 hours of incubation, the supernatant was aspirated for SCFA determination and the pellet was used to extract microbial DNA. The PCR product was used for microbial genome sequencing using Next Generation Sequencing technique. Neither the level of WB in feed, nor the enzyme affected the cecal SCFA production ($P > 0.05$). Likewise, the treatments did not modify ($P > 0.05$) the overall microbial diversity in cecum. In conclusion, the feed residues of all treatments were utilized similarly by the cecal microbes for SCFA production and their balance in cecal colonization remained unaffected. Hence, this study reveals that slight variation in type of fiber entering the ceca and fiber degrading enzymes does not shift the overall microbial diversity in broilers. However, early and periodical sampling from *in vitro* fermentation could provide more information on fermentation metabolites.

(101) Development of a High Performance Liquid Chromatography (HPLC) protocol to identify and measure anthocyanins in poinsettia bracts. Teng, E.S.*, Bingham, J.P., and Amore, T.D. *Department of Tropical Plant and Soil Sciences, Department of Molecular Biosciences and Bioengineering*.

Poinsettia is the most popular holiday potted plant, with eye-catching bracts colored by anthocyanin pigments that attract consumers to buy the plants every holiday season. Poinsettia breeders are constantly challenged to create new and improved cultivars for the industry, and anthocyanin profiles can aid in cultivar development. Identification and measurement of anthocyanins in poinsettia cultivars has not been conducted since the 1980's, thus pigment profiles of modern poinsettia cultivars are lacking. A standard method to identify and quantify the anthocyanins in poinsettia bracts using High Performance Liquid Chromatography (HPLC) does not exist. Methods for extracting and analyzing anthocyanins in pitanga fruit were adapted for poinsettia bracts. Acetone extraction was followed by pre-purifications to remove lipophilic compounds and separation from other flavonoids using a C18 solid matrix. Finally, acid hydrolysis removed sugars from the compound before analysis using HPLC. The adapted protocol results in accurate quantification of the

anthocyanin content in poinsettia bracts and also in optimal HPLC chromatograms of high resolution with sharp symmetrical shape on a flat baseline. An updated, efficient HPLC protocol to identify and quantify the anthocyanins in poinsettias will be used to characterize the anthocyanin profiles of modern cultivars and create a database of the pigments. It will also be used to quantify the effects of temperature and light on anthocyanin content in poinsettia bracts, and beneficial when characterizing new germplasm and new hybrids. We thank the Monsanto Graduate Fellowship for funding.

(102) Agrobacterium infiltration for transient expression of F3'5'H, Rosea1, and Delila in anthurium. Toves, P.J.*, Fitch, M.M., He, X., Criley, R.A., Martin, C.R., Amore, T.D. *Department of Tropical Plant and Soil Sciences, Hawaii Agricultural Research Center, John Innes Center, Norwich, UK.*

Anthurium is the highest selling cut flower in the Hawaii floriculture industry. Standard colors in the market include red, orange, pink, white, and green. Development of novel color is important to remain competitive in the global market. One approach for the development of novel color is genetic modification of the anthurium color pathway with exogenous genes. However, anthurium is slow growing and the visualization of exogenous gene expression on spathe color takes several years from transfection to flowering. Alternatively, transient expression via agrobacterium infiltration is a rapid method to visualize the functionality of exogenous color genes introduced to the anthurium anthocyanin pathway. Detached spathes of anthurium 'New Era' were agroinfiltrated with structural gene F3'5'H, or the transcription factors Rosea1, or Delila, individually or as a combination of all three genes. Control plants were treated with only the infiltration buffer and no agrobacterium. Color change was observed at the sites of infiltration in spathes treated with Delila and the combination of F3'5'H, Rosea1, and Delila approximately 134 hours post treatment. Control spathes and spathes infiltrated only with F3'5'H or Rosea1 did not show any color change at the sites of infiltration. Additional experiments will examine the transient expression of paired combinations of F3'5'H, Rosea1, and Delila.

(103) Recruitment of West Nile Virus NS3 Helicase by NS2B to the ER-Associated Replication Organelles for Efficient Virus Replication. Tseng, A.*, James, N., Nerurkar, V.R. and Kaufusi, P.H. *Department of Molecular Biosciences and Bioengineering, Department of Tropical Medicine, Medical Microbiology and Pharmacology, Department of Cell and Molecular Biology, Pacific Center for Emerging Infectious Diseases, JABSOM.*

West Nile Virus (WNV) reorganizes the ER membranes of infected cells to create unique intracellular compartments known as replication organelles (RO). These RO comprise the viral non-structural (NS) proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, and NS5) for robust virus replication. NS3, a soluble viral protein localized in the cytoplasm, contains protease and helicase activities that are essential for virus replication. What is not clearly understood is how NS3 is recruited from the cytoplasm and stabilized in the RO. Studies have shown that NS2B, a membrane-associated viral protein, plays a central role in the functional activation of NS3. Therefore, the focus of our study is to examine the role of NS2B in the RO association of the NS3 protein. We analyzed the intracellular localization patterns of NS3 with or without NS2B in human epithelial cells, which mimics the initial target cells of WNV. Using high-resolution confocal microscopy, we demonstrated that NS3 localized exclusively at the ER when NS2B was provided in *cis* or *trans*, but showed diffuse cytoplasmic localization when it was expressed alone. Various biochemical assays also confirmed that NS3 was predominantly found in the ER fraction when NS2B was present. Using Förster resonance energy transfer combined with fluorescence lifetime imaging microscopy (FRET/FLIM), we were able to spatially resolve and quantify protein interaction between NS2B and NS3. Results from this study indicate that NS2B plays a direct role in recruiting NS3 to the RO. Future studies will examine virus-host protein interactions and evaluate inhibitors that disrupt the NS2B-NS3 complex as novel antiviral drugs.

(104) FDA food recalls- should you care? Vargas, A.G.M.* and Dobbs, J. *Department of Human Nutrition, Food and Animal Sciences.*

Food safety is important to both the consumer and the food industry. The Food and Drug Administration (FDA) is the governmental branch responsible for ensuring the safety of our nation's food supply. This includes harmful microorganisms, undeclared ingredients, metal toxins, and particle contamination. This study

evaluates FDA food recall data for food safety, including undeclared allergens. FDA Archive Data for Recalls, Market Withdrawals & Safety Alerts were downloaded for 2010 through 2017. Recalls were first categorized by drugs, medical supplies and devices, cosmetics, and food safety issues for foods and dietary supplements. There was a total of 3462 recalls, with 2500 relating to human foods (mean = 313 per year; range = 233 to 449 per year). Of the product recalls relating to human foods, more than 40% were related to two microorganisms, *Listeria monocytogenes* and *Salmonella*, closely followed by undeclared ingredients and allergens. The top 15 companies with the most food recalls represent 11.5% of all food recalls. Out of more than 1500 companies, one food market chain was responsible for over four percent, nearly three times that of the second most recalled company or market. The number of food recalls is small in comparison to the number of unique food products in the marketplace. These food recalls likely represent only a small fraction of the total food safety problems, many of which go unreported to health departments and FDA. Increasing consumer awareness of food recall frequency may encourage companies to find better ways to keep food safe and improve customer loyalty.

(105) Recombinant myostatin prodomain in treating Age-Associated Sarcopenia. Arthur Wong* and Yong Soo Kim. *Department of Molecular Biosciences and Bioengineering, Department of Human Nutrition, Food and Animal Sciences.*

With progressive age, the onset of muscle atrophy leads to decreased muscle mass. Muscle atrophy, such as sarcopenia, the degenerative loss of skeletal muscle mass and function due to aging, increases frailty of the elderly, inflicting a high economic healthcare burden. It was thus hypothesized that inhibition of myostatin (MSTN), a potent negative regulator of skeletal muscle growth, would be a potential new strategy to treat muscle atrophy. A study was designed to investigate whether an administration of anti-MSTN agent (recombinant MSTN prodomain, MSTNPro) will prevent or ameliorate muscle atrophy in a murine model. A truncated MSTNPro fused to murine the IgG Fc domain was created using a pMAL-c5x expression vector and expressed in *E. coli* as a maltose binding protein (MBP) fused protein (MBP-MSTNPro45-100-Fc). Affinity-purified MBP-MSTNPro45-100-Fc demonstrated its myostatin-inhibitory capacity in an *in vitro* reporter gene assay. C_2C_{12} cells, a myoblast cell line, were treated with the recombinant protein to evaluate its effects on proliferation and differentiation. Treatments with MBP-MSTNPro45-100-Fc significantly stimulated cell proliferation in a dose dependent manner. In differentiated C_2C_{12} cell cultures, MBP-MSTNPro45-100-Fc appeared to increase myotube formation, based on immunofluorescent staining for myosin heavy chain (MHC-green) and nuclear (DAPI-blue) with phase contrast microscopy. A study is underway to evaluate its effects on muscle mass in mice to provide insight to increase muscle mass and ameliorate muscle atrophy such as sarcopenia.

