

MAI UKA Ā KE KAI
"FROM THE MOUNTAIN TO THE SEA"

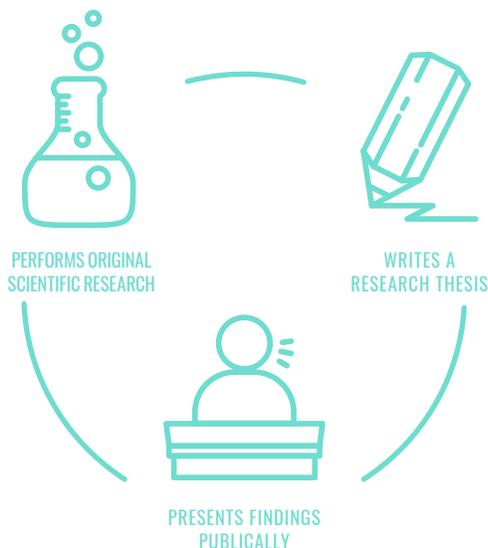
2017 - 2018
ANNUAL REPORT

GLOBAL ENVIRONMENTAL SCIENCE

AT THE DEPARTMENT OF OCEANOGRAPHY

PREPARING STUDENTS FOR THE FUTURE

The Global Environmental Science (GES) program at the UH Mānoa School of Ocean and Earth Science and Technology (SOEST) trains high-quality students to be knowledgeable in Earth-system science and think creatively about the challenges facing communities and natural resources now and in the future.



As a GES degree requirement, each student performs original scientific research, writes a research thesis and presents findings publicly. Mentors include SOEST faculty—global leaders in the fields of ocean, earth and space science. Throughout the GES degree program, students are engaged in fieldwork, laboratory work and field trips, and have access to deep ocean and coastal research vessels, SOEST’s world-class Hawai’i Institute of Marine Biology and an active volcano.

The GES Program is designed to prepare students to achieve their goals. It is one of the most rigorous and involved undergraduate programs at the University of Hawai’i, requiring:

1. A UH faculty-mentored undergraduate research thesis experience;
2. Program specific one-on-one academic coursework and career advising;
3. Rigorous curriculum in science and math; and
4. Development of valuable and critical skills in computer programming, oral communication and presentation, technical writing, and independent research that translate to many fields and opportunities.

The GES program prepares students to excel in post-GES endeavors such as:

- Graduate studies in environment, sustainability, science, and engineering-related fields;
- Professional degree programs in environmental law and policy, environmental and public planning, public health administration, travel industry management, sustainability, etc.;
- Environmental Science-related positions in private industry (e.g., environmental consulting, non-governmental agencies, etc.);
- Environmental Science-related positions in local, state, and federal government agencies;
- Entering or returning to teaching with knowledge of how the Earth system works; and
- Entering the work force in another field as an educated person with the knowledge required to enable us to become wise environmental stewards of the planet.



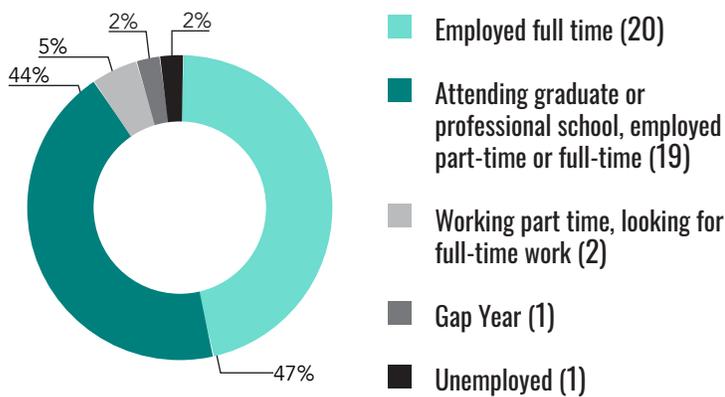
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ALUMNI EMPLOYMENT STATISTICS

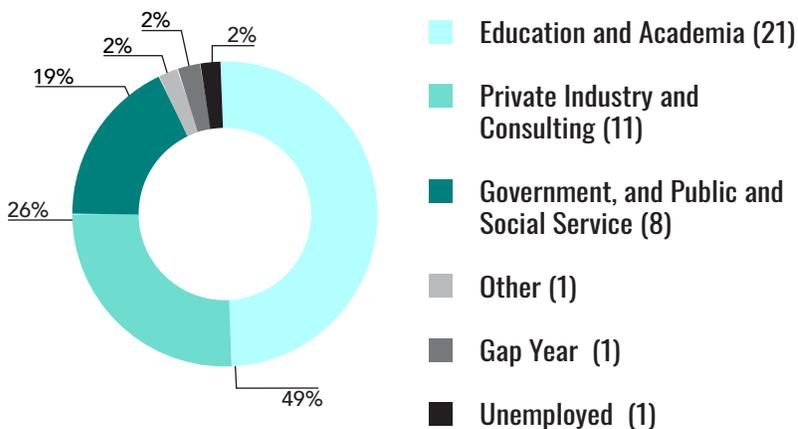
As of 2018, employment 0-12 months after graduation for alumni who graduated from 2013-2017.

43 RESPONSES OUT OF 48 = 90% RESPONSE RATE



As of 2018, category of employment 0-12 months after graduation for alumni who graduated from 2013-2017.

43 RESPONSES OUT OF 48 = 90% RESPONSE RATE



MESSAGE FROM THE CHAIR



ALOHA GES 'OHANA:

As we transition into the 2018-2019 academic year, I am excited to share with you the program's second annual report!

The student-centered focus of the inaugural report was well-received and so we are continuing with this theme of highlighting some of the excellent student achievements from the previous (2017-2018) academic year. We've added a twist to this report by having the students share their experiences in their own words.

While there are far too many amazing things going on with GES to include a story about every single one in this report, I hope the stories in this report inspire and inform you as much as they do me.

I would like to briefly mention one way though that the past efforts of all our alumnae and their faculty mentors still resonate and are positively impacting the University of Hawaii at Manoa (UHM).

Since its inception, the GES Program has been recognized as an exemplar of faculty-mentored, undergraduate research and to my knowledge is the only UHM major that requires a written thesis and oral presentation to the public of results. UHM is now working to provide more formal, articulated access to research opportunities for all its undergraduates via the recent formulation of an Undergraduate Research Office (URO).

The URO is using many of the successful aspects and proven methods of the GES Program to inform and guide its development and implementation of approaches to increase undergraduate research opportunities and successful participation.

Everyone (past and present) associated with GES should be proud of playing a guiding role in improving access to undergraduate research opportunities at UHM for all undergraduates.

