



NUHOU KANAKA PUKA

Department of
GEOLOGY & GEOPHYSICS
University of Hawai‘i, Mānoa
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Inside this issue...

Inaugural REU program	1
Message from the Chair	2
Award for Biass	5
Degrees, Awards & Honors	6
Fred Duennebieer	7
Award for Houghton	9
GG Research highlights	9
Alumni news	13
Field trips	17
Hawai'i Section AIPG	20
Donation form	21

Nuhou Kanaka Puka

Nuhou Kanaka Puka (“Alumni News” in Hawai‘ian) published by the Department of Geology and Geophysics of the School of Ocean and Earth Science and Technology (SOEST) for its alumni and friends.

Chair: Kenneth Rubin

Editors: GG Relations & Honors
Committee

E-mail: ggdept@soest.hawaii.edu

Phone: (808) 956-7640

FAX: (808) 956-5512

GG web site

<http://www.soest.hawaii.edu/GG/>

Follow us on Facebook:

www.facebook.com/UHGeolGeophys/

GG hosts its inaugural NSF REU Program

The US National Science Foundation funds scores of REU sites around the country. For the uninitiated, REU stands for “Research Experience for Undergraduates” and is a program aimed at giving students across the STEM disciplines an opportunity to engage in research. One of the program’s goals is inspiring young minds with a good preparation and curiosity to consider a career in science (not necessarily in academics but the broader opportunities of work in technical and applied science fields as well). While the aim of the program has changed over the years, it is presently focused on increasing participation in the STEM workforce by groups traditionally underrepresented in such endeavors.

Most large oceanographic institutes run REU programs, our department has not hosted such a program before. We decided that we should, and a collective effort to determine what such a program would look like began. We submitted our proposal to NSF in August 2015. Luckily, and somewhat to our surprise, we were awarded funding on our first attempt and started planning our inaugural program for the summer of 2017.

For a department that never has run such a program, we essentially started the planning from scratch. With the help of Brooks Bay (SOEST Illustrations) we designed an attractive flyer, an informative website with application form, and asked faculty to beat the bushes to drum up applications. At the same time, NSF also added links to our site from their list of funded REU sites, which makes it easy for students to find all available REU sites in their area of study.

Over the Christmas holidays, applications started to trickle in, and the trickle had grown to a steady stream by the Feb 1st deadline. We counted almost 650 applications but on closer inspection only 337 were complete (i.e., application form filled out, essay written, transcripts supplied, and a letter of support received from a mentor). Now the hardest part of the program preparations began: The culling of 10 qualified (and lucky) students from the list of 337. We formed a screening committee who helped evaluate the applicants. Our goal was to determine a set of finalists for whom participation in the program would have the biggest impact while still honoring NSF’s intentions with the REU program. Each of our mentors was then given a shortlist of 10 students who had passed the screening and indicated an interest in working with that particular mentor or research topic. While mentors returned a ranked list of each set of 10, the screening committee selected the final 10 (and a set of alternates) that we would offer admission to the program. It was a stellar group of students and with one exception all our first choices happily accepted our offers.

...continued on page 3.

Message from the Department Chair



I am writing this message from a ship at sea, on a research expedition that has taken me, 3 GG grad students and 1 GG postdoc on a journey of time (back to the last deglaciation) and space (to the Line Islands) to hopefully discover new outcrops of drowned coral reefs to study the rates of sea level change their and impacts on reef ecology. It reminds me what a fantastic job I have at the University of Hawaii, and what an interesting and important discipline the Earth Sciences are. Along with nearly 2 dozen other faculty, and over a hundred undergraduate and graduate students, we in the UHM Geology and Geophysics department collectively work around the world, on land and at sea, to broaden understanding of the Earth, to monitor and explore the causes and impacts of events like earthquakes and volcanic eruptions, to examine human impacts on terrestrial environments, and to peer deep into Earth's past for answers about how the planet operates and changes over time. Now more than ever, with political winds in the US blowing against science and reason at many levels, with continual declines in funding of science and science education, and at a time when past and present human activities are increasingly impacting the climate, water, and environment, the world needs places of geoscience learning and research more than ever. Rest assured that the Geology and Geophysics department will continue its work, and hopefully grow and become ever stronger in support of our mission and in service to the people of the State of Hawaii and the world.

Our GG degree programs are vibrant. We have another year of double-digit recruits for our graduate and undergraduate degree programs this academic year, continuing a trend that has been a focus of my time as department chair. We are listening to students and adapting and modernizing our program to meet their needs with increasing emphasis on environmental and applied topics while continuing our leadership in more "traditional" topical areas. Change is not always fast, but it is happening. All the while, teaching evaluations of the faculty remain strong and Geosciences at UH Manoa continues to receive top marks in international rankings. We were in the top 20 in the last Nature ranking, in large part because of the work we do in GG, as well of the work of our colleagues elsewhere in SOEST. GG is the PRIMARY HOME of Geosciences at UH Manoa and we are very happy about the continued international recognition.

This past summer GG welcomed the inaugural class of NSF-REU (research experience for undergraduates) students to the department, in large part due to the efforts of Paul Wessel to get the program funded and to manage it. It was great having this vibrant group of learners in the department over summer 2017. Nearly the entire faculty and many grad students were involved in one way or another, mentoring, providing research, field and social experiences for the participants. GG welcomed a new Department Administrator for VGP this past year, Connie Tsui, and said to farewell to Allison Houghton, who held that position for much of the last decade. We also recently bid farewell to longtime faculty member Janet Becker, who has taken a leave of absence to pursue a new position and Scripps Institution of Oceanography. She will be missed by many.

My colleagues and I remain very grateful to our friends and alumni for your continued financial support. Your gifts to our general and field trip funds have made a very real difference for our students and our program (for instance funding new projectors, computers, and the lion's share of our field trips). If you have not already done so, please consider a (tax deductible) contribution to one of the Department's funds (see the last page of this Newsletter for a copy of the form or click the "donate" button on the GG home page). Every bit you contribute directly helps our students. Thank you!

Ken Rubin, GG Department Chair

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REU, continued from page 1

The first week of the program was designed to get students up to speed on a variety of skills. Students had two days of MATLAB and ArcGIS workshops, mixed with lab safety and public safety training provided by various UH offices. We are particularly appreciative of Tiffany Anderson and Scott Rowland for putting on these workshops, and the students loved them.

The heart of the REU program is the individual research supervised by a dedicated mentor (Table 1). My colleagues had prepared ambitious research projects that the students attacked with vigor for the remaining 8 weeks. The REU students worked very hard on their projects and presented the fruits of their labors as posters at the final symposium (as well as authoring short technical reports documenting their work).

The quality of the projects was very high and many of the students will continue working on the project at their home institution and present updated posters at national meetings, such as GSA and AGU.