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(106) A life story of nitrogen in aquaponics for resource recovery: Insights from molecular perspectives. Wongkiew, S.* and Khanal, S.K. *Department of Molecular Biosciences and Bioengineering.*

Aquaponics can recycle nitrogen and produce organic food (fish and vegetables/fruits) with simultaneous treatment of nitrogen-rich aquaculture wastewater. Nitrogen recovery in aquaponics relies on the symbiotic relationships among bacteria, fish, and plants. However, unclear understanding of an ecology and nitrogen transformations in aquaponics at molecular scale limit aquaponic farmers to archive a high nitrogen recovery, resulting in low food productivity. In this study, we elucidated the nitrogen cycle in floating-raft aquaponic systems using several techniques, including nitrogen mass balance, natural abundance and enriched ^{15}N isotopes, quantitative polymerase chain reaction (qPCR), and high-throughput 16S rRNA gene sequencing. We found that nitrification and denitrification simultaneously occurred in the aquaponics. Aquaponics without the balance between fish feed and plants decreased nitrogen recovery efficiency, produced high nitrogen loss via denitrification under an anoxic condition, and increased an emission rate of nitrous oxide (N_2O), a potent greenhouse gas. Dissolved oxygen and pH were the critical factors to maintain efficient nitrification, resulting in excellent water quality for fish, plants, and bacteria. Interestingly, in plant roots, the abundances of essential nitrifiers (e.g., *Nitrospira* sp. and *amoA*) did not decrease under low pH levels, suggesting the benefit of plants in

aquaponics for improving nitrogen recovery. Here, our nitrogen cycle suggested strategies for farmers how to archive high productivity from aquaponic systems while reducing environmental problems and cost of operation.

(107) Identification of lncRNAs based biomarker using microarray and RNA-seq data for lung cancer. Tianying Zhao*, Vedbar Khadka, Youping Deng. *Department of Complementary and Integrative Medicine, Department of Molecular Biosciences and Bioengineering*.

RNA-Seq and microarray data have been extensively used to screen lncRNAs for diagnostic biomarkers in various cancer types. However, no researches thus far have used data from these two platforms together to validate each other. This study was designed to get biomarkers using RNA-Seq and microarray separately, then validate data from one with another platform.

Lung cancer datasets were obtained from GEO (n = 287) and TCGA (n = 216). Microarray datasets from the same platform were merged and batch effect were removed. Only common lncRNAs in TCGA, Affymetrix and Agilent microarray datasets were used. Differentially expressed lncRNAs in tumor with respect to normal were selected from Affymetrix and TCGA datasets. Then Weka feature selection correlation method was used to find top 20 lncRNAs in each Affymetrix and TCGA datasets for further analysis. Finally, Bayesian network classifier was used in top 20 Affymetrix lncRNAs and validated in TCGA and Agilent datasets. Similar procedure, except for using Voted Perceptron for classification, was applied in TCGA and validated in Affymetrix and Agilent datasets separately. LncRNAs with areas under the ROC greater than 0.8 were considered to be promising biomarkers and those were further used for function and prognostic analyses.

(108) Genetic variations and prenatal expression patterns of myostatin in sheep. Hua Yang* and Jinzeng Yang. *Department of Human Nutrition, Food and Animal Sciences, Institute of Animal Husbandry and Veterinary Medicine, Xinjiang Academy of Agricultural and Reclamation Science.*

Myostatin (MSTN) plays an inhibitory role in muscle mass. The *MSTN* allele in Texel sheep is characterized by a G to A transition in the 3'UTR that creates a target site for microRNAs-mir1 and mir206, which causes translational inhibition of the *MSTN* and results in muscular hypertrophy of Texel sheep. To identify genetic variation and expression patterns of *MSTN* in sheep, we performed PCR-RFLP (HpyCH4IV) of g+6723G-A SNP in *MSTN* according to sheep *MSTN* sequence (Accession number DQ530260.1). Developmental changes of *MSTN* expression in Chinese Merino fetus were detected by qPCR. G to A transitions in the 3'UTR of *MSTN* was not detected in several popular sheep breeds like Suffolk sheep etc. The qPCR analysis demonstrated the overall trend of the *MSTN* expression abundance was gradually decreased from 45d to 145d in lamb fetus. The results provide initial prenatal *MSTN* expression patterns for further study of its function and manipulations in sheep for enhanced growth performance. Dr. Hua Yang is a visiting scholar in Dr. Yang's laboratory in CTAHR.

(109) Increased levels of exhaled carbon monoxide (eCO) in asthma & COPD: an indicator for pulmonary function testing (PFT). Kim, J.E.*, Dobbs, J., Titchenal, C.A. *Department of Physiology, Department of Human Nutrition, Food and Animal Sciences.*

In addition to patient symptoms, it would help physicians to have a standardized indicator for ordering PFT. Exhaled carbon eCO increases in response to inflammation in the body and may serve as a first-line indicator of the need for PFT. The goal of this study was to compare eCO levels in asthmatic and COPD patients with normal healthy controls. Research participants with asthma and COPD (n=101) were recruited from patients scheduled for PFT at the Queen's Medical Center Pulmonary Lab along with a control group in normal health (n=20). eCO levels were measured with a portable carbon monoxide analyzer ("MicroCo Meter") following manufacturer directions. Diagnosis with asthma or COPD was based on patient medical records. Levels of eCO were greater in patients diagnosed with asthma or COPD than in those with normal health. The greatest median eCO levels were observed in asthmatics being treated with corticosteroids (females: n=9, eCO=17.5 ppm; males: n=8, eCO=18.5 ppm) and COPD patients on corticosteroids (females: n=6, eCO=14.0 ppm; males: n=5, eCO=13.0 ppm). Median eCO levels in other asthmatic and COPD patients were lower (asthmatic female: n=19, eCO=7.0 ppm; asthmatic males: n=19, eCO=8.0 ppm; COPD female: n=19, eCO=7.0 ppm; COPD males: n=16, eCO=8.0 ppm).

Normal subjects had the lowest median eCO levels (female: n=16, eCO=4.0 ppm; males n=4, eCO=5.5 ppm). These results indicate that eCO measurement could be a useful first-line diagnostic indicator of the need to conduct PFT. Additional research on the association with corticosteroid treatment and the diagnostic sensitivity and specificity eCO is warranted.

(110) Information Theory & Interference Alignment. Mirza Uzair Baig*, Anders Høst-Madsen and Aria Nosratinia. *Department of Electrical Engineering, Department of Electrical Engineering, University of Texas at Dallas.*
As the title suggests, in this work, we discuss the Shannon information measure and motivate why it is a good tool in benchmarking the optimum performance of information critical systems (for instance; communication over wireless medium). Then we briefly outline the setup and alignment techniques useful in studying interference limited networks (channels where interference is the bottleneck for information flow) which are different than a noise limited channel. Finally, we conclude by an overview of our recent results both analytical and numerical.

(111) Autonomous active needle insertion. Karimi, S.*, Konh, B. *Department of Mechanical Engineering.*
Guidance of active surgical needle via integrated robotic devices that are controlled autonomously, not only will lead to an effective and improved needle tip placement and precise drug delivery, but also will make many needle-based procedures operable at underdeveloped regions and war zone hospitals where not many experienced surgeons are available. The objective of this research is to develop a robotic system capable of autonomous steering of an active needle under electromagnetic (EM) tracking guidance towards stationary target in a tissue mimicking phantom while avoiding obstacles. Our unique contribution is on control and guidance of active surgical needle insertion during the surgery to eliminate the human error. To serve this purpose, an automated robotic system will utilize a fast sampling-based path planner to analyze, and periodically update a reasonable path toward the assigned target. A novel robust control algorithm is under development to generate the optimal needle trajectory towards the assigned target. The control algorithm calculates the required control signals for various system actuators based on the real-time feedback signal provided by the EM tracking system consisting of several sensors providing 3D position and orientation measurements at various needle locations. The needle insertion operation is facilitated by three discrete actuation modules; a linear motor providing 1D linear motion along the needle axis, a Shape Memory Alloy (SMA) wire actuator mounted along the needle bending the needle in one- direction, and a rotary motor which rotates the needle about its axis. The control software system, sends the actuation signals to the actuators guiding the active needle along the desired path, minimizing the tissue damage via rupture.

(112) Autonomous Intersection Control Formulation and Optimization enabled by Connected and Autonomous Vehicles. Zhenning Li* and Guohui Zhang. *Department of Civil and Environmental Engineering.*
Recent advances in Connected and Autonomous Vehicle (CAV) technologies open the door to highly efficient and safe traffic control system operations in the future. Autonomous vehicles can much more accurately judge distances and velocities, attentively monitor their surroundings, and react instantly to situations. Therefore, there is great potential to improve intersection control and arterial management efficiency and safety performance. A CAV-enabled Intersection Management Mechanism (CAV-IMM), is proposed in this study to formulate CAV trajectories and optimize directional traffic movement coordination through intersections safely and efficiently. A temporal-spatial dimension extension-based collision avoidance model is conducted through formulating all possible trajectories of CAVs within intersections in the temporal-spatial dimension, which provides a better means of utilizing intersection resources and increasing intersection operation efficiency. Based on vehicle trajectory formulation, the First Come First Served (FCFS) autonomous intersection control strategy is implemented. A series of parameters, such as time of arrivals, velocity of arrivals, vehicle characteristics, such as acceleration/deceleration capabilities, will be taken into account. In order to investigate traffic operation efficiency and safety performance at intersections under different control strategies, microscopic traffic simulation models is developed based on the standard simulation tool, VISSIM. The comparison between CAV-IMM system and traditional signal control system was

conducted for a four-leg intersection through VISSIM-based simulation. Simulation results indicate that the CAV-IMM system outperforms traditional signal control by significantly reducing total traffic delays

(113) Production and purification of nicotianamine using a recombinant enzyme from giant leucaena (*Leucaena leucocephala* subsp. *glabrata*). James Carrillo* and Dulal Borthakur. *Department of Molecular Biosciences and Bioengineering.*

Nicotianamine is a metal-chelating compound which is produced by all plants for transporting bivalent metal ions, such as Fe^{2+}, Zn^{2+}, Mg^{2+}, Cu^{2+} etc. These transition metals must form a chelation complex with nicotianamine to maintain solubility and a nonreactive state. Nicotianamine synthesis is known be upregulated under nutrient deficient growth conditions in many plants. The goal of this research was to study the relationship between nicotianamine synthesis with the amount of these metal ions in the foliage of giant leucaena. Nicotianamine is synthesized by trimerization of three molecules of S-adenosyl methionine by the enzyme nicotianamine synthase. The nicotianamine synthase cDNA was synthesized from mRNA isolated from giant leucaena (*Leucaena leucocephala* subsp. *glabrata*) and cloned into the T7-expression vector pET14b. It is hypothesized that the micronutrient contents of the foliage of giant leucaena, which is used as a high-protein legume fodder, is related to the expression levels of nicotianamine synthase. To determine the enzymatic properties of nicotianamine synthase from giant leucaena, it is necessary to purify the enzyme by heterologous expression in *Escherichia coli*. N-terminal histidine-tagged recombinant enzyme was expressed, purified under denaturing conditions and refolded by dialysis. The purified enzyme was used to produce nicotianamine from S-adenosylmethionine and the products were analyzed by high performance liquid chromatography. In vitro synthesis of nicotianamine using the recombinant enzyme from giant leucaena will allow greater availability of nicotianamine for further research. This research was supported by the USDA NIFA Hatch project HA05029-H, managed by CTAHR.