ALOHA,

MICHAEL GUIDRY

UNDERGRADUATE CHAIR

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MESSAGE FROM THE FUNDRAISER

TO THE GES 'OHANA OF FACULTY, STAFF, ALUMNI, DONORS, AND FRIENDS:

The 2017 – 2018 year was a wonderful one for the Global Environmental Sciences (GES) program. I'm thrilled to announce that GES has a new endowed scholarship, the Global Environmental Science Endowed Scholarship, created from a gift from Ed and Stephanie Laws. You will have a chance to read the full story of their generous gift later in this report.

I don't think it's possible for me to overstate the impact of scholarships on GES students and the GES department. Scholarships relieve some of the financial pressures students face, giving many the support they need to stay in GES and perform the important and difficult field work that makes them stand out at UH for the rigor and complexity of their degree.

Scholarships also help GES attract and retain some of the highest-performing undergraduates at UH. GES is a rather small program compared to other science disciplines, like biology or chemistry, but it is uniquely training students to understand, nurture, and prepare for a world that will look very different 20, 50, 100 years from now. Our world needs the brightest minds to navigate these changes, and scholarships give GES resources to attract and support students who will be vital participants in the global effort to adjust to a changing climate.

As tuition and the need for environmentally-literate and environmentally-concerned graduates continue to rise, your gifts are needed and appreciated now more than ever. Will you join me in making a donation to the new Global Environmental Science Endowed Scholarship, to support GES students and to be part of the GES 'ohana passionate about conserving, understanding, and stewarding the earth? A link to give is below.

Mahalo for all you do to support GES and its students. I look forward to finding new and exciting ways for us to partner together for the benefit of the program, the students, the state of Hawaii, and the planet we call home.

BEST



JANA LIGHT
ASSOCIATE DIRECTOR OF DEVELOPMENT
jana.light@uhfoundation.org | 808-956-9172



STUDENTS IN THE NEWS



FIVE GLOBAL ENVIRONMENTAL SCIENCE STUDENTS AWARDED COMPETITIVE NOAA SCHOLARSHIPS

Five undergraduate students in the Global Environmental Science (GES) Program in the University of Hawai'i at Mānoa's School of Ocean and Earth Science and Technology (SOEST) have been awarded scholarships from the National Oceanic and Atmospheric Administration (NOAA) Ernest F. Hollings Scholarship or Education Partnership Program.

Seniors McKenna Lewis and Kammie Dominique-Tavares, rising senior Cuong Tran, and rising juniors Diana Lopera and Andrew Tokuda are the honored recipients of these highly competitive awards that provide up to \$45,000 in total support for tuition assistance, a paid summer research experience at a NOAA facility, and travel funds to attend conferences to present the student's research findings. The impact of these scholarships is quite profound. Graduating GES student Kammie Dominique-Tavares, who is going on to graduate school in SOEST's Geology and Geophysics Department, noted, "The NOAA scholarship really exposed me as a junior scientist to what it means to have a career in the field of science. That helped me in the experiences that followed. I've had the opportunity to network with people from all over the country and to travel to many new places. Having a scholarship also eased my stress and allowed me to focus on my education. The experience overall has really enabled me to grow as a person."

Fellow soon-to-be graduate McKenna Lewis said, "Receiving the NOAA Hollings Scholarship has been a pivotal moment for me in my journey through college. I was able to explore my career and

academic interests in a supportive environment, mentored by professionals in the field who cared about my growth. The internship I was offered through the scholarship helped to solidify my career goals. The opportunity to travel to a conference to present the research from my internship helped me grow as a student and professional. The connections I made during the summer internship have helped me to get a job after graduation. Receiving this scholar-

ously, I did not know how I wanted to use my GES degree. Now, being a part of this program has shown me the path that I want to take. That is, to research the effects of sea level rise in the Pacific Islands as well as build resilience to coastal communities. This amazing opportunity will allow me to help my home community regarding the future impacts of sea level rise through global climate change."

Rising juniors Diana Lopera and Andrew Tokuda were recently informed of their awards and will be

"THIS IS QUITE AN UNUSUAL SITUATION TO HAVE FIVE AWARDEES OF THESE HIGHLY COMPETITIVE NOAA SCHOLARSHIPS IN THE SAME ACADEMIC PROGRAM AT THE SAME TIME."

MICHAEL GUIDRY, GES PROGRAM CHAIR

ship has been one of the greatest experiences during my years in college!"

Lewis has secured a position that starts immediately after graduation with the State of Hawai'i's Division of Aquatic Resources to study the impact of Native Hawaiian agriculture practices on near-shore coral reefs on Kauai.

This summer, rising senior Cuong Tran is embarking on his NOAA-sponsored summer experience in Huron, Ohio on Lake Erie. Tran said, "Previ-

completing their research experience in the summer of 2019.

Lopera said, "The NOAA Hollings Scholarship is an opportunity for me to explore a career in environmental-based research, as tackling worldwide problems such as global climate change becomes more relevant than ever."

Andrew is equally enthusiastic, "I believe that the NOAA Hollings Scholarship is a privilege of growing together with one of the largest scientific communities in the world."



"BEING IN GES HAS ALLOWED ME TO TAKE PART IN A BROAD RANGE OF RESEARCH, FROM PHYSICAL AND CHEMICAL OCEANOGRAPHY TO MARINE BIOLOGY AND GEOLOGY, ALLOWING ME TO EXPERIENCE A VARIETY OF FIELDS AND REFINE MY INTERESTS."

- NOAH HOWINS, SENIOR

PHOTO CREDIT: RIKO LEE ▲

BOATS FROM THE HAWAI'I INSTITUTE OF MARINE BIOLOGY ARE USED TO REACH THE STUDY SITE ON THE KANEHOE BAY BARRIER REEF

MEASURING CORAL CALCIFICATION RATES IN KANEHOE BAY

Noah Howins, a senior in the Global Environmental Science (GES) program, is working with Oceanography Department mentors Eric De Carlo and Christopher Sabine to better understand how physical reef characteristics, such as coral cover percentage and depth, account for calcification rate variability across a reef system.

As a result of fossil fuel combustion, which leads to the process of ocean acidification, our oceans continue to become less favorable for keystone calcifying organisms including coral, mollusks, and plankton. In an acidified ocean the survival, growth, and reproduction, of calcifying organisms are adversely impacted. With coral reefs being widely known as the "rainforests of the sea" seemingly small changes in seawater carbonate chemistry can have widespread impacts.

