

Inside this issue...

Our Earth Sciences Department was Energized by the Dramatic 2018 Kīlauea Eruption 1

Breaking News: Action in earthquake country, July 4-5 2019 7

Message from the Department Chair.... 10

Happy 90th birthday, Ralph!! 12

Kost Pankiwskij 12

Alumni Days!! 13

Degrees, Awards & Honors..... 16

2018-2019 GG Faculty Research & Teaching Highlights..... 18

Distinguished Alumnus 30

Alumni News..... 33

Field Trips 41

Donation..... 45

Nuhou Kanaka Puka

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About Us

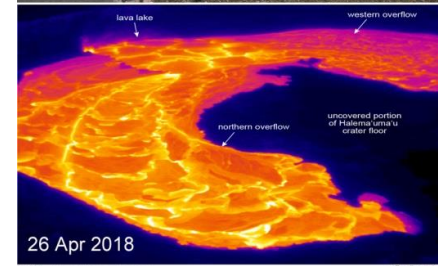
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Our Earth Sciences Department was Energized by the Dramatic 2018 Kīlauea Eruption

By *Kenneth Rubin*

2018 was an extraordinary year at Kīlauea volcano, and because of it, it was an invigorating year for our department. Many of our students, postdocs, staff and faculty participated in one way or another to monitor, study and communicate about Kīlauea during that time. A year later, with the volcano in hiatus, with the memories of an intense and high effusion rate eruption fresh in our minds, with a neighborhood and its residents slowly recovering, with the Hawaiian Volcano Observatory (HVO) buildings shuttered and its staff displaced, and with a half dozen research projects ongoing involving various Earth Sciences faculty and students, it is interesting to look back and reflect on the circumstances that got us here, to summarize the ongoing research and various students' roles in it, and to imagine what the future might hold. In **last year's department newsletter**, Scott Rowland wrote a detailed and well-illustrated description of the early part of the eruption, which I refer readers to if they want more than the brief summary below.



All images from USGS-HVO

Overview: People may debate exactly when things started to change from what we had been calling “normal” for Kīlauea over the last decade or so, where both Pu‘u ‘Ō‘ō and the Overlook crater at the summit were erupting. Key parts of the sequence are summarized in the images on the first page. For me, the change occurred sometime in the 2nd half of April 2018, near the end of spring semester at UHM: the summit was inflating, the inferred magma supply to the summit area was very high, the lava lake in Overlook crater at the summit had its largest overflow on to the Halema‘uma‘u crater floor (see the top two images from April in the figure sequence on page 1), and surface-flow activity at Pu‘u ‘Ō‘ō, although ongoing, began to wane. On April 30, Pu‘u ‘Ō‘ō collapsed after magma drained out of the conduit beneath it, and an increase in seismicity and deformation occurred down the East Rift Zone towards the Leilani Estates region (middle image in the sequence). On May 2, the Overlook crater lava lake began to drain. The next day, pyroclasts and lava began to erupt from what would become more than 20 eruptive fissures adjacent to, and parallel to, the fissures of the 1955 eruption in the same area (2nd image from bottom in the sequence). On May 4, a large (M6.9) earthquake occurred, with its hypocenter near the east end of the Hilina slump. Meanwhile, at the summit, as the lava level dropped below what was visible by webcam, a sequence of periodic earthquakes and explosive ash emissions began (bottom image in the sequence of page 1).

As the eruption progressed, and fissures opened up, the impacts of lava inundation and very high sulfur dioxide flux on neighborhoods in the Lower East Rift Zone (LERZ) were strong. The image at the right, from the United States Geological Survey (USGS) HVO, shows multiple fuming fissure segments and lava erupting from fissures 20 and 22 on 22 May 2018. The surrounding air quality was poor.