However, an REU is not just focused on individualized research projects. Part of the REU program's appeal is the building of a cohort of budding scientists by immersing them in a variety of group activities. I believe the GG REU program has several natural advantages that makes it particularly desirable. First, we planned for a 2-day field trip to the Big Island (which for practical reasons become a 3-day trip) lead by the inimitable Dr. Bruce Houghton, assisted by GG alum Thorvaldur Thordarson and two of Bruce's postdocs (Sebastian Biass and Sebastian Mueller). After traversing the lava, cooking, and living together a very cohesive group returned to Oahu.



The 2017 GG REU Cohort of 10 visiting students from across the US. The 11th student (lower left) is Kayla Brignac who we adopted as part of our cohort (Kayla is a GES major in SOEST and was supported by a NIST fellowship).

We had also proposed to take advantage of SOEST's ship operations and requested resources for a 3-day oceanographic cruise on the R/V Kilo Moana. Here, Chief Scientist Deb Eason and co-Chief Rob Dunn put together a kick-ass science plan that involved three days of frantic mapping, dredging, and processing of rocks and digital data at sea, greatly assisted by Prof. Emeritus John Sinton and other participants. I have never seen so many smiles when I

met the group at the pier following the cruise! These two major experiences book-ended to some extent the REU program, but wait, there was more: Chip Fletcher led the students in a kayak trip and Quaternary geology expedition to the Mokuleias, we visited the Pacific Tsunami Warning Center to learn about earthquakes, tsunamis and the nature of the tsunami warning system, and we joined forces with another UHM REU Site program (in biodiversity) to visit the Hawaii Institute

for Marine Biology on Coconut Island as well as hiking the Palehua trail in the Waianae.

If the GG program was a huge success (and I believe it was) it was to a large measure thanks to our two graduate student assistants Kate Herries and Warren McKenzie. Kate and Warren tirelessly arranged weekly group meetings, took care of several workshops focused on abstract writing and poster design, and expertly maintained our presence on social media (e.g., <https://www.facebook.com/UHGGREU>). I learned quickly to stay out of the way (i.e., “delegate”) and witness great things happening.

Yet all good things must pass, and on August 4th, after the joint symposium with the biodiversity REU program we wrapped up our program with a small

Mahalo and Aloha ceremony. Here, mentors gave certificates to their students and commented on how impressed they were with their apprentices. As thanks for their sustained effort, students also got a GG REU T-shirt that they collectively had designed, and each mentor got a coffee mug with the same design. We said our goodbyes but already know we will see many students again at meetings in the near future. Soon, it will be time to start the cycle all over, starting by identifying the next group of mentors and tweaking our program based on lessons learned this summer. All in all, I believe the REU program is a good addition to our research, education and outreach activities. We have much to offer and cannot wait to get the next summer planned.

REU Mentors and projects.

Burstein, Jacob [*U. South Carolina*. Mentor: *Fletcher*]. Jake used our coastal erosion model to project shoreline movement under future sea level rise at 4 turtle nesting beaches on the North Shore of Oahu. When the shoreline migrates within 20 feet of existing roads and homes it triggers an emergency permit that can lead to seawall construction. Seawall construction on an eroding shoreline leads to beach loss, in this case critical habitat loss. Jake probed this phenomenon with his modeling to provide improved management information to government officials.

Burstein, Joshua [*U. South Carolina*. Mentor: *Smith-Konter*]. Josh worked on a 4D visualization project of seismic and geodetic data of the Big Island, Hawaii. Using state-of-the-art visualization tools, he integrated new seismicity data, seismic velocity models, GPS crustal motions, and crustal deformation models to improve our understanding of the architecture of the Big Island volcanic system.

Chang, Jennet [*Am. Samoa Comm. College*. Mentor: *Dulai*]. Sea level significantly affects not only coastal flooding and erosion but the condition of the coastal aquifer. We used the 2017 king tides to document the interplay between submarine groundwater discharge at low tide and seawater intrusion at high tide in Kaneohe Bay Oahu. Using electrical resistivity imaging of the shallow subsurface we found that seawater intrusion was present as much as 4 m below the subsurface and was completely flushed at the following low tide by brackish water discharging from the coastal aquifer.

Guest, Imani [*Rider U.* Mentor: *Garcia*]. Imani studied mantle xenoliths from Salt Lake Crater, Oahu to determine the geothermal gradient for the Hawaiian swell. She was analyzing the composition of minerals in these rocks using the SOEST electron microprobe to determine temperatures and pressures for the deep-seated mantle rocks. The results from this work will be utilized by a NSF funded study to look how the crust and mantle under Hawaii responds to the rapid loading by Hawaiian volcanoes.

Kitamikado, Christina [*El Camino College*. Mentor: *Martel*]. Christina investigated, from a theoretical standpoint, the flexure of the oceanic crust beneath the Hawaiian Islands through time. She was using MATLAB and the fundamentals of continuum mechanics to produce time-dependent computer models of the flexure beneath axisymmetric island loads.

Kubica, Marcelina [*Yale U.* Mentor: *Popp*]. Marcelina investigated the use of compound-specific stable isotope analysis of amino acids in hair as a means reconstructing diets of ancient populations. Knowing past diets can be crucial in understanding the intrinsic connection between human behavior and use of natural resources. She analyzed hair from members of three tribes surrounding Lake Turkana, Kenya whose subsistence is distinctly different - freshwater fish, camel or cattle/goat based.

Litchmore, Daniel [*Northeastern U.* Mentor: *Glenn*]. Dan’s project used a drone equipped with a thermal infrared camera to observe stream discharge behavior as it meets a saline endmember. It allowed for the visualization of discharge plumes and a better understanding of stream outlet dynamics that would normally be nearly impossible to observe with just a normal camera.

Pettus, Holly [*W. Virginia U.* Mentor: *Konter*]. Holly used the electron microprobe to use mineral compositions to help estimate the depths and temperatures that a series of mantle rocks originated from during a

volcanic eruption. She also compared her results from experiments of known temperature and pressure estimated conditions to assess the accuracy of the technique.

Regensburger, Paul [*North Carolina State U. Mentor: Ito*]. Where two tectonic plates collide, they can form mountain belts, which create dramatic landscapes and are zones of major earthquake activity. Paul used computational geophysical models to illuminate the processes that govern the location of major fault zones in mountain belts as well as the stresses they support.

Zuniga, Leann [*California State U. Mentor: El-Kadi*]. LeAnn utilized laboratory and modeling in assessing contaminant transport in porous media. A tracer was used to determine the velocity of water movement and examine the dispersion (or spreading) effects when fresh water displaces brackish water or vice versa. In addition to the experimental work, LeAnn applied a mathematical model and software to simulate the time evolution of contamination concentrations and estimating transport parameters.

The author: Paul Wessel

* * *

IAVCEI George Walker Medal awarded to Sebastien Biass

Sébastien Biass, a GG post-doctoral researcher, was honored by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) with the George Walker Medal.