Howins' project is taking place on a small section of the Kāne'ōhe Bay barrier reef where he conducts Lagrangian experiments every few weeks. The low-tech experiments require a can of Coca-Cola, a balloon, and sampling bottles. The experiment is performed by dropping the can in the water on one side of the reef where Howins immediately takes the initial water

samples. A small balloon tied to the can makes it easy to track as it travels across the reef. Once the can reaches the opposite side of the reef Howins recovers it and take another set of samples. Since the Coca-Cola can is neutrally buoyant it is not propelled by the wind pushing against it and Howins is able to sample the same parcel of water that was initially sampled on the opposite side of the reef. Theoretically, any changes seen in the samples can be attributed to interactions with the reef the water transited across.

While highly-constrained tank studies have found that calcification rates for the dominant coral species in Kāne'ōhe Bay scale linearly with coral cover, questions remain as to whether these results translate spatially and temporally across the entirety of Kāne'ōhe Bay.

The data Howins has collected to date have proved exciting and with 8 months left in his project he is hoping to see seasonal changes as well.

Howins states, "Being in GES has allowed me to take part in a broad range of research, from physical and chemical oceanography to marine biology and geology, allowing me to experience a variety of fields and refine my interests. After I graduate from the GES program I look forward to attending graduate school and continuing to follow my research interests. One of the strengths of GES is its interdisciplinary nature; you can tailor the program to your interests and work directly with faculty members to develop research projects and write a proposal to fund your research. Having worked in the same research group since my first semester I have learned far more about the areas of research that interest me than what is covered in class."

"MY RESEARCH REVOLVES AROUND THE ISSUE OF GLOBAL CLIMATE CHANGE AND STUDYING THE LIZARDS' RESPONSE TO SHORT-TERM TEMPERATURE STRESS COULD GIVE US INSIGHT ON HOW TROPICAL ECTOTHERMS WOULD FARE IN A WARMING WORLD."

— DIANA A. LOPERA, JUNIOR

PHOTO CREDIT: KAINALU STEWARD ▲

HAPPY SHOT OF DIANA TWO HOURS LATER AND 500M HIGHER AFTER HIKING SENDERO CHAI WITH STUDENTS AND MENTORS IN THE OTS REU

CLIMATE CHANGE AND COSTA RICAN LIZARDS

This summer, I was given the opportunity to travel to Costa Rica to partake in a summer Research Experience for Undergraduates (REU) under the Organization of Tropical Studies (OTS). Stationed at the Las Cruces Biological Station in San Vito, Costa Rica, I am investigating the thermal tolerance of the cool-adapted tropical ectotherm *Anolis aquaticus* (water anole), endemic to southern Costa Rica/Northern Panama along with my field mentor Dr. Lindsey Swierk (Binghamton University) and home mentor Dr. Sladjana Priscic (University of Hawaii at Manoa). Tropical ectotherms, such as reptiles, are predicted to be highly susceptible to a warming planet, as their physiology is generally optimized for a relatively narrow temperature range. Using populations from three different habitat types (primary forest, secondary forest, and abandoned pasture), we are testing the hypothesis that populations persisting in deforested (warmer) habitats would be acclimated to higher temperatures and may therefore fare better under temperature stress.

My research revolves around the issue of global climate change and studying the lizards' response to short-term temperature stress could give us insight on how tropical ectotherms would fare in a warming world. I am spending this summer deep in the premontane rainforests of Las Cruces, studying water anoles found in streams throughout the rainforest. We search for lizards on rock walls, under logs, crevices, etc. and collect a variety of data (ambient temperature, humidity, lizard mass, coordinates, etc.). We usually end every field day wet from the waist down with boots filled with water, bringing some lizards back from different habitat types to the lab and test their response to short-term temperature stress.

The program also has other activities for us, such as cultural exchange nights, field trips to forest restoration sites, and science communication workshops. We learned and produced short science communication videos about the day in the life of a field biologist, with great help from Day's Edge Productions, a science film crew that makes content for organizations like National Geographic and Nature. This experience is targeted towards minority groups, so I am constantly learning about different cultural backgrounds and customs from my fellow participants. I am having such a blast so far and I would definitely recommend this program to anyone interested in research and learning more about tropical ecology!

"THE FOCUS OF MY EXPERIENCE IS TO COMMUNICATE HOW SHORELINE PROPERTIES ARE AT RISK FROM THE EFFECTS OF EROSION AND TO PROVIDE PROPERTY OWNERS SUSTAINABLE SOLUTIONS."