(114) Tolerance of Four Native Hawaiian *Peperomia* Species to Interior Lighting Conditions. Aleta K. Corpuz* and Orville C. Baldos. *Department of Tropical Plant and Soil Sciences.*

Hawaiian *Peperomia* species have high ornamental potential due to their compact growth and attractive foliage. To select potential species for indoor use, tolerance under low light conditions must be determined. In this study, survival of *P. cookiana, P. blanda, P. oahuensis* and *P. sandwicensis* to three indoor light regimes was determined. Prior to indoor evaluation, plants were potted in a 1:1 coir:cinder mix and grown under 70% shade with daily sprinkler irrigation. *P. blanda* were grown in 15.2 cm plastic pots while *P. cookiana, P. oahuensis*, and *P. sandwicensis* were grown in 7.6 cm plastic pots. Plants were transferred indoors (23.12°C and 54.79% RH) and grown for six months under three light levels: 1) window (4.20 $mol \cdot m^{-2} \cdot d^{-1}$); 2) 12-hour high fluorescent light mimicking office conditions (0.43 $mol \cdot m^{-2} \cdot d^{-1}$); and 3) 12-hour low fluorescent light (0.22 $mol \cdot m^{-2} \cdot d^{-1}$). Ten plants per species were grown in each treatment. Mortality was recorded daily and analyzed using Kaplan-Meier survival analysis and Fisher's Exact Tests. Results indicate that for most species, reducing the light levels increased mortality rates. In the window treatment, days (d) to 50% mortality for *P. oahuensis, P. blanda* and *P. cookiana* was observed after 120 d. In both fluorescent light treatments, 50% mortality of *P. oahuensis* and *P. cookiana* occurred within 60 d. For *P. blanda*, 50% mortality was observed at 43 d in the low light treatment and 118 d in the high light treatment. *P. sandwicensis* had the highest percent survival across treatments after 180 d. All plants survived in the high fluorescent treatment followed by 80% in the window treatment. The low fluorescent treatment exhibited 60% survival. Results indicate that *P. sandwicensis* can be potentially used as an indoor plant.

(115) Protein disulfide isomerase-9 mediates the development of healthy pollen under environmental stress. Feldeverd, Elizabeth* and Christopher, David A. *Department of Molecular Biosciences and Bioengineering.*

In healthy plant cells, the proper folding of newly synthesized proteins in the endoplasmic reticulum (ER) plays a crucial role in protein function. Protein disulfide isomerases (PDI) mediate correct protein folding by catalyzing the formation, breakage, and isomerization of disulfide bonds. In plants exposed to heat stress, unfolded and misfolded proteins

accumulate, hindering plant growth. A major heat-sensitive process is pollen development, leading to heat-induced sterility. Plants attempt to alleviate the stress by activating the "unfolded protein response" (UPR). UPR stimulates the expression of certain PDIs via specialized transcription factors, such as bZIP60. Two key PDIs activated during UPR are PDI9 and its homolog PDI10 in *Arabidopsis thaliana* plants. PDI9 and PDI10 localize to the ER and are highly expressed in pollen. IRE1 splices bZIP60 to its active transcription factor form, which then induces the UPR. Here, the role of PDI9 is characterized during the UPR stress response in *Arabidopsis*. The wild type response was compared to a double mutant in which both the PDI9 and PDI10 genes have been knocked out (pdi9-pdi10). Protein unfolding stress was chemically induced in 7-day-old wild type and pdi9-pdi10 double mutant seedlings. The mutant showed a significant increase in bZIP60 expression and in the accumulation of spliced bZIP60 mRNA. These results indicate that PDI9 modulates bZIP60-based splicing. Future experiments will study PDI9 interactions with other UPR proteins, and define a physiological phenotype. Understanding the molecular role of PDI9 in healthy pollen development will lead to strategies to sustain plant reproduction in the tropics during global warming.

(116) Use of comparative genomics tools to develop robust field-deployable and lab diagnostic tests for important plant pathogens, *Clavibacter michiganensis* ssp. and *C. michiganensis* ssp. *nebraskensis*. Larrea-Sarmiento, A.*, Alvarez, A. and Arif, M. *Department of Plant and Environmental Protection Sciences.*

Clavibacter michiganensis (*Cm*) subspecies are important gram-positive bacteria distributed worldwide and affecting a wide range of plant species, nine subspecies have been characterized leading to a specific host infection. In this study, we developed field-deployable and lab protocols based on multiplex recombinase polymerase amplification (RPA) and Taqman qPCR to specifically detect *Cm* and *C. michiganensis* ssp. *nebraskensis* (*Cmn*; pathogen of Goss's bacterial wilt and leaf blight of corn). The use of whole genome comparison and bioinformatics analyses provide capabilities to precisely select the unique gene regions to develop highly specific and sensitive diagnostic tools. Five complete genomes within the Cm subspecies were retrieved from NCBI GenBank genome database. Analyses and whole genome comparisons were performed using Geneious, Mauve and BRIG depicting the genomic rearrangements in both the core- and pan-genome regions. Two regions (one for *Cm* and other for *Cmn*) were selected to develop the robust diagnostic tools. Both developed multiplex TaqMan qPCR and multiplex RPA were validated against the members of inclusivity and exclusivity panels to confirm high specificity and broad range detection capabilities. No false positives and no false negatives were obtained. Both techniques resulted in an accurate and sensitive detection of *Cm* and *Cmn*. However, RPA showed high resistance against inhibitors and can be used to directly detect from infected plant tissues macerated in TE buffer. Developed tools have applications in routine diagnostics in laboratory and plant clinics, biosecurity, surveillance, disease epidemiology and management.

(117) Effects of Animal Behavior and Core-Body Temperature on Production Efficiency of Grass Finished Cattle. Oshiro, M.*, Thorne, M.S., Lee, C.N., Kim, Y.S., Fukumoto, G.K. *Department of Human Nutrition, Food and Animal Sciences.*

Energy requirements of the grazing animal are influenced by several factors such as increased foraging activity, frame size and physiological status, but is superseded by the requirement to maintain a homothermic balance. Therefore, we hypothesized that changes in grazing behavior activities would affect core-body temperature (CBT) and animal performance measures. A two-year study was conducted on 24 grass-finished cattle at the University of Hawaii, Mealani Agricultural Experiment Station. Animal behavior, CBT, weather variables, and forage quality were assessed during three daily observation periods over three seasons. Over all seasons, active grazing (63.0%), standing (15.6%) and laying while chewing (10.4%) were the predominant behaviors observed. Grazing activity across daily periods were highest during the AM period, a time when mean CBT (38.3±0.01°C) was lowest. The CBT varied for all animals across seasons and periods, and averaged 38.6 (±0.03) °C in 2013 and 38.4 (±0.04) °C in 2014. We did not find any significant relationship between CBT and grazing behavior. Forage quality varied seasonally, and were greatest in summer 2014 compared to the both fall seasons. Diurnal differences were observed in water-soluble

carbohydrate (WSC) and non-fiber carbohydrates (NFC), which were higher in the PM across all seasons. Average Daily Gain (ADG) was not significantly greater (P=0.78) between the years 2013 (0.87±0.04 kg/d) and 2014 (0.84±0.03 kg/d). Animals were slaughtered at approximately 21(± 0.15) months of age and an average live body weight of 527.1 (±8.98) kg in both years.

(118) RNA sequencing of the shell gland reveals novel genes related to calcium remodeling during eggshell formation in laying hens. Sah, N.*, Kuehu, D.L., Khadka, V.S., Jha, R., and Mishra, B. *Department of Human Nutrition, Food and Animal Sciences, Department of Molecular Biosciences and Bioengineering, Department of Complementary and Integrative Medicine.*

Over 10% of the eggs produced in poultry farms are lost due to soft-eggshell breakage which accounts for a huge economic loss to the egg industry, thus needs to be addressed. The oviductal shell gland of a laying hen provides the biological environment in the eggshell formation. Cellular processes and biological pathways involved in the eggshell formation are still not clearly understood. The purposes of this study were to 1) identify the novel differentially expressed genes and biological pathways in the shell gland (laying vs non-laying) involved in the eggshell formation, and 2) validate the novel genes in the laying (3h and 20h postovulation, n=5/group), non-laying (n=4) and molter hens (n=5). Total RNA was isolated from the shell gland of Hy-Line hens, and subjected to high-throughput sequencing on a NextSeq 500 sequencer. In the laying hens, 616 genes were differentially expressed (DE) of which 276 and 340 were up- and down-regulated, respectively. Highly up-regulated genes from the RNA-seq data were further validated using real-time PCR. Among the DE genes, Plasma membrane Ca^{2+} transporting 2 (calcium transporter), Otopetrin 2 (modulating the influx of calcium), Calciton (bone mineralization) and Stanniocalcin 2 (biomineralization) were highly expressed in the shell gland of layers at 20h post-ovulation (around egg shell formation). In conclusion, these novel genes from the egg shell gland may increase the bioavailability, mineralization and remodeling of calcium for the eggshell formation and can potentially be used to enhance the quality eggshell production traits in chickens, thereby reducing the loss.