The George Walker Award is given every two years to a young scientist up to seven years after acquiring a doctoral degree. The award recognizes achievements of a recent outstanding graduate in the fields of research encompassed by IAVCEI.

Sébastien Biass, post-doctoral researcher working with SOEST volcanologist Bruce Houghton, was honored for “achievements that are all deeply rooted in field studies and because of his unique appreciation with the importance of statistical and critical treatment of field data within the growing field of numerical modelling,” cited professor Costanza Bonadonna of the University of Geneva. “His unique approach, stems from combining thorough field studies with state-of-the-art numerical modeling, furthering both deposit characterization and the newly-born discipline of hazard and risk

assessment that he is pioneering. What makes Sébastien unique in his science is his open mind and multidisciplinary approach, his scientific curiosity and enthusiasm and his dedication to going beyond his own limits.”

Biass commented “My vision of the IAVCEI George Walker Award for early career scientist is closely tied to my vision of scientific research, which contains three components. First, scientific curiosity is one of the greatest source of pleasure in life and provides the motivation to attempt understanding the unknown. Second, luck, in the selection of work colleagues, has been an integral part of my research. Specifically, Costanza Bonadonna and Bruce Houghton, both part of the UH family in either past or present, have shown me how working on interesting science with bright people is an invaluable source of satisfaction. Thirdly, I see research as having a global objective of the wellbeing of society, which in volcanology translates to a better understanding of the physics of hazardous processes occurring during eruptions in order to mitigate better the impacts on exposed communities. This award therefore represents a success on these three levels and belongs as much to everyone I have ever looked up to as it does to me. Having been picked amongst a long list of such successful young scientists humbles me and gives great motivation to pursue my scientific career.”

The award honors the memory of former UHM geology professor George Walker, whose discoveries pioneered a modern quantitative approach to physical volcanology and greatly accelerated understanding of volcanic processes.

Degrees, Awards & Honors

Undergraduates

Sean Hoffman - BA Summer 2016
Amy Kitchener - BA Summer 2016
Hannah Azouz - BS Summer 2016
Jaclyn Guenther - BS Summer 2016
Raymond Moore - BS Summer 2016
Nicholas Vaiana - BS Summer 2016
Natalie Johnson - BS Fall 2016
Shyun Ueno - BS Fall 2016
Liliane Brukhard - BS Spring 2017
Samantha Burns - BS Spring 2017
James Mifflin - BS Spring 2017
Danny Powell - BS Spring 2017
Sebastian Quinn - BS Spring 2017
Gavin Zirbel - BS Spring 2017

Masters of Science

Joseph Kennedy -Coupling Aircraft and Unmanned Aerial Vehicle Remote Sensing with Simultaneous In-Situ Coastal Measurements to Monitor the Dynamics of Submarine Ground-water Discharge (Advisor: C. Glenn, Summer 2016)
Christina Richardson - Geochemical Dynamics of Nearshore Submarine Groundwater Discharge: Maunaloa Bay, O'ahu, Hawai'i (Advisor: H. Dulai, Summer 2016)
Nicole Robinson - A High-Resolution $^{187}\text{OS}/^{188}\text{OS}$ Record for the Late Maastrichtian (Advisor: G. Ravizza, Summer 2016)
Clifford Evan Watkins -Constraints on Dynamic Topography from Asymmetric Subsidence Across the Mid-Ocean Ridges (Advisor: C. Conrad, Summer 2016)
Telma Sigurdardottir - Audiomagnetotelluric exploration across Wai'anae Range, O'ahu, Hawai'i (Advisors: G. Apuzen-Ito & D. Thomas, Fall 2016)
Jonathan Tree - Mantle Potential Temperatures of 4.5 to 47 MA Hawaiian Volcanoes Using Olivine Thermometry: Implications for Melt Flux Variations (Advisor: M. Garcia, Fall 2016)
Hannah Azouz -Impact of Surface Runoff Derived Biodiesel on Marine Microbial Populations (Advisor: H.Dulai, Spring 2017)
Bianca Mintz -Analysis of Spattering Activity at Halema'uma'u in 2015 (Advisor: B. Houghton, Spring 2017)
Julie Schnurr - Air Blasts: Explosion Yield Estimation and Waveform Modeling (Advisor: M. Garces, Spring 2017)

MGeo- Masters in Geoscience

Ksenia Trifonova- Advisor: J. Becker, Summer 2016
Gregg Nakano- Advisor: A. El-Kadi, Fall 2016

Doctor of Philosophy

Tayro Acosta-Maeda -Raman Spectroscopy for Planetary Exploration and Characterization of Extraterrestrial Materials (Advisor:S. Sharma, Summer 2016)

Joseph Fackrell - Geochemical Evolution of Hawaiian Groundwater (Advisor: C. Glenn, Fall 2016)
Samuel Howell -Faulting and Deformation at Divergent and Transform Plate Boundaries (Advisor:G. Apuzen-Ito, Fall 2016)
Myriam Lemelin -The Composition of the Lunar Crust: An In-Depth Remote Sensing View (Advisor: P. Lucey, Fall 2016)
Silke Ballmer - Ambient Seismic Noise Inter-ferometry on the Island of Hawai'i (Advisor: R. Dunn, Spring 2017)
Kendra Lynn - Compositional Zoning in Kilauea Olivine: A Geochemical Tool for Investigating Magmatic Processes at Hawaiian Volcanoes (Advisor: M. Garcia, Spring 2017)
Jonathan Sleeper - Tectonic & Magmatic Controls on Extension and Crustal Accretion in Backarc Basins, Insights from the Lau Basin & Southern Mariana Trough (Advisor: F. Martinez Spring 2017)

Student Awards

Agatin Abbott Memorial Award

Presented to the outstanding senior, annually, in memory of department faculty Agatin Abbott.

Liliane Burkhard

Fred M. Bullard Continuing Student Fellowship

Endowed by Thais Freda Bullard in memory of her father, Fred M. Bullard, a pioneer in the studies of Volcanology and general Geology & Geophysics. **Yi Hu, Xiaojing Lai, Trista McKenzie**

Harold T. Stearns Fellowship

Endowed by longtime department friend for the purpose of supporting student research on geological and geophysical problems in Hawaii and the Pacific Basin. **Daniel Dore, Katherine Herries**

J. Watumull Scholarship

Awarded annually to the department's outstanding graduate student from an endowment from the Watumull Foundation. **Xiaojing Lai, Andrea Gabrieli**

ARCS Award

Awarded by the Achievement Rewards for College Scientist Foundation. **Haunani Kani**

GG-OGE Achievement Scholarships

Andrea Gabrieli, Katherine Herries, Yi Hu, Samantha Isgett, A Pleus, D. Tachera, C. Shuler, S. Mitchell

Other Fellowship, Scholarships & Awards

Trista McKenzie won the 2017 first place on AGU virtual poster competition.