- CUONG TRAN, SENIOR



PHOTO CREDIT: LEILA FAULSTICH ▲

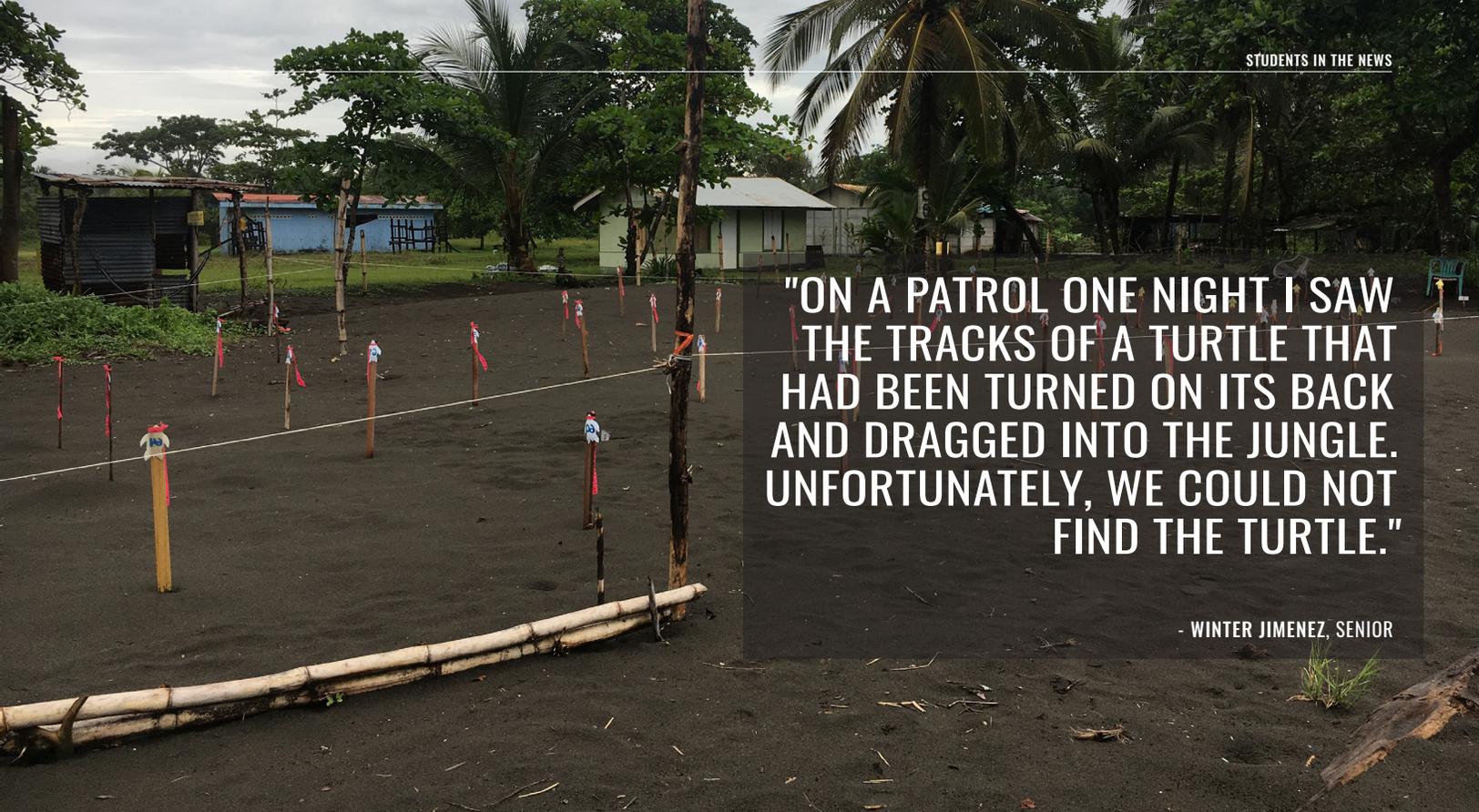
CUONG TRAN INTERNING AT THE OLD WOMAN CREEK NATIONAL ESTUARINE RESEARCH RESERVE

TEARING DOWN THE WALLS: INCREASING COMMUNICATION BETWEEN THE SCIENCE COMMUNITY AND SHORELINE PROPERTY OWNERS

This Summer of 2018, I found myself stationed on an estuary of Huron, Ohio as part of my summer experience with the National Oceanic and Atmospheric Administration (NOAA) Ernest F. Hollings Scholarship Program. As an education and communications intern at the Old Woman Creek National Estuarine Research Reserve, the focus of my experience is to communicate how shoreline properties are at risk from the effects of erosion and to provide property owners sustainable solutions. A newly innovative initiative called "nature-based shoreline" uses natural material to stabilize shorelines against erosion. These methods are sustainable and cost-efficient compared to traditional, hardened shoreline structures such as a seawall or bulkhead. Although there are a growing number of permitting hardened infrastructures along U.S. shorelines, and to-date few implementations of these new nature-based shoreline techniques, we have a great opportunity moving forward to implement more sustainable shoreline erosion mitigation measures.

My internship project seeks to determine the best practices for decreasing the communication barrier

between the science community and shoreline property owners, as well as to highlight the issues related to the installation of nature-based shorelines for property owners. I am conducting a literature review analysis of articles pertaining to nature-based shorelines and interviewing Ohio coastal employees that are familiar with the installation of nature-based shorelines. These efforts will inform a communications piece I am creating as part of a nationwide concentrated effort to implementing nature-based shorelines. In addition to working on my internship-specific deliverables, I am also assigned a multitude of tasks such as taking care of the animals in our visitor center, assisting with school groups on learning about Watershed-Estuary-Great Lake connections and the effects of human impacts, leading weekly kayak trips on our estuary, assisting with other research projects, and helping with Environmental Education workshops! Overall, it has been such an amazing experience to work with inspiring and motivating people that care about the importance of science communication and to explore research opportunities outside Hawaii!



"ON A PATROL ONE NIGHT I SAW THE TRACKS OF A TURTLE THAT HAD BEEN TURNED ON ITS BACK AND DRAGGED INTO THE JUNGLE. UNFORTUNATELY, WE COULD NOT FIND THE TURTLE."

- WINTER JIMENEZ, SENIOR

PHOTO CREDIT: WINTER JIMENEZ ▲

THE HATCHERY IS GUARDED AT ALL TIMES BY LOCALS OR VOLUNTEERS TO KEEP DOGS, CRABS, AND POACHERS FROM TAKING TURTLE EGGS

GIVING TURTLES A HELPING HAND

The Summer of 2017 I had the opportunity to volunteer with International Volunteer HQ on a sea turtle conservation project in Parismina, Costa Rica. Parismina is a small, remote village on the Caribbean coast with a population of less than four hundred. Parismina has no cars and only dirt roads. We only had Wi-Fi in the volunteer house (or the Casaña as the locals call it). The local's houses doubled as bakeries, shops, smoothie shacks, and small restaurants. Parismina housing is government subsidized, so the locals only need to pay for electricity and food.

The turtle conservation project is trying to stop poaching in Parismina. With not many jobs available the locals used to poach sea turtles for their meat, shell, and eggs. Volunteers walk the beach at night on patrols with local guides. Interestingly enough, some of the patrol guides used to be poachers but stopped and now get paid to stop the other poachers. While on the patrols you must wear all black and walk about six miles in sand and complete darkness (no phones allowed so no pictures of turtles). The three types of turtles found in Parismina are leatherback, hawksbill, or green sea turtles. If turtles are found on the beach nesting we take measurements. Once they return to the water we collect the eggs and they are taken to the hatchery. While I was there, almost ninety nests were at the hatchery. The hatchery is guarded at all times by locals or volunteers to keep dogs, crabs, and poachers from taking the eggs. During the day, we participate in beach clean ups and soccer games with the locals.

The locals are incredibly welcoming and very friendly. Most of the locals only speak Spanish but they helped me work on my Spanish and were very patient as I tried to speak to them. We stayed with host families who fed us three meals a day. The family I stayed with was truly amazing. The mother, Xiomara, welcomed us with her two sons and her husband. Her youngest son who is eight, became a good friend of mine and always played with us when we were home. Her older son plays on the Parismina soccer team that Xiomara's husband coaches. They invited us to the neighboring village to watch the Parismina vs Tortuguera soccer game. A lot of our patrol guides were on the team as well and we became very good friends with them.

Although poaching has seemed to slow down in Parismina it still happens. On a patrol one night I saw the tracks of a turtle that had been turned on its back and dragged into the jungle. Unfortunately, we could not find the turtle. The long-term volunteers work with the locals to create other jobs so they have income and will not poach. They have a craft fair every week where the locals sell necklaces, dream catchers, key chains, and much more. My time in Parismina taught me the importance of aiding developing communities in learning and practicing sustainability. It has been one of the most eye-opening experiences of my life and I will never forget my time there.