(119) Small scale data, big picture extinction: Count-based population viability analysis as a tool for comparative extinction risk for rare Cyanea species in Kīpahulu Valley, Haleakalā National Park, Maui. Torigoe, S.*, Litton, C. *Department of Natural Resources and Environmental Management, Haleakalā National Park.*

Extinction threatens more than ten percent of plant species in Hawai‘i. Count-based population viability analysis, or diffusion analysis (DA), is an underutilized and robust tool for predicting population change and extinction risk based on count data (i.e., population densities). Managers of rare species face many conservation crises with very limited resources, and DA allows these managers to make informed, defensible decisions using routinely collected data.

Time-corrected count data for two endangered species (*Cyanea maritae* (CM) and *Cyanea copelandii* ssp*. haleakalensis* (CCH)) were used to parameterize DA analyses and construct loglinear cumulative distribution functions with projected risk of stochastic extinction for seven metapopulations of these species in Kīpahulu Valley, Haleakalā National Park, Maui. Two of four examined metapopulations of CCH had lower mu—the mean rate of population change—and thus relatively high risk of extinction at 100 years (96 and 98%, respectively, compared with 70% and 62%). In turn, one of three examined populations of CM had lower mu and 86% risk of extinction within 100 years, compared with 72% and 52%. High-risk populations can be prioritized for protection from invasive species, as well as ex-situ genetic banking.

Observer error and density dependence are potentially problematic sources of error associated with DA, and models should be contextualized with field knowledge. Nevertheless, comparative extinction risk can help inform conservation priorities with sparse data.

Funding provided by the Hau‘oli Mau Loa Foundation and the National Park Service.

(120) Soil macroinvertebrate responses to removal of feral pigs (*Sus scrofa*) across a 25-year chronosequence in tropical montane wet forests. Wehr, N.H.*, Lincoln, N.K., Hess, S.C., Litton, C.M. *Department of Natural Resources and Environmental Management, Department of Tropical Plant and Soil Sciences, U.S. Geological Survey Pacific Island Ecosystem Research Center.*

Nonnative feral pigs (*Sus scrofa*) are recognized throughout the Pacific Island Region as one of the most destructive, introduced ecosystem engineers present. Comparatively, nonnative soil macroinvertebrates, including earthworms, remain understudied as ecosystem engineers capable of invading and altering both the structure and function of native habitats. Of further importance, the ecological relationships between these nonnative organisms remain largely undescribed. This study analyzed the relationship between nonnative feral pigs and nonnative soil macroinvertebrates using paired sites inside and outside of five feral pig removal units representing a ~25 year highly constrained chronosequence in tropical montane wet forests on Hawai'i Island. The abundance and biomass of soil macroinvertebrates were sampled across all sites. In total, we found 13 distinct taxa representing 11 orders of soil macroinvertebrates. The removal of feral pigs reduced the abundance and biomass of earthworms, while other soil macroinvertebrate species were largely unaffected. These results suggest that a positive feedback loop (i.e., a facilitative relationship) exists between feral pigs and earthworms, in alignment with the 'invasional meltdown' hypothesis, which has important implications for managing nonnative feral pig and earthworm populations throughout the Pacific Islands.

(121) Chemical-binding properties of mimosine, a non-protein amino acid found in *Leucaena leucocephala*. Honda M.D.H.*, Jarrett J.T., and Borthakur D. *Department of Molecular Biosciences and Bioengineering, Department of Chemistry.*

The tree-legume *Leucaena leucocephala* contains a high concentration of the non-protein amino acid mimosine. Mimosine binds to pyridoxal-5' phosphate (PLP) and bivalent metallic ions such as Fe^{3+}, Fe^{2+}, Zn^{2+}, Cu^{2+}, Mn^{2+} and Co^{2+}, which are important plant-enzyme cofactors. Mimosine may serve as a phytosiderophore for chelating Fe^{3+} and other bivalent cations such as Zn^{2+}, Cu^{2+}, Mn^{2+} and Co^{2+} in the rhizosphere of leucaena. The binding properties of mimosine with various metallic ions have not yet been fully characterized. Therefore, the objectives of this research were to: (i) characterize the chemical-binding properties of mimosine with metal cofactors, and (ii) determine the mimosine content of leucaena under various environmental conditions. Using hydrogen nuclear magnetic resonance, the pKa of mimosine was estimated for the 4 potential acid donor groups of mimosine. Using UV-vis spectrophotometry, the iron-binding properties of mimosine have been partially characterized. The amount of mimosine produced by leucaena under varying concentrations of combined nitrogen, exposure to drought for different time period, at different age of the plant, and in different tissues of the plant have been determined. Detail characterization of metal-binding properties of mimosine and determining mimosine content in different parts of leucaena grown under normal and environmental stress conditions will help to understand the role of mimosine in leucaena and its rhizosphere. This research was supported by the USDA NIFA Hatch project HA05029-H, managed by CTAHR.

(122) Fuzzy Cognitive Maps as a tool for identifying knowledge gaps to design educational technology transfer activities for smallholder potato farmers in Guatemala. LaPorte, P.*, Chan-Dentonic, J., Chan, C., Sipes, B., Melakeberhan, H., Sanchez-Perez, A., and Mejía, A. *Department of Natural Resources and Environmental Management, Wageningen University and Research, Michigan State University, Universidad de San Carlos de Guatemala.*

Plant parasitic nematodes (PPN) cause potato yield and economic loss for smallholder potato farmers in the Western Highlands of Guatemala. Assessing farmers' understanding and perceptions of the impact of soil health on PPN populations and on potato yield is key to designing more effective technology transfer activities to increase adoption of integrated and scalable nematode-soil health management practices. We used fuzzy cognitive mapping to assess knowledge gaps on the impact of specific agronomic practices on outcomes. We conducted comparative analyses of maps of farmers and agricultural professionals by (1) identifying differences in the direction and weight of causal relationships; (2) analyzing the differences among the individual maps of farmers; and (3) evaluating relative changes of outcomes under "what if" scenarios for adopting each agronomic practice. Major differences exist between maps regarding effects of soil health and agronomic practices on PPN population and of compost and nematicide on soil health. These gaps in knowledge suggest more educational activities in order for farmers to adopt soil health management technologies and improve farm livelihoods.

(123) High rate anaerobic treatment of sulfate-laden industrial wastewater with simultaneous removal of hydrogen sulfide using biochar. Fernanda R. Oliveira* and Samir Khanal. *Department of Molecular Biosciences and Bioengineering.*

Anaerobic digestion is widely used in wastewater treatment to convert organic matter into biogas, a mixture of methane, carbon dioxide, and hydrogen sulfide (H_2S). Several industrial wastewaters such as those from pulp and paper, wine distilleries, molasses fermentation, potato-starch factory, oil refinery, pharmaceutical, and petro chemical have significant amounts of sulfate (1,000 mg/L – 15,000 mg/L) that is costly to treat and develop sulfide toxicity in the anaerobic process. This study compared the performance of three different reactors in terms of chemical oxygen demand removal, biogas production and stability against sulfide toxicity. The removal of H_2S from biogas using biochar columns integrated with each reactor treating sulfate-laden wastewater was investigated. Biochars were produced under different temperatures (550 and 800^{o}C) and feedstocks (softwood and hardwood). Adsorption capacity and the mechanisms of gaseous sulfide capture and its chemical form of retention in the biochar surface were also examined via a series of breakthrough studies and advanced analytical tools and techniques. Efficacy of biochar for H_2S removal depends largely on its surface physiochemical characteristics, such as surface area, micro-porosity, nutrients composition, and O-bearing surface functional groups, such as COOH, OH, and R-OH.

(124) Best termination methods of mustard (*Brassica juncea*) and oil radish (*Raphanus sativus*) cover crops for nematode management. Waisen, P.*, Wang, K.-H, Cheng, Z., Sipes, B. *Department of Plant and Environmental Protection Sciences.*

Brassica cover crops biosynthesize glucosinolates which upon tissue damage produce iso-thiocyanates (ITC) and sulfate among other products. Mustard (MS) and oil radish (OR) are known to produce biofumigants against plant-parasitic nematodes (PPNs). Objectives of this study were to determine best termination methods of MS and OR to maximize biofumigation effect while enhancing soil health. Three field experiments were conducted at Poamoho Experiment Station. Results from the first experiment determined that terminating OR at 4 weeks after seeding reduced root-gall index value caused by root-knot nematodes (*Meloidogyne* spp.) on pumpkin ($P \leq 0.05$). Second experiment examined the biofumigation potentials of MS and OR in no-till (NT), macerated and tilled (MT), or macerated and tilled followed by covering with black plastic (BP), compared to bare ground (BG). MSBP suppressed root-knot nematodes by 63.7%, while MSBP and ORBP suppressed reniform nematodes by 52.7% and 39.4%, respectively ($P \leq 0.05$). However, when using bacterial-feeding nematodes as soil health indicator, ORBP improved soil health better than MSBP ($P \leq 0.05$). In the third experiment, individual MS termination methods of macerated (M), tilled (T) and covered with BP were compared to their combined treatments, MTBP. Using sulfate as an indirect measure of ITC, MTBP showed a synergistic effect in biofumigation, with a higher concentration of sulfate than all the other MS termination methods ($P \leq 0.01$). Future experiments could examine mix cover cropping of OR and MS for 4 weeks with termination by MTBP method to maximize biofumigation effect, while improving soil health.