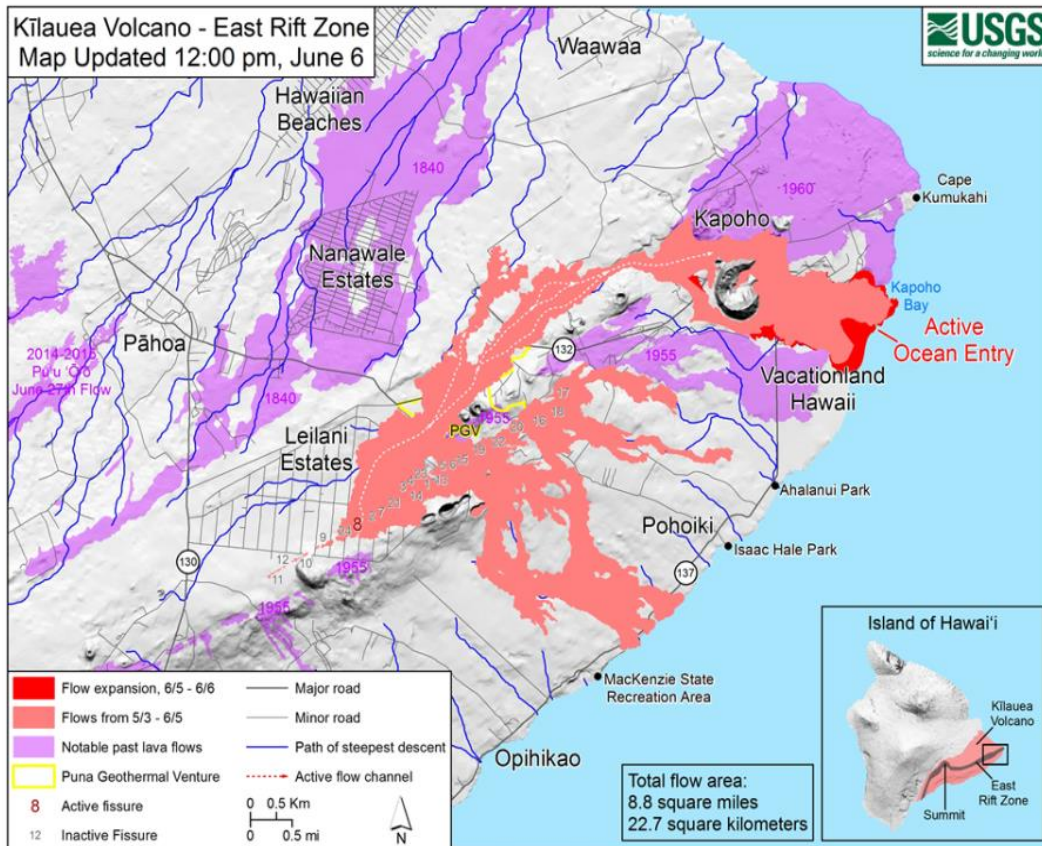
Through the months of May and June, multiple neighborhoods and landmarks were inundated with lava: along the row of eruptive fissures on the Lower East Rift Zone (for instance in the Leilani Estates and Lanipuni Gardens neighborhoods); along the coastline to the east (at Kapoho); and on the

intervening slopes. The image at the bottom of the page, from the USGS-HVO, shows lava entering Kapoho bay and destroying its coastal community on 4 June 2018. HVO would later estimate that the lava effusion rate during the LERZ event was roughly a factor of 10 times the average rate over the 35 years of the Pu‘u ‘Ō‘ō eruption.

The months of May and June 2018 saw many different types of activity and hazards on the lower East Rift Zone, including vog, tephra fall, and laze (volcanic fumes at the ocean entry). Meanwhile, at the summit, there was a rapid drain-back of magma from beneath the summit lava lake, the initiation of punctuated explosive volcanism and ashfall, as well as a cycle of frequent earthquakes around the summit and subsidence, which damaged roads and facilities, and led to the abandonment of the USGS-HVO buildings.

After a chaotic first month, with activity spread over 22 fissures and impacts to communities inland and on the coast, the eruption in the LERZ eventually focused to one primary vent (fissure 8), which produced a large channelized lava flow that reached the ocean in two different locations at different





USGS Hawaiian Volcano Observatory map showing the location of lava flows in the lower east Rift Zone (including 2 separate ocean entry areas) after roughly 1 month of eruption. The number “8” near the Leilani Estates label marks the site of the long-lived and highly productive fissure 8.

times. This further impacted residential communities with lava inundation and volcanic fumes from the ocean entries. Lava effusion continued for about 4 months. Since it stopped in early August, the volcano has been in eruptive repose, leaving dramatic landscape changes and vexing geo-ethics questions about land use on an active volcano (see the map above).