“RETREATING FROM THE SHORE PROVIDES THE SPACE NEEDED FOR NATURAL COASTAL CHANGES AND PROVIDES OUR BEST CHANCE FOR BEACH PRESERVATION. LET’S FREE THE BEACH.”

— KAMMIE TAVARES, SENIOR



PHOTO CREDIT: CHIP FLETCHER ▲

KAMMIE DOING A COASTAL SURVEY AT PAPAĪĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT

PROTECTING HAWAII'S BEACHES FOR FUTURE GENERATIONS

A picture of Keawa'ula Bay with a clear sky, light blue water and green mountains of the Wai'anāe range is on the screen as Kammie Tavares began her presentation at the Global Environmental Sciences (GES) Symposium, the culminating event of her bachelor's of science degree at the University of Hawai'i at Mānoa. She described her favorite memory there—watching sunsets, and playing in the sand with her brothers while her parents prepared dinner on the grill. She grew up in Wai'anāe and always felt a deep connection to the Mākaha-Keawa'ula coast.

After starting her degree program, Kammie realized beaches are important not just personally but also ecologically, culturally, and economically. Despite the importance of beaches, coastal development is an ongoing major issue for the existence of beaches. Shoreline hardening, the construction of

seawalls to protect beachfront development from erosion, paradoxically causes narrowing and loss of beach in adjacent areas.

For her project, Kammie and her advisor, Geology professor Chip Fletcher, hypothesized that the number of coastal structures considered threatened by coastal erosion, and who's owners may consider hardening the shore, will increase as sea level rises. She used a computer model to project the erosion risk with a sea level up to 98 cm higher than present day and then calculated the length of developed shoreline on O'ahu that will be considered threatened based on current state policies. Initial results show that just 32 cm of sea level rise has drastic implications for the future of beaches on O'ahu and coastal development. Her findings accentuate that the time to act is now.

“Beaches are dynamic environments and most beaches in Hawai'i, especially here on O'ahu, are trapped by development near the shore,” said Kammie. “Retreating from the shore provides the space needed for natural coastal changes and provides our best chance for beach preservation. Let's free the beach.”

To conclude her presentation, Kammie takes the audience back to Keawa'ula, except this time, her niece and nephew are playing in the

sand. They and future generations are her motivation in this project. For her, protecting beaches is important to ensure that future generations have the opportunity to make memories of their own.

She then shared the 'ōlelo no'eau “E lauhoe mai na wa'a; i ke kā, i ka hoe; i ka hoe, i ke kā; pae aku i ka 'āina.” This translates to “Everybody paddle the canoes together; bail and paddle; paddle and bail; and the shore is reached.” This motivational statement encourages everyone to do their part quickly, so the goal is reached.

“I am concerned that the current policies and management practices in place are not upholding the value of beaches as they should,” Kammie said. “Hawai'i's coast is where federal, state, city and county members and local residents all act as stakeholders. We are all in the canoe together, and it is up to us to decide our role in the future of Hawai'i's beaches. Will our wa'a land on a sandy shore? Or will it be a seawall?”

Kammie's goal with her research is to create more awareness of the urgency of the situation. She is continuing this project as part of a Master's thesis in the fall and will eventually publish the results and make the information available to the community.

AWARDS AND SCHOLARSHIPS

DEAN'S LIST

Kayla Brignac, Shanel Crawford, Mia Delano, Norma-Jean Driscoll, Noah Howins, Winter Jimenez, Nalani Kito-Ho, McKenna Lewis, Diana Lopera, Noeau Machado, Kelsey Nichols, Katherine Papacek, Kealohi Sabate, Ashley Sanchez, Kammie-Dominique Tavares, Andrew Tokuda, Cuong Tran, Henrik Weiberg, Eric Welch, Amanda Wong

HONORS PROGRAM

Noah Howins, McKenna Lewis, Amanda Wong

UNDERGRADUATE RESEARCH OPPORTUNITIES PROGRAM (UROP) AWARDEES

Kayla Brignac, Brenna Carroll, Kiefer Hermann, Noah Howins, Kammie-Dominique Tavares, Andrew Tokuda, Cuong Tran, Eric Welch

SARP KAYAN SCHOLARSHIP

Noah Howins, McKenna Lewis, Cuong Tran

FRANCES & EVELYN FOO SCHOLARSHIP

Noeau Machado, Cuong Tran, Eric Welch

NOAA SCHOLARSHIPS

Diana Lopera – Hollings 2018-2020
Cuong Tran – Hollings 2018-2020

TESTER SYMPOSIUM

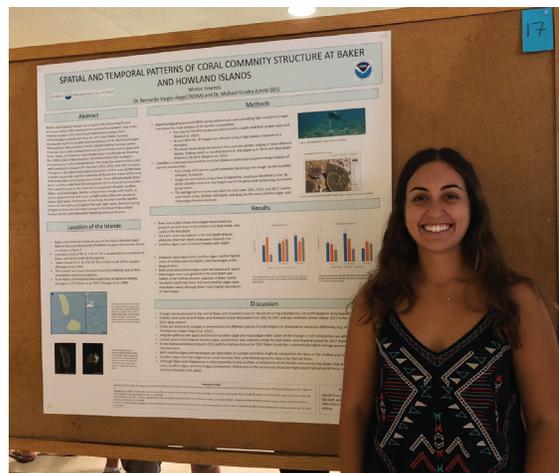
Kayla Brignac – Best Undergraduate Poster, Honorable Mention
Kiefer Hermann – Best Undergraduate Poster

UNIVERSITY OF HAWAI'I SCHOLARSHIPS

Caleb Hsu – Regent's Scholar
Amanda Wong – Chancellor's Scholar



PHOTO CREDIT: KARA ANDRES ▲
AMANDA WONG WEARING A BUNNY SUIT IN PREPARATION FOR EXTRACTING EDNA FROM WATER SAMPLES



WINTER JIMENEZ PRESENTING HER RESEARCH ▲
AT 43RD ALBERT L. TESTER MEMORIAL SYMPOSIUM

DONOR SPOTLIGHT



(FROM LEFT TO RIGHT) MICHAEL GUIDRY, ED LAWS, STEPHANIE LAWS, JANA LIGHT, ALEXANDER SHOR, ▲ AND NIKLAS SCHNEIDER ATTEND SCHOLARSHIP SIGNING CEREMONY

ED AND STEPHANIE LAWS ESTABLISH GLOBAL ENVIRONMENTAL SCIENCE ENDOWED SCHOLARSHIP

In late December 2017, Dr. Edward A. and Mrs. Stephanie S.L. Laws established the Global Environmental Science Endowed Scholarship to support undergraduate students in the Global Environmental Sciences program in the Department of Oceanography. The gift will provide standout GES students with tuition and other academic financial support, allowing them to focus on their studies, be rewarded for excellent work, and be able to take advantage of research opportunities for their senior thesis projects.