* * *

Fred Duennebier, 1943-2017

With profound sadness the Department acknowledges the passing of our colleague Fred Duennebier on October 12, 2017. With a BS in physics from Trinity College (Hartford, Connecticut) Fred was one of our own, earning both M.S. (1968) and PhD (1972) degrees from the University of Hawai'i under the supervision of Dr. George Sutton. Following a brief stint in Lunar and Planetary Seismology at the University of Texas, Fred returned to the Hawai'i Institute of Geophysics as an associate geophysicist in 1975, and was hired by the Department of Geology and Geophysics in 1981, becoming a full professor in 1984, where he remained until his retirement in 2009. He was associate Chair of GG during 1992-1993 and Department Chair 1993-1996. He was recognized by the University of Hawai'i as a UH Distinguished Alumnus in 2005.



Fred's research career was characterized by fearless innovation and creativity. It began with his involvement in the NASA Apollo lunar program to deploy seismometers on the Moon. He and his team discovered "moonquakes" and used meteoroid impacts to study the internal structure of the moon. He was involved with a number of Apollo missions including Apollo 11, 14, 15, and 17. With this proven expertise, he became a co-investigator of the Viking Mars Seismic Experiment, which used a seismometer on the Viking lander to probe the deep subsurface of Mars. The only environment more challenging to make seismic measurements than outer space is the deep seafloor. With George Sutton, Fred pioneered the development of the first

generation of ocean bottom seismometers and, in the late 1980s, installed one of the first seismometers in an ODP borehole in the northwest Pacific.

Fred was a pioneer in establishing real-time observatories on the seafloor, commonly using repurposed telecommunication cables. These include HUGO (the Hawai'i Undersea Geo-Observatory on Lō'ihi), he was co-leader of teams that established the Hawai'i-2 Observatory (H2O) halfway between Hawai'i and California, and the Aloha Cabled Observatory (ACO) at Station Aloha, north of O'ahu. He brought in more than \$10 million in research funding for these projects and left a record of more than 100 publications in high-quality journals.

Although Fred's research accomplishments are as significant as any in our department, many will remember him most fondly for other aspects of his life and career. He was truly passionate about education, the scientific method, and his devotion to students.





He deflected praise deftly, never sought the spotlight, and was most eager to promote the successes of his teammates, and especially his students. He had immense technical proficiency in electrical engineering, spectral analysis, and digital signal processing, but it was his caring attitude and determination to get the very best out of his students that likely made him among the most widely sought as a graduate mentor. He served on more than 60 (!) graduate committees in the department, including serving as the principal advisor of 16. He reminded his students that teaching and outreach are at least as important as research, and he walked the walk. He judged at the Hawai'i State Science Fair; he was a frequent guest to local elementary and high schools; he participated in alumni education; he taught with enthusiasm and proficiency at all levels offered in the department. For hundreds, perhaps thousands, of school-age kids he will

forever be known for his “Make-a-Quake” demonstrations at schools and during the biennial open house. The latter seemed to delight him no end, showing keiki how to locate epicenters of earthquakes they made themselves by swinging a sledge hammer or jumping up and down. Like few others, he made science fun.

Fred was the consummate marine scientist, and encouraged every student in the department to go to sea. He led by example, worked long hours, played games and had fun, fixed anything that broke, and, ever the teacher, taught everyone how to lose at the poker table after watch. Fred's abilities at poker are legendary. He hosted and won the inaugural HIG (now SOEST) World Series of Poker in 1981, and, as required of the winner, hosted again the following year. He repeated this feat four more times over the years and probably would have won even more often if his wife Terri hadn't instructed otherwise. Hereafter the WSOP champion's trophy has been named the Duennebier Memorial Trophy in his honor.



Fred was extraordinarily kind, treated everyone with respect, and loved a good practical joke, especially during comprehensive exams. He was a humble man who placed family above all else, yet somehow seemed to always be available to the department and our students. We are deeply saddened by the loss, but will forever be inspired by his example.

Written by John Sinton, with help from others



IAVCEI Thorarinsson Medal awarded to Bruce Houghton

Bruce Houghton, the Gordon A. MacDonald Professor of Volcanology and Science Director of the National Disaster Preparedness Training Center at UHM was honored recently by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) with the Thorarinsson Medal.

The Thorarinsson Medal is awarded only once every four years by the IAVCEI for outstanding contributions to volcanology, and is the highest award in international volcanology.

"A giant of volcanology, Bruce has tackled 'big' problems in geology with innovative approaches and technologies, and is truly a scientist of outstanding distinction," stated University of Tasmania's Rebecca Carey in her nomination letter. *"His research has not only generated a wealth of new scientific understanding, but also critically Thorarinsson-type pioneering advances in long-standing cornerstone volcanologic concepts."* Further, Houghton has pioneered research across the interface of fundamental volcanological science and hazards, social and behavioral science, leading to a world-first detailed training course for scientists, first responders and emergency managers, titled the U.S. FEMA Volcanic Crisis Awareness course.

Houghton and his predecessor at UHM, George Walker, are among the only nine volcanologists to-date given the Thorarinsson award, an award named for the noted Icelandic geologist and volcanologist Sigurdur Thorarinsson.

Houghton reflected on becoming a Thorarinsson Medalist; *"I was delighted and surprised by the award. All my research is collaborative and, since moving to UH 70% of my papers have been first-authored by my students or postdocs, and these are not the type of statistics that usually lead to such awards. I was particularly pleased because all three of my mentors in volcanology are in the list of eight prior winners of the medal; it is quite humbling to be joining them. For UH to have been awarded two of the nine Thorarinsson Medal to-date is, I think, a sign that volcanology is in excellent health here in Hawaii. The challenge now is to find ways to build on this reputation and capture for UH some of the wonderful crop of young volcanologists on the market."*



Bruce near Ruapehu, New Zealand

* * *

2016-2017 GG Faculty Research and Teaching Highlights

Garrett Apuzen-Ito is advising three new graduate students. **Alexandra Pleus** (M.S.) is developing models of lithospheric flexure along the Hawaiian seamount chain to use with gravity data collected onboard the Schmidt Institute's R/V Falkor. The goal is to invert for parameters that control the rheology of the oceanic lithosphere, which is not well understood. **Karl Gerstnecker** (MGeo) is creating an education demo about renewable energy and climate change, the centerpiece being a windmill that can be readily assembled with salvaged parts available all over the world. **Elise Leroux** (MGeo) is collecting data to look for trends in slow-moving landslides that impact homes and other developments around Oahu. Garrett is finishing up projects with **Samuel Howell** (Ph.D 2016), now a postdoctoral scholar at the JPL (Pasadena CA), and **Jonathan Weiss** (Ph.D 2016), now a postdoctoral scholar at Leeds University UK.