(125) Differential effects of lignin chemistry on conversion. Wells, J.*, Crow, S., Khanal, S., Turn, S., Hashimoto A. *Department of Natural Resources and Environmental Management, Department of Molecular Biosciences and Bioengineering, Hawai'i Natural Energy Institute.*

Global interest in renewable fuels is rapidly growing as the need for local and sustainable energy increases. In Hawai'i, local energy growth and creating new energy sources, specifically liquid fuels, are of high priority. To this end, the structural properties of 12 potential biomass feedstock grasses were investigated to facilitate feedstock crop choice for two bioenergy conversion pathways: 1) anaerobic digestion (AD), and 2) hot water pretreatment followed by enzyme hydrolysis (HWP). Copper oxide oxidation and extraction was used to investigate lignin structural chemistry as a predictor of crop conversion efficiency through each pathway, with conversion conducted at bench scale. The conversion efficiency of AD was best predicted by a ratio of lignin with aldehyde side chains compared to acid and ketone side chains. In contrast, HWP results were best predicted by a ratio of cinnamyl and syringyl lignin compared to vanillyl lignin. After AD, there was a difference of ~2% total biomass loss that can be explained

by lignin chemistry, where as in HWP, there was a difference of ~5% extracted sugar explained by lignin chemistry. These results indicate that specific lignin chemistry can impact conversion efficiency and that AD and HWP conversions are controlled by different subsets of lignophenols. Instead of simply using total lignin for crop screening, lignin chemistry should also be considered before crops and conversion pathways are chosen and scaled. Selecting more readily convertible crops, with favorable lignin chemistry, could lead to an improvement of conversion efficiency by 2-5% and may prove to be a simple and effective way to select and screen feedstocks to improve the outlook of bioenergy production in the state.

(126) Withdrawn

(127) Management of the Invasive Brazilian Peppertree (*Schinus terebinthifolius*) in Hawai'i. Au, M.*, Ramadan, M., Wang, K-H. *Hawaii Department of Agriculture, Department of Plant and Environmental Protection Sciences.*
Brazilian peppertree or Christmasberry (*Schinus terebinthifolius*) is a noxious, invasive weed throughout the state of Hawai'i. The overall goal of this project is to reduce population densities of *S. terebinthifolius* in Hawai'i in order to restore the state's native species and biodiversity. *Megastigmus transvaalensis* is a seed-feeding, chalcid parasitoid wasp that was accidently introduced into Hawai'i through commercial pink peppercorn shipments. It is a major biocontrol agent proof to be effective in reducing population densities of *S. terebinthifolius* in other parts of the world. However, current distributions of this parasitoid are not mitigating the widespread growth of *S. terebinthifolius* in Hawaii. This study, through the Hawaii Department of Agriculture, conducts field surveys of the *M. transvaalensis* to determine its distribution and numbers across the state. Specific objectives include: 1) examine the natural distribution and parasitism rates of *M. transvaalensis* on Brazilian peppertrees on O'ahu, 2) developmental stage preference of *S. terebinthifolius* fruit for infection, and 3) identify other natural enemies infesting *S. terebinthifolius* on O'ahu. Field surveys from twelve locations across O'ahu were conducted during the fruiting season from August to December 2016. Approximately 500 - 1,000 ripe or unripe drupes were collected and analyzed for parasitism rates. A higher parasitism rate was found in the ripe than the unripe drupes (P<0.05). The highest rate of parasitism occurred in the Mānoa and Schofield area. Parasitism of unripe drupes indicated that the *M. transvaalensis* infected the fruit when they were green and developed as the fruit ripens. This survey also revealed two other parasitoids present on *S. terebinthifolius* trees.

(128) Quantification of total phenolics in *Bidens* to estimate antioxidative capability. Barone, R.P.*, Keeley, S.C., Owens, D.K. *Department of Molecular Biosciences and Bioengineering, Department of Botany.*
Hawaii is an amicable tropical environment where plants can develop without the occurrence of frost and/or other common winter threats. This mild environment has led to increased competition for water, nutrients, and other sources of nourishment as various plant species are capable of essentially year-round growth, which has further caused each individual species to develop a unique array of phytochemicals, such as phenolics, as they attempt to increase their fitness in a state of continual "chemical warfare" in competition for limited resources. Members of the genus *Bidens* are an interesting example of endemic Hawaiian plant life that have been commonly utilized in traditional medicine across the tropics and subtropics due to their antibacterial, antifungal, and antioxidant capabilities. In Hawai'i alone, there are 19 endemic species of *Bidens* distributed across all of the main islands which have been used in the practice of lā'au lapa'au (Hawaiian herbal medicine) to treat a variety of health conditions. In this study, the phenolic content of two *Bidens* species were analyzed to estimate antioxidative capability. Plants were collected from multiple sites on O'ahu and voucher specimens submitted to the Joseph F. Rock Herbarium. Leaf, stem, and root tissues were dried to common mass and extracted with 7:3 acetone/water. The purified extracts were measured spectrophotometrically to quantify phenolic content and values converted to the commonly used gallic acid equivalents (mg g^{-1} dry weight). The findings of this study further our understanding of the capability of *Bidens* species to combat oxidative stress.

(129) Nutritional Analyses of Endemic Hawaiian Fruit for Wild Foraging 'Alalā (*Corvus hawaiiensis*). Katherine Hiu*, Becky Ostertag, Bryce Masuda, James Sheppard, Jonathan Price. *Department of Natural Resources and Environmental Management,*

Department of Biology, UH-Hilo, Hawai'i Endangered Bird Conservation Program, San Diego Zoo Global, Department of Geography, UH-Hilo.
Suitable foraging resources are an essential characteristic of a reintroduction site. For the ʻAlalā (*Corvus hawaiiensis*), a critically endangered Hawaiian corvid, these food resources include endemic fruits. We examined the nutritional composition of five endemic Hawaiian fruit types that are relatively common in the wild and consumed by the ʻAlalā: ʻōhelo ʻai (*Vaccinium reticulatum*), ʻōhelo kau lāʻau (*Vaccinium* calycinum), pūkiawe (*Leptecophylla tameiameiae*), pilo (*Coprosma* spp.), and ʻōlapa (*Cheirodendron trigynum*), to better understand the food resources and nutritional potential for wild foraging ʻAlalā. Due to the sensitivity of the release site, the fruit samples were collected at a nearby location with similar elevation, rainfall, and substrate age. Using a Costech Elemental Analyzer (CEA) 4010, we found ʻōlapa to contain the highest percentage of carbon, while pilo was found to have the highest percentage of nitrogen. Our near infrared spectroscopy machine (NIRS) analysis found that ʻōlapa was highest of all fruit types in total nitrogen and lowest in simple sugars. We found that ʻōhelo ʻai was low in total nitrogen and high in simple sugars. Interestingly, the results suggest a possible tradeoff between nitrogen and sugar in fruit types. This research will provide valuable information about habitat quality for future reintroduction efforts. Thank you to our contributors, Pacific Internship Programs for Exploring Science (PIPES), National Science Foundation (NSF), and Hauʻoli Mau Loa Foundation.

(130) Tuning cellular photoprotection to improve algal productivity. Kajihara, L.* and Su, W.W. *Department of Molecular Biosciences and Bioengineering.*
The light-harvesting systems of green microalgae include three stress related genes (*lhcsr1*, *lhcsr3.1* and *lhcsr3.2*) that catalyze the rapidly reversible component (qE) of non-photochemical quenching (NPQ), a response to dissipate excess light energy in the form of heat. In the *npq4* mutant of *Chlamydomonas reinhardtii*, *lhcsr3.1* and *lhcsr3.2* are silenced, which leads to attenuated NPQ. Traditional algal cultures suffer from low biomass concentration, which complicates economical large-scale cultivation. This study, funded by the University's Undergraduate Research Opportunities Program, aimed to evaluate potential benefits of attenuated NPQ on algal biomass production under different light intensities and in suspended versus immobilized cultures. Our hypothesis is that under low to moderate light stress, algae with attenuated NPQ may conserve cellular energy that is otherwise devoted to NPQ and use it toward building more biomass. *C. reinhardtii* wild type (wt) and *npq4* strains were grown in suspension cultures and in alginate beads to simulate immobilized growth. Cultures were grown for four days under a range of full spectrum light intensities at constant illumination and cycled light. Student's t-Test was used to identify differences of statistical significance between biomass productions of the two algal strains under different treatments. Initial results showed that under high light stress, wt and *npq4* growth was inhibited in both culture methods. Under moderate light stress, the *npq4* mutant had significantly greater cell concentrations in suspension cultures. These findings mostly support our initial hypothesis and point toward the tuning of cellular NPQ as a potential strategy for increasing algal biomass production.