A former faculty member of the Department of Oceanography at SOEST, Ed is a Professor in the Department of Environmental Sciences at Louisiana State University. While at UH, Ed was a key supporter in the department's effort to start the GES program. Stephanie works for the State of Hawaii and is active on

the ARCS Honolulu board. Says GES Chair Guidry, "We are excited to celebrate their generosity and introduce them to the students their support will benefit."

Since the program's first days, GES students have been directly impacted by Ed's expertise and instruction as one of his textbooks, *Aquatic Pollution: An Introductory Text* (now in its fourth edition), has been used for the GES-required course Ed started and instructed (OCN 310 Aquatic Pollution) while at UHM.

The first three beneficiaries of the GES Endowed Scholarship are Kealohi Sabate, Noeau Machado, and Noah Howins. Noah took the time to meet and share his appreciation with Stephanie when she attended the 2018 Spring GES Symposium. Says Howins, "The lessened financial burden as a result of being awarded the Global Environmental Science Endowed Scholarship will allow me to focus more on my studies and becoming not only the best scientist that I can be, but the best person. It was both humbling and fulfilling to see Stephanie's palpable sense of excitement as I described the projects and volunteer opportunities I have been a part of as a GES student. I look forward to making both Ed and Stephanie proud by excelling in academics, research, and outreach."

GES FACULTY

ROSIE ALEGADO

Marine microbial ecology, choanoflagellate-bacterial interactions, influence of bacteria on animal evolution

HARIHARASUBRAMANIAN ANNAMALAI

Diagnostic and modeling aspects of the Asian Summer Monsoon system, prediction and predictability of the Asian Summer Monsoon system, dynamical and physical link between Monsoon-ENSO

DAVE BEILMAN

Long-term terrestrial ecology, paleoscience approaches to global change science, carbon cycling

ROBERT R. BIDIGARE (EMERITUS)

Bio-optical oceanography, pigment biochemistry, plankton metabolism

BARBARA BRUNO

Planetary geosciences, geoscience education

STEVEN BUSINGER

Evolution and structure of destructive atmospheric storms, including: frontal cyclones, hurricanes, and severe thunderstorms

GLENN S. CARTER

Physical oceanography, ocean mixing, internal tides, underwater ocean gliders

QI CHEN

Environmental changes (e.g. climate change, land use and land cover change, sea-level rise, habitat and biodiversity loss) and use of multiple tools (e.g. remote sensing, GIS, statistics, process-based models, and field observations) to address these issues

ANTONY D. CLARKE (EMERITUS)

Physical and chemical properties of aerosol in remote troposphere, aircraft studies of aerosol in free troposphere

MICHAEL COONEY

High rate anaerobic digestion, bio-oil extraction from biomass, and the analytical characterization of chemical microenvironments surrounding immobilized enzymes

ERIC H. DE CARLO

Aquatic chemistry, metals and their anthropogenic inputs, transformations, fate and transport, sedimentary geochemistry

JONATHAN DEENIK

Soil fertility and soil quality, nitrogen and carbon cycling in agroecosystems, traditional agroecosystems, biochar and sustainable agriculture

EDWARD DELONG

Application of contemporary genomic technologies to understand the ecology, evolution and biogeochemistry of complete microbial assemblages

STEVEN J. DOLLAR

Biogeochemistry, nearshore processes and effects of human activity on the coastal zone

JEFFREY C. DRAZEN

Physiological ecology of marine fishes, energetics, tropodynamics, deep-sea biology, adaptations to the deep-sea

KYLE EDWARDS

Phytoplankton ecology, community ecology, ecological theory and statistics, benthic communities

MARGO EDWARDS

Marine geology and geophysics, remote sensing of the seafloor, Mid-Ocean Ridges, Arctic Basin

ERIC FIRING

Ocean circulation and currents on all scales, with emphasis on observation and dynamics

PIERRE J. FLAMENT

Surface ocean layer dynamics, mesoscale circulation structures of the ocean, remote sensing of the sea surface

CHARLES H. FLETCHER

Quaternary and coastal marine geology, sea-level history, coastal sedimentary processes (erosion), sea level rise

OCEANA FRANCIS

Storm-generated ocean waves, meteorological and ocean processes on coastal infrastructure, sustainable coastal infrastructure, water, and wastewater systems

KIANA FRANK

Identifying environmental drivers of microbial dynamics and to characterize the impact of microorganisms on biogeochemical cycling in mineral-hosted ecosystems from mountain ridge to mid-ocean ridges

PATRICIA FRYER

Marine geology, petrology, tectonics

ERIC GAIDOS

Molecular evolution; microbiology of extreme environments; biosphere-climate feedbacks; critical intervals in Earth history; exobiology; biological networks

MICHAEL O. GARCIA

Volcanology, igneous petrology, geochemistry

THOMAS W. GIAMBELLUCA

Interactions between the atmosphere and the land surface, including influences of land use and land cover change on climate and surface hydrology and effects on global climate change on hydrologic processes and terrestrial ecology

BRIAN T. GLAZER

Biogeochemical processes in marine environments; use of molecular methods to characterize and understand synergy of geomicrobiology

CRAIG R. GLENN

Paleoceanography, marine geology, sedimentology, sediment diagenesis

ERICA GOETZE

Marine zooplankton ecology; dispersal and gene flow in marine plankton populations; evolution, behavioral ecology and systematics of marine calanoid copepods

E. GORDON GRAU

Environmental physiology and comparative endocrinology of fish

MICHAEL GUIDRY (GES CHAIR)

Biogeochemical modeling, mineral precipitation/dissolution kinetics, K-12/university curriculum development

MICHAEL HAMNET

Coastal zone management, fisheries economics, disaster preparedness and mitigation

DAVID T. HO

Air-water gas exchange, tracer oceanography, carbon cycle, and environmental geochemistry

STEVEN HOWELL

Environmental aerosol research, aerosol chemistry

ANDEA JANI

Ecology of infectious diseases

ALY EL-KADI

Hydrogeology, modeling groundwater systems

CHRISTINA KARAMPERIDOU

ENSO dynamics and predictability, ENSO in past climate, response of mid-latitude atmospheric circulation to climate change and variability

DAVID KARL

Microbiological oceanography, oceanic productivity, biogeochemical fluxes

CHRISTOPHER KELLEY

Deepwater habitats, ecology and fisheries, seafloor mapping and GIS

MAREK KIRS

Environmental microbiology, microbial source tracking, quantitative PCR, recreational water quality

PAUL KEMP

Growth, activity and diversity of marine microbes, biosensor applications in microbial oceanography, molecular ecology of marine bacteria