Garrett and Diamond Tachera (M.S. student with Nichole Lautze) went gravimeter prospecting for geothermal heat on the Mauna Kea's SE flank in March. You can beat the view! **Henrieta Dulai** leads a research group that applies geochemistry to address crucial water quality problems

in the state and across the Pacific. Thanks to continued support from the Water Resources Research Center the Dulai lab has a strong presence in American Samoa. Currently, postdoc **Olkeba Tolessa Leta** works on modeling sediment fluxes in the Faga'alu watershed and GES undergraduate **Eric Welch** leads the study of pesticide distribution and flux across watersheds on the island of Tutuila as his senior thesis project. Eric received funding from the UH Undergraduate Research Opportunities Program and won first place in the UH Manoa Undergraduate Showcase Best Talk in Natural Sciences. Hawaii has its own problems we are trying to tackle. Graduate student **Trista McKenzie** has been making great progress on a Sea Grant funded project focusing on developing new tracing techniques for groundwater specific contaminants using the combination of radon, nitrogen isotopes, and contaminants of emerging concern. She hopes to help resolving water quality problems resulting in beach closures in Kahaluu, Oahu.



Trista McKenzie collecting water samples in Kahaluu

Dulai and graduate student **Catherine Hudson** are part of the Ike Wai team in an NSF funded project studying Hawaii's water resources. Catherine is looking at the geochemical signature of groundwater discharging to the ocean along the coastline and what it can tell us about its origin, age, and flow path. Dulai and UH Undergraduate Research Opportunities Program funded GES undergraduate student **Elizabeth Dionne** collaborate with David Ho from UH Oceanography and his team on studying the role of groundwater discharge and tidal pumping on carbon fluxes in the Florida Everglades. Last but not least, we say goodbye to **Hannah Azouz** who graduated in Spring 2017 with MS from GG. Good luck and we are happy you could be part of our team!

We were busy in the summer of 2017 when we hosted **Jennet Chung**, a student from American Samoa Community College as one of the GG REU cohort students who spent two months with us studying groundwater discharge and seawater intrusion during the king tides of summer 2017. We involved Jennet in

some serious fieldwork when our whole team joined her deploying electrical resistivity cables and collecting water samples from dusk to dawn. Jennet, you should be proud of yourself, you did a great job!

Neil Frazer continues to work with colleagues Garrett Ito, Nicole Lautze, Don Thomas, Steve Martel and others on geothermal exploration in Hawaii; with Rhett Butler on the probability of large tsunami-generating earthquakes on the global subduction system; with Garrett Ito, Paul Wessel and MS candidate **Alexandra Pleus** on lithosphere rheology; with grad alumnus **Sean Vitousek** (University of Chicago) and Tiffany **Anderson** on increases in the frequency of flooding due to sea level rise; with Martin Krkošek (University of Toronto) on disease transfer from sea-cage farmed salmon to wild salmon; and with Bin Chen (HIGP) to estimate error bounds on seismic velocities extrapolated into the deepest mantle from laboratory measurements at lower values of pressure and temperature.

Greg Moore continued his research on tectonics and sedimentation in convergent margins. The highlight of the year was a 2-week cruise with his German and Swiss colleagues on the German R/V Sonne in the Kumano forearc basin south of Japan in October. The group is working on high-resolution multibeam bathymetry data to study surficial landslides (see below). Greg also attended a workshop in Korea to formulate an IODP drilling proposal for the eastern Korean margin and presented a talk on large mud diapirs in Kumano Basin at the Japan GeoScience Union meeting in Tokyo in May. He also helped with the GSA Cordilleran Section meeting that was held at the Hawaii Convention Center in late May. He also continued work on the application for a permit to collect seismic reflection/refraction data on the NE Hawaiian Arch in September, 2017, as a Site Survey for future MoHole drilling. This project will involve the UH group deploying and recovering the OBSs, with the shooting being done by our JAMSTEC colleagues on their R/V Kairei.

Greg's group doubled in size with the addition of Ph.D. student **Jason Lackey**, and active duty U.S. Air Force Captain, who formerly taught at the U.S. Air Force Academy. Jason is moving along swiftly -- he passed his Ph.D. comps in June and submitted his first paper on landslides in the Kumano forearc, using the Sonne bathymetric data.

Brian N. Popp continues his isotope biogeochemical research focusing on nitrogen cycling in marine environments, marine food web studies and the marine mercury cycle. **Joy "Leilei" Shih** (Oceanography

Ph.D. Student) is examining the importance of ammonia oxidation associated with sponges on the nitrogen budget of reefs in Kaneohe Bay, Oahu. Joint with Jeffrey Drazen (UH Oceanography), Cecelia Hannides (G&G Assistant Researcher), Kanesa Duncan Seraphin (UH Sea Grant Center for Marine Science Education) and Hilary Close (UCSC/USGS) we are using amino acid compound specific nitrogen isotope analyses to study the trophic ecology of meso- and bathy-pelagic organisms in the ocean north of Oahu. This group is also using trophic positions derived from isotopic analyses of amino acids to examine methylmercury bioaccumulation in pelagic fishes and zooplankton and, in combination with isotopic analysis of mercury (with Joel Blum, University of Michigan), we hope to better constrain mercury cycling in the ocean. Check your local television schedule for our upcoming Voice of the Sea documentaries on these two projects. The first of our three TV episodes focused on mercury research in the food web recent won a Bronze Telly Award for Educational Television Programming! New field work will take me to the Antarctica in January-February 2018 to study microbial nitrogen cycling.

Scott Rowland — The one different thing I did in the 2016-2017 academic year was go on sabbatical for 6 months. That time sure flew by in a hurry! I didn't go anywhere for long, but was able to attend GSA in Denver, conduct field work on Moloka'i, and join ex-HIGP-er Andy Harris and his crew on Kīlauea for a few days. I organized field trips for the GSA Cordilleran Section meeting in May – Craig Glenn deserves tons of credit for pulling off such a monumental undertaking with only a shoestring organizing committee.

Along with Kevin Gooding of Intera, I am working on re-constituting the Hawai'i chapter of the AIPG (American Institute of Professional Geologists), and hoping that it can double as a Hawai'i Geological Society of some sort (we haven't decided on its exact name yet). Regardless of the name, the goal is for geological types of all flavors in Hawai'i to communicate and cooperate better, both professionally and socially. If you are interested in participating, please contact me.

In February, GG graduates Rachel Gilooly (BS 2003; AECOM), Travis Takashima (BS 2015; St. Louis School), Amy Kitchner (BS 2016; KUPU) and Shyun Ueno (BS 2016; Hart Crowser, Inc.) all took time out of their busy schedules to come and talk to current undergraduates about what they can expect out in the real world. We're very proud of all four of these graduates, and they illustrate the wide variety of fields

that a GG degree prepares a student for. Mahalo for making the effort to encourage and educate the next generation!