(131) Detection of Tobacco Streak Virus and Molecular Characterization of Novel a Tobamovirus in Sunn Hemp, *Crotalaria juncea*, Expressing Virus-Like Symptoms. Kong, A.*, Arakaki, A., Long, M., and Melzer, M. *Department of Molecular Biosciences and Bioengineering, Department of Plant and Environmental Protection Sciences, Department of Tropical Plant and Soil Sciences.*
Sunn hemp (*Crotalaria juncea*) is a leguminous cover crop valued for its ability to rapidly accumulate biomass and fix nitrogen into the soil. It can be grown for use as either a green manure to improve soil quality or as surface mulch for weed suppression. In October 2016, farmers on Molokai noticed symptoms of leaf mosaic, reduced seed pod numbers, and a reduction in the number of seeds per pod in their sunn hemp crop. The purpose of this research was to identify the pathogen(s) responsible for the observed symptoms. Although these symptoms are indicative of *Sunn hemp mosaic virus* (SHMV) infection, next generation sequencing of a dsRNA-based library revealed the presence of *Tobacco streak virus* (TSV) and a novel tobamovirus. The presence of TSV was confirmed by a serological assay, and represents the first discovery of this virus in Hawaii. The genomic sequence of the new tobamovirus shared less than 80% identity to the SHMV genome, indicating it is a distinct species

closely related to SHMV. The presence of TSV and the novel tobamovirus is a serious concern to the sunn hemp industry on Molokai. Studies are underway to better understand the spread and impact of these pathogens in sunn hemp.

(132) Distribution, Impacts, Biotypes, and Viral Biocontrol Status of Coconut Rhinoceros Beetle in Palau. Masang, N.*, Adams, B., Kong, A., Watanabe, S., Kitalong, C., Miles, J., and Melzer, M. *Department of Plant and Environmental Protection Sciences, Palau Community College, Ministry of Natural Resources, Environment & Tourism, Republic of Palau.*

The coconut rhinoceros beetle (CRB) is native to Southeast Asia and has spread to parts of the Pacific where they are a major pest to coconut palms. Currently the most known effective biocontrol is *Oryctes rhinoceros nudivirus* (OrNV), which was purposefully introduced to Palau in the 1970s. A new CRB genotype, CRB-G, which appears resistant to OrNV, has since been detected in Palau. In this study we have conducted a large-scale survey in Palau to understand the impact of CRB-G and OrNV by assessment of coconut palm tree damage. We selected 50 sites across the main islands of Palau, Koror and Babeldaob, and the isolated islands of Peleliu, Angaur, Kayangel and Sonsorol for this study. In each site, CRB specimens were collected on-site or via panel traps. DNA was extracted from the leg of the each CRB and used as template in PCR to test for the presence of OrNV. The CRB genotype was determined by a restriction fragment length polymorphism assay using the CRB cytochrome oxidase I gene. The palm tree damage assessment was performed at each site with at least 25 trees in the summer of 2016 from June through August. Total of 1500 palm trees were assessed during this study. We found that nearly all trees showed minimal damage that would not affect coconut yield. OrNV was detected in CRB specimens from all locations. Interestingly, the virus was found in several specimens of CRB-G, which is supposedly resistant to infection.

(133) Analyzation of phenolic and antimicrobial functionality in byproducts of Hawai‘i coffee cherries for potential upscaling. Pereira, G.*, Liu, X., Nakamoto, S., Li, Y. *Department of Human Nutrition, Food and Animal Sciences.*

Coffee is considered to be one of the largest profit producing crops for the agricultural economy of Hawai‘i. Yet roughly only half of the valued product is fully utilized for commercialization. Recent outbreaks of coffee borer have had a significant impact on Hawai‘i coffee industry, with many berries being discarded due to infestation. While coffee husk and pulp formulate to approximately 45% of the berry composition, they are regarded as a waste product during coffee bean processing. The long term goal of this project was to analyze the berry to find value in the waste, therefore using the fruit to its full potential. This study focused to extract and quantify bioactive compounds and evaluate the antimicrobial potential of phenolic compounds in coffee berry extracts. Coffee berry husks were separated from the bean, freeze dried and grounded into powder. The powder was infused with a methanol/water mixture overnight to get a crude extract (F0). Sep-Pak cartridge was used to separate F0 into three fractions, including sugar plus organic acids (F1), monomeric phenolics (F2), and anthocyanins (F3). The concentrations of phenolic compounds and anthocyanins in the fractions were determined. Each fraction was evaluated against a pathogenic bacterial strain *Staphylococcus aureus* via the agar well diffusion assay. The concentration of anthocyanins in F0 and F3 was 69.2 mg/L and 48.4 mg/L, respectively. Higher total phenolic content was observed in F0 at 21.51 mg/mL. F0 and F3 showed large zones of inhibition, both at 13 mm, against *S. aureus*. These results suggest that the waste product of coffee bean processing contains phenolic compounds and anthocyanins, which could be reused as a health promoting product.

(134) Survey of Disease, Management and Biosecurity Practices of Hawai‘i Swine Farmers. Castle, B.A.*, Odani, J., Jha R., Ogasawara, N., Zaleski, H.M. *Department of Human Nutrition, Food and Animal Sciences, Ross University Veterinary Medicine.*

Although swine diseases and parasites cause significant losses to producers in Hawai‘i, limited information is available on changing disease patterns and related farm practices. Serological samples from Hawai‘i swine farms were tested for antibodies against Porcine Circovirus Type 2b (PCV; 97% positive), Senecavirus (SVA; 50%), Porcine Epidemic Diarrhea (PED; 27%) and Porcine Reproductive and Respiratory Syndrome (PRRS; 11%). Coccidia oocysts (54%) were detected on every island, and *Ascaris suum* (15%), *Oesophogostomum*

dentatum (15%), *Metastrongylus* spp. (4%), *Trichuris suis* (4%), and *Stephanurus dentatus* (4%) ova were detected on O'ahu, Molokai, and Hawai'i farms. In addition, a management and biosecurity practices survey was administered to farmers (n=20). Survey questions were analyzed by region, sow population, and disease presence using agglomerative hierarchal clustering. Most common practices include cooking food waste (93% of farmers feeding food waste), administering an anthelmintic (75%), and feral pig exclusion (60%). The average number of piglets born (p=0.014) and number weaned (p=0.052) per litter has increased since 1996, while preweaning mortality is similar. Analysis indicates that disease prevalence is related to the movement of pigs both on-island and between islands, as Kaua'i, which is protected by quarantine, remains negative for PRRS and PED, and Molokai is negative for PRRS, PED, and SVA. Geographical differences in disease distribution make targeted biosecurity practices and informed decision-making possible. A clear picture of these patterns will aid in management and vaccination recommendations to better target diseases and minimize the use of antibiotics.

(135) Removal of *Escherichia coli* K12 from contaminated tap water using a single-stage dielectrophoresis (DEP) device filled with glass beads. Chun, C.* and Jun, S. *Department of Human Nutrition, Food and Animal Sciences.*

Conventional water treatment methods, such as filtration and disinfection, require the addition of physical or chemical disinfectants and are prone to fouling. An electrostatic phenomenon known as dielectrophoresis (DEP) offers an alternative to traditional water filtration technology. DEP is the lateral movement of bioparticles experiencing a dipole moment under the influence of applied, non-uniform electric fields. Target cells within a solution can be polarized towards a specific field gradient when exposed to electric fields of different magnitudes. In this study, a single-stage, continuous flow, millimeter-sized DEP device was designed and fabricated to remove *Escherichia coli* K12 from contaminated tap water. The device utilized titanium electrodes and was constructed out of polydimethylsiloxane (PDMS), with glass beads packed inside the channel. Glass beads were used to alter the electric field distribution and create many areas of high electric field influence for the trapping of bacterial cells on its surface. A frequency generator paired with an amplifier regulated the frequency and voltage applied to the electrodes, and a syringe pump controlled the flow of the sample into the device. The effect of varied voltages, flow rates, and frequencies on the separation efficiency was studied. The highest percent reduction of *E. coli* K12 was 99% with the device set at 60 V and 100 kHz, along with a flow rate of 0.1 mL/min. Higher applied voltages and slower flow rates seemed to lead to an increased reduction of the bacteria. An optimized macro-scale system, with multiple stages of DEP, could potentially be created for commercial use as a novel method of removing pathogens from polluted tap water.

(136) Surface applied or incorporated? Does compost and biochar placement affect plant growth and soil fertility? Cox, J.*, Hue, N., Ahmad, A., Kobayashi, K. *Department of Tropical Plant and Soil Sciences.*

Soil amendments such as compost and biochar can provide additional nutrients, increase soil water holding capacity and add beneficial microorganisms. Biochar has provided crop and soil improvements worldwide, but has mostly been incorporated into the soil. Farmers with tree crops are limited to surface application, but it is unknown whether the benefits transfer down through the soil profile. This study aims to compare compost and biochar applied on the surface, or incorporated to 10cm depth, using Oxisol and Andisol soils, and Chinese cabbage and papaya. An experiment was conducted in a glasshouse with each amendment applied at 4% by volume, either on the soil surface or mixed in the top 10cm of a 20cm deep pot, plus a control. Cabbage and papaya plant height and leaf relative chlorophyll content (estimate of leaf N) were measured weekly. Cabbages were harvested at 8 weeks and oven dried. Cabbage dry weight for the incorporated amendments overall was significantly higher ($p<0.01$) than the control by 19%, and by 14% for the surface application. In the Andisol there was no difference in cabbage dry weight between surface and incorporated amendments, but in the Oxisol the cabbage dry weight was significantly higher in the incorporated compared to surface and control. The root biomass in the Andisol was located throughout the 20 cm for the incorporated treatment, but in the top 10 cm for the surface applied. In the Oxisol however, both treatments showed root biomass higher in the 10-20 cm layer. Papayas were significantly

($p<0.05$) taller in both amended treatments than the control for the Andisol, but not for the Oxisol. Therefore, in some soil types, the application of these amendments to the soil surface will provide similar benefits to incorporating them.