DENISE EBY KONAN

International trade, microeconomics, computational economics

YUAN-HUI (TELU) LI (EMERITUS)

Geochemical cycles from solar nebula to human brain

KEM LOWRY

Design, planning and evaluation of ocean and coastal management programs. Experience in Hawaii, Indonesia, Sri Lanka, Philippines and Thailand

ROGER LUKAS (EMERITUS)

Physical oceanography, interannual and decadal climate variability

DOUGLAS LUTHER

Tide dynamics and energy flow, mixing in the abyssal ocean, circulation and energy fluxes in the North Atlantic

FRED T. MACKENZIE (EMERITUS AND GES FOUNDER)

Geochemistry, biogeochemical cycling, global environmental change

STEPHEN J. MARTEL

Engineering and structural geology

MARGARET A. MCMANUS

Descriptive physical oceanography, coupled physical-biological numerical models; development of ocean observing systems

CHRISTOPHER MEASURES

Trace element geochemistry, hydrothermal systems, elemental mass balances

GARY M. MCMURTRY

Geochemistry, geology and geophysics

MARK D. MERLIN

Biogeography, natural history of the Pacific

MARK A. MERRIFIELD

Physical oceanography, coastal circulation, sea level variability, current flows and mixing in the vicinity of coral reefs, islands and seamounts

ANUPAM MISRA

Material science, remote sensing, remote Raman, micro Raman, High Tc_Superconductor, stress strain sensors

TOMOAKI MIURA

Remote sensing of terrestrial vegetation, GIS

GREGORY MOORE

Marine geophysics, structural geology

MICHAEL J. MOTTI (EMERITUS)

Hydrothermal processes, geochemical cycles

PETER MOUGINIS-MARK

Volcanology from space, remote sensing of natural hazards

PETER K. MÜLLER (EMERITUS)

Ocean circulation, waves and turbulence

CRAIG NELSON

Structure and function of natural bacterial communities in aquatic habitats such as coral reefs, lakes, streams, and the open ocean

ANNA NEUHEIMER

Quantitative ecology of fish and aquatic invertebrate populations, with applications to evolutionary biology, physiology, ecosystem dynamics, resource management, and climate issues

ALISON NUGENT

Mountain meteorology and cloud physics, orographic convection and precipitation, shallow cloud dynamics, cloud microphysics

BRIAN N. POPP

Isotope biogeochemistry, organic geochemistry

JOHN N. PORTER

Atmospheric science, use of satellites to study aerosol and cloud forcing, ship measurements of aerosol and cloud optical properties

JAMES POTEIRA

General ocean circulation and its relationship to climate, processes in the western equatorial Pacific and eastern Indian Ocean and their connection

BRIAN S. POWELL

Numerical modeling and variational data assimilation, ocean predictability, ocean circulation and ecosystem dynamics

BO QIU

Large-scale ocean circulation, ocean atmosphere interaction, satellite observations, and numerical modeling of ocean circulation

MICHAEL RAPPÉ

Ecology of marine microorganisms; genomics; coral-associated microorganisms; ecology of microorganisms in the deep subsurface

GREG RAVIZZA

Paleoceanography and environmental chemistry; geologic history of chemical weathering; geochemistry of recent and ancient metalliferous sediments, and chemical signatures of extra terrestrial matter in marine sediments

KELVIN RICHARDS

Observations and modeling of ocean processes, ocean dynamics, ocean atmosphere interaction, ecosystem dynamics

KEN RUBIN

Isotope geochemistry, chronology

MARK A. RIDGLEY

Resource management and human-environment system analysis

JAMES ROUMASSET

Environmental economics and sustainable growth

KATHLEEN RUTTENBERG

Biochemistry of phosphorus and phosphorus cycling in the ocean, rivers, and lakes; nutrient limitation of aquatic primary productivity; effects of redox chemistry on nutrient cycling; early diagenesis in marine sediments with focus on authigenic mineral formation and organic matter mineralization

CHRIS SABINE

The role of the ocean in the global carbon cycle; interpreting ocean inorganic carbon measurements; measuring and understanding ocean acidification; air-sea exchange of CO₂ at the ocean surface; understanding multiple tracer relationships; and examining carbonate and organic matter re-mineralization

FRANCIS J. SANSONE (EMERITUS)

Suboxic/anoxic diagenesis in sediments, hydrothermal geochemistry, lava-seawater interactions, trace gas geochemistry

NIKLAS SCHNEIDER

Decadal climate variability, tropical air-sea interaction, coupled modeling

JANE SCHOONMAKER (EMERITA)

Sedimentary geochemistry and diagenesis; paleoenvironment and paleoclimate sedimentary records

KAREN SELPH

Biological oceanography, microbial ecology, protistan grazer feeding dynamics, phytoplankton distributions, use of flow cytometry in ecological research

SHIV K. SHARMA

Atmospheric instrumentation and remote sensing, Lidar, Raman, and infrared spectrometry and fiber-optic environmental sensors

CRAIG R. SMITH

Benthic and ecology, deep-sea biology, sediment geochemistry, climate-change effects on Antarctic ecosystems, marine conservation

GRIEG F. STEWARD

Aquatic microbial ecology, molecular ecology and diversity of viruses and bacteria

BRIAN TAYLOR

Plate tectonics, geology of ocean margin basins

PHILIP THOMPSON

Historical reconstructions of global mean sea level from tide gauges. Sea level forecasting on timescales of weeks to months. Statistics of water level extremes and wave-induced inundation. Decadal climate variability and its effect on sea level and distribution on heat in the ocean

ROBERT TOONEN

Dispersal and recruitment of invertebrate larvae, population genetics, evolution and ecology of marine invertebrates

BIN WANG

Atmospheric and climate dynamics

JOHN WILTSHIRE

Marine minerals, mine tailings, disposal and remediation and submersible engineering and operations

ROBERT WRIGHT

Hyperspectral imaging instrument development, remote sensing, infrared radiometry, volcanology

RICHARD ZEEBE

Global biogeochemical cycles, carbon dioxide system in seawater and interrelations with marine plankton, paleoceanography, stable isotope geochemistry

2017-2018 GRADUATES

FALL 2017

KELCEY ANN CHUNG

Presented on "Comparing the Fecundity of Brooding Species along the West Antarctic Peninsula" with Dr. Craig Smith from Oceanography.

MIA DELANO

Presented on "Heritability of Coral Calcification Rates and Potential for Adaptation to Ocean Acidification" with Dr. Rob Toonen and Dr. Chris Jury from Hawaii Institute of Marine Biology.