The Moloka'i field site was Ka'āpahu (the truncation), a thick benmoreite flow sequence mauka of Kamalō.

I (and Julia, who took over when I was on sabbatical) would like to thank the GG101L TAs for their hard work this past year: Estelle Bonny (F16), Kate Herries (F16), Alexandra Pleus (F16), Alyssa Anderson (S17), Hannah Azouz (S17), and Warren McKenzie (S17).



Travis Takashima, Amy Kitchener, Rachel Gilooly, Shyun Ueno

Ken Rubin Ken Rubin is looking forward to his last year as department chair and continues his research on land and at sea. He and colleagues are working on active submarine volcanism, deglacial sea level change and cyber-infrastructure for Earth Sciences. Ken has two Schmidt Ocean Institute research expeditions on R/V Falkor this year, both of which are 2-leg extravaganzas with autonomous robots mapping the sea bed in high resolution on a first leg, followed by

ROV diving on a second leg. One project is on right now, examining drowned coral reefs formed during sea level change at the end of the last ice age on the “**SeaLevel Secrets**” **cruise** (https://schmidtocean.org/cruise/unraveling_ancient_-_sea_level_secrets/), and the other in Nov-Dec 2017 is studying volcanic growth histories and ecosystems in a dense volcanic province in Tonga’s **NE Lau Basin** (<https://schmidtocean.org/cruise/underwater-fire-studying-submarine-volcanoes-tonga/>). Grad student Kate Herries (shown below, at the science camera controls of ROV SuBastian) and Postdoc Val Finlaysson are working on topics related to these two projects, respectively.



Kate Herries and others in the ROV control room

Steve Stanley states: “I have published a paper introducing a new technique for estimating the magnitudes of major mass extinctions, which corrects previous estimates in subtracting out extinctions that preceded terminal mass extinctions within mass extinction intervals. The most important result was a demonstration that the biggest mass extinction of all time, that of the terminal Permian, only removed about 81% of species, not 90-95%, as customarily claimed. Contrary to the common claim, life did not nearly die out in this crisis. I have a manuscript nearly completed showing that the onset of the modern ice age of the Northern Hemisphere brought on extinctions via climatic cooling that substantially reduced the diversity of mollusks in the Western Atlantic. Another nearly complete manuscript shows that the strophomenatans, the largest group of Paleozoic brachiopods, were shallow infaunal animals, not members of the epifauna.

Still another nearly complete manuscript, based partly on a uranium-lead date, shows that the largest migration of mammals from South America to North America in the Great American Interchange, occurred slightly before 3 million years ago, not 2-5-2.7 million years ago, as previously believed. My post-doc, Sonia Rowley, has received the prestigious David Attenborough Award for research in field biology. She continues her seminal work on sea fans and sea whips, and is also collaborating with me on a project showing that the strong water movements in shallow seas around Oahu are restricting many groups of mollusks to relatively deep waters.”

From Thanksgiving to mid-January, **Paul Wessel** was Chief Scientist for an oceanographic expedition on the R/V Kilo Moana to the remote Ellice Basin, which lies between the Ontong Java and Manihiki Plateaus in the South Pacific. Thanks to ship repair delays, the cruise’s initial schedule from 10/31–12/16 kept slipping and ended up straddling the 2016 to 2017 transition. Other GG participants were Eric Hellebrand, who stepped in on short notice to replace co-PI Anthony Koppers (OSU) as dredger-in-chief, my graduate student **Elizabeth Benyshek**, and former student (now post-doc at KIOST, S. Korea) **Michael Chandler**, assisted by students from OSU and the U of Sydney. Working in reconnaissance mode, we investigated the modes of opening of this basin using multibeam mapping. Formed during the Cretaceous Superchron, the seafloor showed no magnetic stripes and we instead dredged selected tectonic corridors for dating via seafloor basalt ages (performed at OSU). Wessel also continues work on GMT 6, now with new post-doc Leo Uieda who is designing and develop the long-awaited Python interface to GMT – initial design plans and a working prototype running in a Jupyter notebook were presented at the Scientific Python conference in Austin, TX in June. Earlier in the year, with colleague Joaquim Luis from U Algarve, Portugal, Wessel also released the GMT/MATLAB toolbox, allowing MATLAB and Octave users direct access to the GMT toolset. The summer was spent supervising the GG REU Site program before heading to the annual GMTSAR Workshop and Developer’s Conference at Scripps for scientists and developers interested in radar interferometric imaging of surface deformation.

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Alumni News

Gerard Fryer (MS 73, PhD 80) recently retired from the Pacific Tsunami Warning Center. In addition to his PTWC colleagues Chip McCreery (PhD 1992) and Nathan Becker (PhD 2005), other G&G alums at his retirement party were David Phillips (PhD 2003) and Dan Walker (PhD 1972). Gerard's wife, Patricia Fryer (MS 1973, PhD 1981) took part via a video link from the drillship Joides Resolution, where she was Co-Chief Scientist. Despite retiring, Gerard serves as Chair of the Hawai'i Earthquake and Tsunami Advisory Committee and is a Volunteer (Natural Hazards) at Hawai'i Emergency Management Agency. Gerard maintains his connection to UH as an Affiliate Researcher in Hawai'i Institute of Geophysics & Planetology. He is (still) working on deciphering the enigmatic Aleutian tsunami of April 1, 1946, and also wanders around the islands inspecting deposits left by megatsunamis from giant Hawaiian landslides.



Scott Rowland (PhD 87): I am currently a Specialist in the Geology & Geophysics Dept., mainly teaching classes. I recently went to Oregon to visit my brother and his family, and took (L -> R) my parents, sister, and son to Crater Lake.



Scott's family at Crater Lake

Geoffrey Garrison (PhD 02): I'm working in the startup clean tech world trying to expand generation of geothermal electricity using Enhanced Geothermal Systems (EGS). I'm currently working with the HotRock Energy Research Organization (HERO) in Seattle developing projects using new EGS technologies to expand geothermal resource development into unconventional areas. What used to be called "Hot Dry Rock" has become commercial in Europe. I'm trying to help make it work in the US.

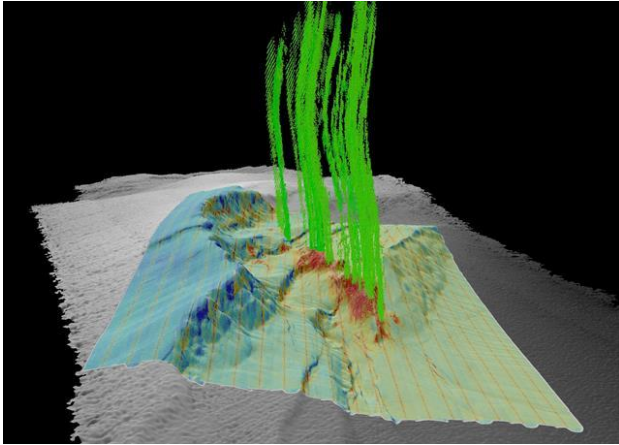


Geoff getting some field work in with Koa

Jeremy Kimura (BS 03) was recently married and continues to work at the Hawaii Commission on Water Resource Management. He spends his leisure time watching television and making bean soup.