(137) Identification and Characterization of Simple Sequence Repeats in Protein-coding genes of *Acacia koa*. Christopher I. Nakano*, Michael D.H. Honda, Kazue L. Ishihara, and Dulal Borthakur. *Department of Molecular Biosciences and Bioengineering.*

Acacia koa is an important timber wood tree endemic to the Hawaiian Islands. The goal of this project was to identify and characterize *A. koa* genes that contain simple sequence repeats (SSRs) within protein coding sequence. Previous studies identified SSRs from only genomic DNA of *A. koa.* Identification of SSRs within coding sequences (SSR-CS) will allow for their use in phylogenetic analysis or as genetic markers in *A. koa* improvement programs. *A. koa* transcriptome data consisting of 200,000 gene sequences were analyzed for the presence of SSR-CSs from 2 to 12 base pairs (bp) in length, with each SSR-CS being repeated 2 to 12 times. In this way, 3,140,115 potential SSR-CSs were identified. Further analyses focused on 1,080 SSR-CSs with the lengths of 12, 11, 10, and 9 nucleotides, each repeated twice. Among these, the gene sequences that were >500 bp and contained an open reading frame were selected for further investigation. Sixty gene sequences have been identified so far that satisfy these criteria. Upon detailed analysis of these 60 gene sequences and the proteins they coded for, 37 gene sequences were identified to encode proteins related to plant defense and survival. These 37 genes were then separated into two categories, based on the functional and structural characteristics of their translated proteins. Amplification of these candidate SSR-CS markers may be useful as a tool for identifying *A. koa* families at an early stage of growth in breeding studies. This work was supported by the USDA NIFA McIntire-Stennis project HAW00597-M, managed by CTAHR.

(138) Molecular characterization of Ti ringspot-associated virus through next generation sequencing and bioinformatic tools. Olmedo-Velarde, A.*, Park, A., Melzer, M. *Department of Plant and Environmental Protection Sciences.*

Ti ringspot disease (TRD) is an emergent disease affecting ti plants (*Cordyline fruticosa* L.) that is spreading throughout Hawaii, and is characterized by the presence of chlorotic circular lesions in the leaves that can turn into amorphous ringspots. Recently, it was shown that TRD is associated with infection by Ti ringspot-associated virus (TiRaV), a virus with similarities to members of the genus *Emaravirus*. The aim of this project was to sequence the genome of TiRaV using next generation sequencing and bioinformatic analyses. Doubled-stranded RNA, a hallmark of infections by RNA viruses, was extracted from symptomatic tissue collected at the UH Manoa campus. Reverse transcriptase (RT)-PCR was performed using a terminal primer targeting a conserved region of the 5` and 3` ends of all known emaraviruses. Amplicons were sequenced using an Illumina MiSeq platform. Over 2.4 million paired-end reads were *de novo* assembled using Trinity after quality control with FastQC and Trimmomatic. A total of 1952 contigs were subjected to BLASTx searching using the viral database in GenBank. Five segments coding for the four characteristic core proteins of emaraviruses (polymerase, glycoprotein, coat protein and movement protein), and an additional hypothetical protein of the TiRaV genome were completed. Phylogenetic analyses placed TiRaV in a clade with members of the genus *Emaravirus*, clearly indicating it represents a novel member of this virus genus.

(139) Managing invasive macroalgae in Paikō Lagoon State Wildlife Sanctuary: A partnership with the state of Hawai‘i and the Maunalua community. Payne, C.E.*, Oleson, K.L.L. *Division of Forestry and Wildlife, Department of Natural Resources and Environmental Management.*

Invasive macroalgae negatively affects marine areas by monopolizing space, altering geochemistry, and changing food webs. Hawaii's Division of Forestry and Wildlife (DOFAW) seeks to establish an official protocol for managing invasive macroalgae in Paikō Lagoon State Wildlife Sanctuary as part of their larger efforts to manage sites throughout O‘ahu. This capstone project developed a long-term, volunteer-based invasive macroalgae removal and monitoring program as a practical solution for the DOFAW staff. I developed removal protocols based on an understanding of the macroalgae biology, lessons learned from past efforts, removal practices outlined in the current literature, and observations of other group's

removal process. I developed monitoring protocols guided by the work of Lindenmayer and Likens to measure long-term macroalgae conditions. Final protocols include groups of four volunteers using quadrats, five-gallon buckets, and hand nets to remove only invasive macroalgae in set transects and subsections. A pilot, nine-month monitoring period revealed significant decline in average percent cover in the transect with the most removal events (77% (95% CI [±18.27]) to 31% (95% CI [±16.53])). The benefits of these protocols include reduction of invasive macroalgae, deployment using minimum budget and staff resources, and community engagement in natural resource management and ecological field methods.

(140) Development of a sensitive single-tube nested PCR assay for rapid detection of *Campylobacter jejuni* in ground chicken. Wu, B.Y.* and Li, Y. *Department of Human Nutrition, Food and Animal Sciences.*

Campylobacter jejuni is a leading cause of foodborne disease and accounts for approximately 1.3 million illnesses each year in the United States. Outbreaks of *C. jejuni* are usually associated with contaminated raw milk and undercooked chicken. Single-tube nested polymerase chain reaction (PCR), in which products of the primary amplification reaction are used as templates in the second round of PCR, can improve the sensitivity and specificity of the reaction and prevent cross contamination of template DNA. This study aimed to develop a sensitive single-tube nested PCR assay for rapid detection of *C. jejuni* in chicken. Both outer and inner primer sets were designed based on the hippuricase gene (*hipO*) of *C. jejuni*. The two primer set concentrations and PCR annealing temperatures were optimized. The established assay was tested with DNA extracted from *C. jejuni*, *C. coli*, *C. lari*, and seven non-*Campylobacter* bacterial species. Serial dilutions of *C. jejuni* DNA and cells in inoculated ground chicken homogenate were used as templates to investigate its sensitivity compared to PCR based on inner primers. Results showed the optimal concentration and annealing temperature were 0.1 pmol for outer primers at 65℃ and 40 pmol for inner primers at 55℃. The single-tube nested PCR assay only generated amplicons from *C. jejuni*. The detection limit of this assay was determined to be single copies of target DNA extracted from the pure culture and 10 CFU/ml of *C. jejuni* in ground chicken homogenate, which was about 100 fold lower than that of PCR based on inner primers. This single-tube nested PCR assay would enable more sensitive detection of *C. jejuni* within shorter time and thus enhance the safety of the nation's food supply.

(141) Protecting Tree Species: Identification of pathogenic fungi from *Acacia koa* in Hawaii. Yoo, Y.H.* and Uchida, J. *Department of Plant and Environmental Protection Sciences.*

Acacia koa is endemic and one of popular trees in Hawaiian Islands, called koa. A number of diseases of koa are caused by pathogenic fungi. Especially, wilt disease of koa can cause by fungal pathogen such as *Fusarium oxysporum* that can causes high rates of mortality koa in Hawai'i. This study focused to compare koa seeds A and B that inoculated with two different Fusarium species which were *Fusarium oxysporum* and *Fusarium solani*. During 9 weeks, the growth rate was monitored so which *Fusarium* sp. is the most infected to koa.

Based on the results of this study, *F. oxysporum* affected the growth rate of koa that showed 20 % of fatality of koa seeds both A and B. The first symptom of koa wilt showed from 4 weeks and eventually died koa after 5 weeks. Otherwise, *F. solani* showed that they were not affect to the growth rate of koa seeds both A and B, and it seems to indicate that *F. solani* could be not pathogenic fungus to koa. Previous researches already proved showed the diversity in *F. oxysporum* identified from diseased koa, however, further research of the effects of other *Fusarium* sp. for koa seriously required.

(142) *Artocarpus altilis*, the 'ulu' breadfruit, journeys thousands of miles and thousands of years to a pint glass near you – an ancient food crop resurfaces as beer of the future. Arios, J.P., Barlett, B., Bottema, M., Buchanan, J., Carlson, B., Doherty, J.*, Gong, T., Saxby, S., Sinclair, N., Zhao, T,. Bingham, J.P. *Department of Molecular Biosciences and Bioengineering.*

The ancient food crop plant, *Artocarpus altilis* (the breadfruit), is a valuable and underutilized source of nutrient dense starch. As a high-yield perennial, breadfruit represents a sustainable supplement to an increasing global demand for agricultural yield. In this project, we explore this versatile food crop as a wheat alternative for brewing beer.

This project highlights Polynesian and Hawaiian agricultural history and underscores the current relevance and value of an oft overlooked food crop. To demonstrate the versatile nature of

breadfruit, we propose brewing a novel beer from the starchy pulp of *Artocarpus altilis*. The aims of the project are three-fold:
1) Demonstrate the importance of *Artocarpus altilis* as a high-yield cereal alternative
2) Create a desirable, profitable product with cultural significance
3) Raise funds for education through the medium of a student-run, University-backed company
Successful completion of the project will likely garner positive attention and attract future funding, thus elevating the status of this symbolic plant. The project could continue indefinitely as a working model of University-backed business that operates as a for-profit but allocates and reinvests resources as a non-profit.