ELIZABETH DIONNE

Presented on "Resolving Carbon Contributions in a Mangrove Estuary" with Dr. Henrietta Dulai from Geology & Geophysics and Dr. David Ho from Oceanography.

ARIEL LORENZEN

Presented on "Assessing the Accuracy of an Environmental Monitoring System in the Ala Wai Harbor" with Dr. Eric De Carlo from Oceanography.

TIANA TRAN

Presented on "An Analysis of the Recruitment of Pocillopora Damicornis Under Climate Change Scenarios" with Dr. Rob Toonen and Dr. Chris Jury from Hawaii Institute of Marine Biology.

SPRING 2018

TAYLOR ANDERSON

Presented on "Developing a Low-Cost Sensor for Comparative Analysis of High Frequency Wind Speed Fluctuations" with Dr. Alison Nugent from Atmospheric Sciences.

NORMA-JEAN DRISCOLL

Presented on "Bacteriophage and Host Bacteria Interactions within the Ala Wai Canal" with Dr. Grieg Steward from Oceanography.

KIEFER HERMANN

Presented on "Rain Gauge Analysis of Precipitation on Oahu" with Dr. Alison Nugent from Atmospheric Sciences.

WINTER JIMENEZ

Presented on "Spatial and Temporal Patterns of Coral Community Structure at Baker and Howland Islands" with Dr. Bernardo Vargas-Angel from the National Oceanic and Atmospheric Administration.

NALANI KITO-HO

Presented on "Using Benthic Imagery to Assess the Coral Reef Community around Wake Atoll" with Dr. Karen Selph from Oceanography and Dr. Bernardo Vargas-Angel from the National Oceanic and Atmospheric Administration.

MCKENNA LEWIS

Presented on "Assessing the Down-Fjord Mechanistic Relationships of Biodiversity and Abundance of Antarctic Benthic Macrofauna of Andvord Bay" with Dr. Craig Smith from Oceanography.

CANDICE MATSUDA

Presented on "Developing Soil Water Retention Curves to Guide Irrigation Needs for the Soils of the Pioneer Farm" with Dr. Jonathan Deenik from Tropical Plant and Soil Science.

KATHERINE PAPACEK

Presented on "The Media's Portrayal of Offshore Aquaculture in the Pacific and how it affects the Public Perception of the Aquaculture Industry" with Dr. Kirsten Leong from the National Oceanic and Atmospheric Administration and Dr. Jenifer Winter from the School of Communications.

KAMMIE-DOMINIQUE TAVARES

Presented on "Sea Level Rise Triggering Widespread Coastal Hardening and Environmental Destruction on Hawaiian Shores" with Dr. Charles "Chip" Fletcher from Geology and Geophysics.

ERIC WELCH

Presented on "Field Assessment and Groundwater Modeling of Pesticide Distribution in the Faga'alu Watershed on Tutuila, American Samoa" with Dr. Henrietta Dulai and Dr. Aly I El-Kadi from Geology and Geophysics.

SUMMER 2018

HARLEE MEYERS

Presented on "Bacterial Pollution Sourcing and Oceanic Transport on the South Shore of Kaua'i" with Dr. James Potemra from Hawai'i Institute of Geophysics and Planetology.

ASHLEY SANCHEZ

Presented on "Oceanographic Contributions to Flooding in Honolulu, HI" with Dr. Philip Thompson from Oceanography.



FALL 2017 GRADUATES ▲



SPRING 2018 GRADUATES ▲



SUMMER 2018 GRADUATES ▲

CONNECTING WITH ALUMNI SERIES

In our hopes to bridge the gap between current GES students and the expanding alumni base, we offer this opportunity for GES graduates to visit the University of Hawaii at Manoa campus and interact in an informal environment with a small group of GES students. Alumni will visit our current GES students to share their experiences in the program and now the workforce.

FALL

GAVIN MURA is a 2014 GES graduate. He is currently a Environmental Scientist at AECOM Technical Services in Honolulu.

ERIC SHIMABUKURO is a 2014 GES graduate. He is currently a Research Oceanography Specialist at the Center for Microbial Oceanography: Research and Education (C-MORE) at the University of Hawaii.

SPRING

BRYAN CHINAKA is a 2013 GES graduate. He is currently a Environmental Scientist at Myounghee Noh & Associates, L.L.C.

HEIDI NEEDHAM is a 2014 GES graduate. She is currently in the Masters Program in Geography at the University of Hawaii, and is also a Graduate Research Assistant in the Ecohydrology Lab.

RYAN UEUNTEN is a 2016 GES graduate. He is currently working at a non-profit organization called Hikia'alani in Hawaii. He also works part-time in the Native Ecosystem Protection Management Office at the Department of Land and Natural Resources in Honolulu.



BRYAN CHINAKA ▲



ERIC SHIMABUKURO ▲

MESSAGES FROM ALUMNI



SPRING 2018 GRADUATION ▲

“Three words: Global Climate Change! I often tell people the GES program teaches a well-rounded environmental program with a focus on climate change. I use my courses on modeling, chemistry and biogeochemical systems most at work in a water quality focused office.”

– RENEE THOMPSON, 2001

“GES has met my professional needs for the past 13 years since graduation. I have continuously held fulltime professional work . . . in [the environmental field such as] a zoology research lab, a compliance inspector for the Florida Department of Environmental Protection, and as a teacher/director of an Environmental Academy.”

– BLAKE VAHLSING, 2004

“[The GES Program] taught me problem solving skills, good communication skills in writing and in public speaking and time management.”

– NATALIE KWA, 2011

“[What I liked most about the GES Program is] the focus on science and math for courses. The heavy course work taught me study habits, focus and dedication that I have implemented many times. Also the community of other GES students and faculty . . . were awesome, positive and helpful.”

– EMILE MEDER, 2013

“GES trained me to be a well-rounded scientist and professional. I learned how to communicate with scientists and non-scientists alike. I will bring my environmental knowledge to the field of public health.”

– MIA DELANO, 2017

GIVING OPPORTUNITIES

We rely on the generous financial support of our alumni and friends. Your contributions, no matter what size, play a critical role in supporting academic achievement and research by students and faculty.

If you would like to make a contribution today, please remove and send in the below pledge form along with preferred payment. Thank you for your support of the Global Environmental Science program!

Gifts to the Friends of GES fund are tax-deductable.

Will you partner with us to support GES students? Contributions can help fund:

RESEARCH EXPERIENCE

Awards will support faculty-mentored undergraduate research projects and experiences.

GES COMPUTER LOUNGE

The GES computer lounge is a valuable, yet outdated, resource for students. We are hoping to renovate the lounge with new computers, furniture, programs, lighting, etc.

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DEPARTMENT OF OCEANOGRAPHY

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