Jim Gharib (PhD 06): I work for the Fugro group of companies. Fugro is a Dutch multinational company, with over ten thousand employees worldwide, that provides geotechnical, survey, subsea, and geoscience services. I am Fugro's global product manager for hydrocarbon seep exploration. I run projects involving mapping the seafloor with echosounders and integrating the echosounder data with other datasets (e.g. seismic, grav/mag, etc.) to identify geological features associated with natural hydrocarbon seepage, and then sampling these features to analyze their geochemical signatures. A recent standout project we did was the combined Mexico and US Mega Survey with TGS Nopec and Oro Negro Energy. We mapped just short of 1 Million square km of seafloor in the

Gulf of Mexico and Caribbean from 2015 to 2017, making it the **largest contiguous seabed mapping survey** [\[link\]](#) of its kind in human history. Other UH alums working with me include Stephanie Ingle (at UH from 2005-2007) and Ed Saade (at UH from 1977-1979). Stephanie is a Sales and Marketing Specialist and a Consulting Geoscientist. Ed is the President of Fugro USA Inc. and the Regional Director of the Marine Division for Fugro's Americas Region (North and South Americas).



Three-dimensional perspective of a hydrocarbon seep

Aaron DeLoach (BS 10): I am currently assistant lab officer aboard the JOIDES Resolution, an international deep sea science drilling vessel. I have just started my 8th expedition to study the paleo climate and tectonics of the Tasman Sea. Helping scientists to further our understanding of some the more remote and least studied geologic settings around the world, while getting to travel, is the most rewarding work I have ever done. Plus, I get to return home to Hawaii every two months. Thank you University of Hawaii and all the amazing faculty at SOEST.



JOIDES Resolution in Hawaiian waters

Mark Higley (BS 11) I spent last summer doing seasonal work as a Land Health Assessment technician

with the Great Basin Institute in Northern Nevada. We did extensive remote field work living out of a tent 8 days at a time. We looked at relationships between soil and plant communities and how human and animal activities affect them. Some of the most fascinating work I have done in the most beautiful areas. That was one of the best summers I can remember. Since then I am back in Hawaii working as a geologist with AECOM.



One of Mark's field sites with the magnificent Ruby Mountains in the background.

In June, **Adonara Mucek (BS 11)** completed her Ph.D. in Geology at Oregon State University, successfully defending and submitting her dissertation entitled "*Investigating Timescales of Resurgence at Large Calderas: Post-74 ka Activity at Toba Caldera, Sumatra, Indonesia*". She also managed to get a chapter, "*Post-supereruption recovery at Toba Caldera*", published in Nature Communications, her first first-author paper. She is currently tying up loose ends in Oregon, presenting another chapter at the IAVCEI conference in Portland in August, before going home to Singapore to be with family. Her immediate plans involve helping her parents at home and going to New Zealand to WWOOF, while applying for possible jobs/positions closer to home.



Ado and her parents, after the graduation

Sarah Glancy (MS 14): After graduating in Fall of 2014, I moved to the other side of O‘ahu to teach geology classes at UH - West Oahu as a lecturer. I love teaching college students, especially showing them how geology applies to their lives. I proposed a new course for UHWO, Geological Hazards, in Fall of 2015 and am now teaching it. During the summer months, I have had the opportunity to attend MSIREaCH, School of Ice, the AMS Climate Studies Diversity Project, and Earth Science Educators’ Rendezvous conferences. I visited Australia in June and snorkeled in the Great Barrier Reef! Mahalo to all of my UH ohana for all of their support!



Sarah in Australia

Lerma Gamiao (BS 14): Since graduating in the spring of 2014, I began working as a GIS Technician-I with the U.S. Army Corps of Engineers (USACE) at Fort Shafter. The first project I worked on was to build a geodatabase for the Department of Transportation (DOT), Harbors Division’s GIS which focused on mapping improvements, structures, and environmental hazards within Honolulu Harbor and Kalaeloa Barbers Point Harbor (KBPH). Last year, our group started working on mapping water, fire and sewer features within Honolulu Harbor and KBPH to be integrated into the DOT Harbors Division’s GIS. I also get to work on smaller projects which includes analyzing LiDAR data for anomalies, rockfall surveys, and making simple maps.

After almost three years of working with the USACE, I recently got promoted as a GIS Technician-II. I am now focusing my work on real estate and reviewing GIS data to make sure that it is compliant with Army standards. Although I don’t get to work on a lot of geology, I am able to apply the things that I have learned from the GG Department into the work that I do now. Aside from work, I have also been traveling to different places. I was able to visit the Philippines after 15 years, see the New York City lights, South Carolina, Hilo, and Tokyo, Japan.



Lerma visiting Japan

Logan Magad-Weiss (BS 16): I’m at UC Riverside getting a masters. My project is using carbon and oxygen isotopes to better constrain the rise and fall of oxygen during the paleoproterozoic. My study sight is located in the east arm of the Great Slave Lake in the Northwest Territories in Canada. We are looking to find evidence of the lomagundi carbon isotope excursion, a carbon isotope excursion from ~2.22-2.06 Ga where carbon values became highly positive, on the order of +8. We are searching for it in unaltered carbonates, and looking for black shales that represent a potential ocean deoxygenate of event that could’ve brought the carbon values back to ~0 per mil as we see in the isotope record.



Logan at Great Slave Lake, Canada

Lhiberty Pagadua (BS 16) This was my first trip to the Philippines and I met a few relatives from my mother's side. My cousins recommended to visiting Go Kart Racing, Tarlac City, Philippines. If you like to race, this is the place.



Lhiberty and her family

Shyun Ueno (BS 16) Since January of this year, I've been hired full-time by Hart Crowser as a Field Geologist right here in Honolulu! My work with the company ranges from geotechnical engineering to environmental consulting where I do a mix of field and office work. I have used a good portion of my background from my degree in GG to do geotechnical exploration, investigation and a variety of report writing. I even do a good amount of mapping using ArcGIS! The next exciting step is getting rope access

certified and to start rock climbing, all on the company dollar! Plus, I'm no longer having to work weekends to accommodate school, so I've been on some pretty cool adventures with more to come.

Samuel Howell (PhD 17) and Marissa Cameron (current PhD) celebrated their wedding with their families and many good friends in SOEST on Oahu April 29, 2017.