(143) Engineering basil plants for resistance against downy mildew. Navet, N.*, Shao, D., Dose, H., Tian, M. *Department of Plant and Environmental Protection Sciences.*
Basil is an important herb crop recognized for use in medicines, cosmetics and culinary. Its production has been impaired by downy mildew disease caused by *Peronospora belbahrii*, a destructive obligate biotrophic oomycete pathogen. Because disease resistance is lacking in popular sweet basil varieties and traditional breeding suffers various barriers, generating disease resistant plants via biotechnology promises to broaden resistance sources and speed up the breeding process. Three strategies, including host-induced gene silencing (HIGS) of potential pathogen virulence genes, overexpression of basil defense genes and CRISPR/Cas9 mediated gene editing of basil genes involved in disease susceptibility, are being employed. Four candidate genes, *P. belbahrii PbEC1* & *PbORCE1*, basil *Lectin1* and *DMR1* have been selected as targets of HIGS, overexpression and gene editing respectively. *PbEC1* and *PbORCE1* are candidate RxLR effector genes highly induced during infection, with PbORCE1 highly conserved in all plant pathogenic oomycetes. Plant lectins are potent immunomodulatory receptors believed to play key roles in plant immunity. *Lectin1* is present and highly induced during infection in a resistant cultivar BA107, but absent in the susceptible line Dolly, suggesting its role in mediating basil downy mildew resistance. The basil homolog of *Arabidopsis* DMR1 (Downy Mildew Resistant 1) gene, knockout of which enhances *Arabidopsis* resistance against its downy mildew pathogen *Hyaloperonospora arabidopsidis*, is potentially involved in basil downy mildew disease development. Suitable constructs were made and used to transform sweet basil Genovese via *Agrobacterium*-mediated transformation. Transgenic plants have been generated and are being subjected to analyses. The completion of this project will not only generate disease resistant plants, but also help dissect the molecular basis of basil-*P. belbahrii* interactions.

(144) Microaeration in anaerobic digester: A unique approach to improve stability and performance of the renewable energy production. Duc Nguyen* and Samir K. Khanal. *Department of Molecular Biosciences and Bioengineering.*
Anaerobic digestion (AD) technology shows an immense potential for recovering renewable energy from organic waste streams. However, the AD process is susceptible to process failure due to the accumulation of volatile fatty acids (VFA). In this research, a novel microaeration system controlled by oxidation-reduction potential (ORP) was developed to remove excess VFA and maintain the stability of the high loading rate AD process without the need for pH adjustment or loading rate reduction. The results from triplicate experiments showed that upon microaeration, the total VFA concentration quickly reduced from 7.4 ± 0.6 to 3.2 ± 0.6 g/L as acetate, together with 3-fold increase of methane yield, recovering the digesters from the verge of failure. The sensitivity of ORP probe to the present of oxygen allowed the precise control of the microaeration system and the coexistence of both anaerobic and facultative niches of microorganisms. Results from bioenergetics and microbial community analysis further revealed an alternative VFA conversion pathway under ORP-controlled microaerobic condition, bypassing the conventional syntrophic reactions. This novel operating approach opens up an effective process control strategy for high loading rate AD processes, offering significant economic merits and promoting the applications of this promising bioenergy production technology.

(145) Effects of intermittent energy restriction with a Mediterranean diet versus the Dietary Approaches to Stop Hypertension diet on overall and visceral adiposity: A pilot study. Panizza, C.E.*, Lim, U., Yonemori, K.M., Cassel, K.D., Wilkens, L.R., Shvetsov, Y.B., Harvie, M.N., Le Marchand, L., Boushey, C.J. *Department of Human Nutrition,*

Food and Animal Sciences, University of Hawai'i Cancer Center, University of Hawai'i Intercollege PhD Program in Nutrition, HI. [3]Manchester University Hospital, UK.

Men and women in Hawai'i (*n*=60), aged 35-55, BMI 25-40, visceral adipose tissue (VAT) ≥90cm^2 for men and ≥80cm^2 for women, of Japanese, Chinese, or Korean ancestry, were randomized equally to the intermittent energy restriction with a Mediterranean (IER+MED) diet or the Dietary Approaches to Stop Hypertension (DASH) diet for 12 weeks. The IER+MED group was instructed to restrict 70% energy on 2 days and follow the MED diet and meet their estimated energy requirement (EER) for the other 5 days each week. The DASH group was instructed to follow the DASH diet and meet their EER. Dietitians provided initial instruction for the diets and contacted participants 7 times primarily by telephone for support and compliance assessment. 4-day mobile food records were completed at baseline, weeks 6 and 11. Trained technicians measured anthropometry and dual energy X-ray absorptiometry (DXA)-based body composition, including estimated VAT, at baseline and week 12. At week 12, participants in the IER+MED group lost greater amounts of body weight [5.9 (±3.1) kg vs. 3.2 (±3.4) kg in DASH; *P*=0.006], waist circumference (WC) [7.0 (±4.5) cm vs. 4.4 (±3.1) cm in DASH, *P*=0.018], and VAT [1.3 (±29.5) cm^2 reduction vs. 4.2 (±20.5) cm^2 increase in DASH, *P*=0.43]. In this short-term pilot study, the IER+MED group had greater reduction in weight and WC than the DASH group. The larger effect of the IER+MED diet on adiposity measures may be due to the IER, larger energy deficit and/or different diet composition.

(146) Characterizing Eating Behaviors of Adolescents Ages 10-13 in Hawaii While Eating Alone. Suzuki, A.*, Anderson, A., Choi, Y.C., Cluskey, M., Gunther, C., Hongu, N., Jones, B., Lora, K., Misner, S., Monroe-Lord, L., Penicka, C., Reicks, M., Richards, R., Topham, G., Wong, S.S., Banna, J. *University of Georgia, Oregon State University, Ohio State University, University of Arizona, Purdue University, University of Oklahom, District of Columbia Cooperative Extension, Brigham and Women's Hospital, University of Minnesota, Brigham Young University, Kansas State University, Department of Human Nutrition, Food and Animal Sciences.*

During childhood, parents/caregivers supervise most meals and snacks; as youth gain independence, opportunities to eat without their supervision increase. Dietary behavior during occasions when early adolescents eat alone may have a significant impact on overall diet quality and health outcomes later in life. However, there is no published evidence characterizing eating behavior of adolescents in Hawai'i while eating alone. The study objectives were to: 1) Determine how often adolescents eat alone; and 2) Characterize occasions when adolescents eat alone, including the location, time of day, and, other activities performed while eating. Children aged 10-13 years (n=42) in Oahu, Hawai'i were asked to take pictures of all foods and beverages consumed on one day. One-on-one interviews were conducted with children using the pictures as a guide. Descriptive statistics were calculated using frequencies to understand the characteristics of occasions when adolescents ate alone. Eighteen percent of meals and 27% of snacks were consumed when adolescents were alone. Children most often ate alone during breakfast and lunch at school and snacks at home. About half of adolescents watched television or used electronic devices while eating alone. Further understanding of eating habits of adolescents may inform improvement of current programs as well as development of effective interventions to promote better health outcomes in adulthood.

(147) Nutrient profile and *in vitro* digestibility of nutrients (energy, protein and amino acids) of animal protein byproducts. Utsav P. Tiwari*, Brian Kerr, and Rajesh Jha. *Department of Human Nutrition, Food and Animal Sciences, USDA-ARS, Ames, IA.*

Animal protein byproducts (APB) are produced in slaughter houses and rendering plants that contain wide array of inedible carcass tissues including blood, feathers, bones etc. They are very high in energy, protein and amino acids (AA). The objective of this study was to characterize the variation in nutrient composition of APB and determine apparent ileal digestibility (AID) of nutrients and AA. Total of 13 APB were collected from different industry at different place in US and grouped into 5 categories depending upon their content like feather meal (FM), meat meal (MM), meat and bone meal (MBM), blood meal (BM) and poultry byproduct meal (PBM). Nutrient profile was determined using standard methods and AID by an *in vitro* model of swine. Gross energy (GE) and crude protein (CP) in

APB ranged from 4100-5797 kcal/kg and 53-97% respectively. Both GE and CP were highest in BM. The AID of GE of MBM (70%) was higher (P<0.05) than PBM (50%). The AID of lysine of BM was higher (P<0.05) than PBM and AID of methionine of BM was higher (P<0.05) than FM. The AID of GE of PBM was higher (P<0.05) than FM. Thus, MBM provides the highest amount of digestible GE whereas AID of most essential AA was higher in BM than other APB. These APB can be used in swine diet to provide most AA. However, except BM, none of them provides sufficient lysine required for optimum growth of swine and need to be supplemented while using these ABP in swine diets.

(148) Cassava root chips an alternative to corn in broiler diet: effect on growth performance and gut health parameters. Yadav, S.*, Singh, A., Tiwari, U.P., Mishra, B., Jha, R. *Department of Human Nutrition, Food and Animal Sciences.*

Variable price, limited supply and increasing demand of conventional energy feedstuffs such as corn necessitate the exploration and evaluation of alternative feedstuffs. Cassava root chips (CRC) may serve as a cheap energy source in poultry diets while fiber in it will ferment and improve gut health. This study evaluated the effects of CRC inclusion in broilers diet on growth performance and gut health parameters. A total of 180 day-old chicks were equally and randomly allotted to 5 dietary treatments with 6 replicate pens per treatment (n=36/treatment group). Five treatments were corn-soybean meal based diets with inclusion of 0, 12.5, 25, 37.5 and 50% of CRC replacing corn. After 42 days of feeding trial, birds were euthanized and samples were collected. Histomorphology was performed using the ileum tissue samples and volatile fatty acid (VFA) content using cecal digesta samples as gut health parameters. Compared to control group, the body weight was not significantly different (P>0.05) up to 25% CRC inclusion in starter and up to 37.5% in total study period. Average daily gain was significantly lower (P<0.05) at 50% CRC inclusion in starter and total study period. Feed conversion ratio was not significantly different (P>0.05) up to 37.5% CRC inclusion in starter diet whereas 50% CRC inclusion in finisher diet was similar to control. Villus height, crypt depth, their ratio and villus surface area were not different among the treatments. Acetate and total VFA produced increased with the increase in the CRC inclusion from 25 to 50% in diets. In conclusion, CRC can be included up to 37.5% in poultry diets as replacement of corn to reduce feed cost while improving the gut health of broilers. Further study with exogenous enzymes supplementation can enhance nutrient utilization of CRC in broiler feeding program.