Sam and Marissa

* * *



GG101L helped to beautify the UH campus with a few geologic time scales.



Students learned GPS navigation on Wa'ahila ridge.



Students created, and located "earthquakes".



Students used simple leveling tools to measure the profile of Wai'alaie beach.



BOT 450 and **GG101L** students hiked to Ka'ena Pt. to learn about rocks, plants, and birds.



With **GG305** students as guides, **GG101L** students created geologic maps at Lē'ahi.



Spring 2017 Kīlauea trip with GG101, 101L, 103, and 130.



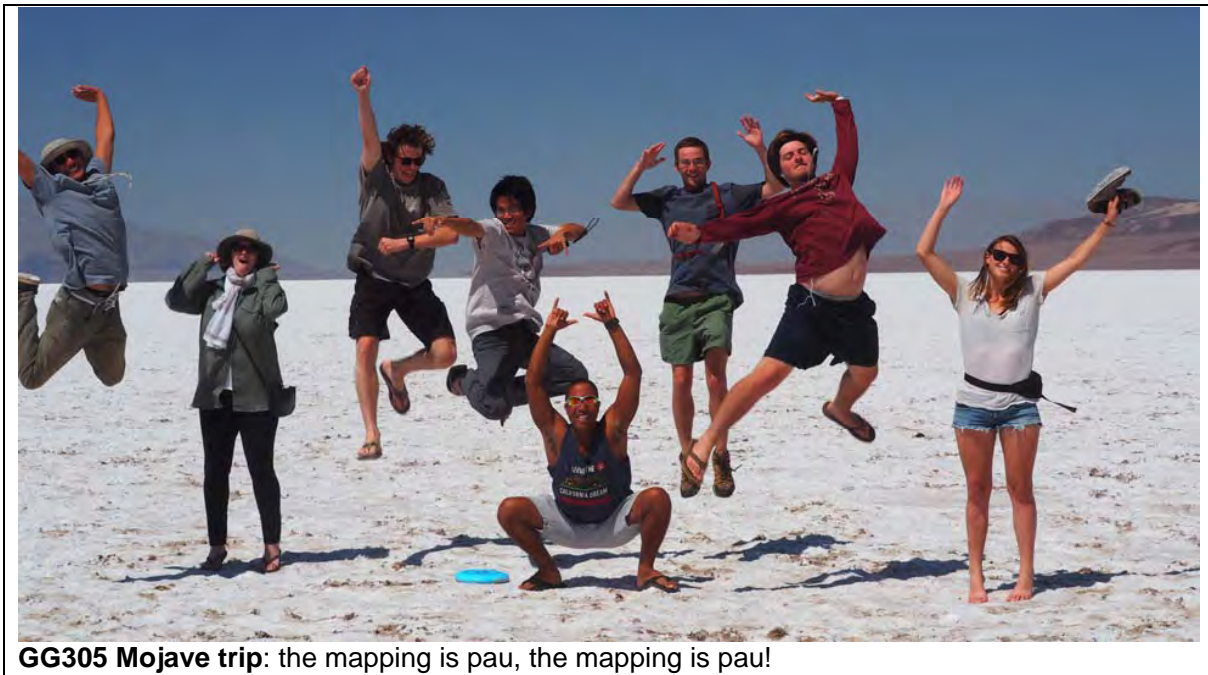
Biking out to the ocean-entry site.



Nighttime visit to Halema`uma`u and Pele.



Looking at a real strike-slip fault (always better than in a textbook).



GG305 Mojave trip: the mapping is pau, the mapping is pau!



As usual there was one really cold Mojave day...



Strikes and dips on real rocks(!) at Hanauma Bay.



...and one day when a duststorm (82 mph in Las Vegas!) entirely blotted out the sky. The wind direction switched 180° and the temperature dropped ~30° in a span of about 10 minutes. We were treated to a real display of the power of nature, that's for sure.



Carbonate mega-breccia in Titus Canyon, Death Valley NP.

Combining a Hawai'i Section of the American Institute of Professional Geologists (AIPG) and a virtual/distributed Hawai'i Geological Survey (or Society)

For more information please contact: Kevin Gooding at kgooding@intera.com or (808) 382-6853
Scott Rowland at scott@hawaii.edu or (808) 956-3150

The American Institute of Professional Geologists (AIPG) was founded in 1963 to promote the geological profession, provide certification for geologists, and establish standards of excellence in the practice of the geological sciences. The AIPG has over 7,500 members in the United States and other countries. The organization is composed of a main office near Denver and 36 individual state or regional sections. We would like to re-establish a Hawai'i Section of the AIPG.

Meanwhile, Hawai'i is one of a few US states without an official Geological Survey. We envision that the AIPG Hawai'i Section will also function as an unofficial/virtual/distributed Hawai'i Geological Survey (or maybe the Hawai'i Geological Society – we'll have to come up with a more catchy name). There won't be an office or bureaucracy, but instead a network of geologists with varying expertise and backgrounds available to help government agencies, private entities, and each other when necessary. The idea is not to replace the existing roles of companies or offices, but to be a resource for them when needed, as well as to improve all of our work with better awareness of what others can do and are doing.

Benefits of AIPG membership.

- Become connected with local business and employment opportunities
- Find out what is happening in the Hawai'i geological fields
- Make new friends.
- Meet and collaborate with geologists from all sectors and career stages – consulting companies, private practices, local, state and federal government, universities, retired geologists, and students.

Meet and collaborate with geologists from all over the United States.

- Exposure to highly qualified professionals from all geological disciplines.
- The opportunity to network and establish valuable business contacts.
- The development of unique camaraderie and of lasting friendships.



CPG-professional certification. The Certified Professional Geologist title is a testimony of academic credentials, professional practical experience and commitment to a code of professional ethics.

- Better job opportunities and compensation in both the United States and internationally.
- Additional national and international professional recognition.

International Recognition. Through agreements with professional societies in other countries, AIPG provides its CPG members with international reciprocity. The CPG title is recognized in Canada, Australia, the European Federation and the United Kingdom.

AIPG Membership Categories.

- Certified Professional Geologist – Applicants for certification have a bachelor's degree or higher in the geological sciences plus 8 years of professional geological work experience. CPG shall affirm adherence to applicable professional and ethical standards. \$50 application fee + \$170 per year
- Professional Member – Applicants must have attained a degree in the geological science and affirm adherence to applicable professional and ethical standards. \$130 per year
- Young Professional Member – Applicants must apply during the first three years upon earning a baccalaureate. \$65 per year
- Student – Applicants must be currently enrolled in a geological science degree program. Free!
- Associate – Applicants must have an avocational or general interest in the geological sciences. \$65 per year

THE MEMBERSHIP SIGN-UP PAGE IS at

<https://netforum.avectra.com/eweb/shopping/shopping.aspx?site=aipg&cart=0&shopsearchCat=Membership>