All told, the eruption consisted of an intense sequence of events, with many interesting characteristics, and (unfortunately) a wide array of hazards, all of which provide opportunities for research to enhance our understanding of eruptive styles, precursory signals, pre-eruptive magma storage, and even magma generation at and beneath Kīlauea. For instance, besides the very high effusion rates, monitoring/sampling efforts conducted by HVO and colleagues indicated an unusually wide variety of erupted compositions on the LERZ, including very rare (for Hawai'i) andesites, as well as less differentiated magmas that were

similar to what Pu'u Ō'ō had been erupting for years. The diversity of magma sources and differentiation degree suggest that some of the magma that erupted had spent considerable time (decades or more) in the LERZ crust before erupting, pointing to the likelihood of a magma storage reservoir there (and attendant hazards), rather than all the magma having been sourced from the summit or Pu'u Ō'ō regions. This is an area of active research.

Media Frenzy: In the earliest days of these events, members of the Earth Science Department were following the activity closely, using social media, traditional media, HVO press releases, and word of mouth to share and discuss the geological events unfolding in real time. Media outlets had an insatiable appetite for information, and several of our faculty, including me, began to be flooded with requests for interviews on local TV/radio as well as international media outlets from around the globe. In fact, four members of our VGP group (Scott, Mike,

Julia and I) conducted nearly 100 high profile (e.g., CNN, BBC) media interviews, usually on short notice and at all hours of the day, in just the first month of the eruption. Some examples are in the images to the right.

Field Team Experiences: This episode of exciting activity also posed immense challenges for our colleagues at the USGS and Hawai'i County Civil Defense. Our own Bruce Houghton and members of his research group, (especially graduate student Brett Walker and post-doc Samantha Isgett) became heavily involved in monitoring efforts on the ground during the eruption, while also conducting research on pyroclast eruption dynamics. Brett relayed to me that *"During the eruption, I witnessed many communities on the Island of Hawai'i demonstrate profound mental, spiritual, and physical strength in the face of unstoppable trauma. I learned first-hand just how important teamwork, organization, and communication really are, ... [such] can save lives."*

Research: Because of the eruption, last year was an invigorating time for the department, and personally made for an interesting last semester in my role as department chair. Opportunities and ideas for research and scholarship about the eruption, and a fair bit of prognosticating, were bubbling up from around the department. Several major research initiatives on the volcanic products and on geophysical indicators of eruption conditions, deformation and the condition of Kīlauea volcano spun up with short-fuse extramural support; many of these initiative were in collaboration with (in fact, dependent on) scientists at USGS-HVO and UH Hilo. Some of these ongoing studies and a brief synopsis of *initial* findings include:

- Studies of eruptive modes, especially pyroclast-producing environments between Hawaiian fountaining and Strombolian end members (Bruce Houghton and graduate student Brett Walker) demonstrate that individual and neighboring eruptive fissures can alternate between sustained and episodic gas segregation conditions, leading to variable pyroclast formation and dispersal over short timescales. Brett says, *"By having a better understanding of what causes*



Experts say new eruptions along Puna are unexpected

Posted: May 04, 2018 6:08 PM HST
Updated: May 04, 2018 6:08 PM HST



Ken, Scott and Julia interacting with the news media during the eruption



Brett Walker photo-documenting lava fountaining on the Lower East Rift zone during 2018.

certain styles of volcanic activity, and transitions between them, we can look for the changes and signs that give extra warnings about both sudden and gradual shifts in the behavior of the volcanoes.”

- Crystal cargo records of magmatic conditions and timescales (Tom Shea, graduate student Adrien Mourey, and HVO and UH Hilo colleagues) indicate that many individual olivine crystals from the eruption record two stages of magma mixing: an older stage (typically > 100 days prior to eruption) and a shorter one (that likely corresponds to the mixing events shortly preceding the May 3rd 2018 eruption initiation and/or syn-eruptive processes). Adrien says, *“This eruption was a unique opportunity as PhD students to apply different techniques (e.g. diffusion chronometry in minerals for me) to understand Kilauea volcanic system. It allowed me to create valuable collaborations with HVO and other people around the world like in Singapore or Oregon.”*

- Photo documentation, hand specimen examination, and application of lava transport models (Julia Hammer, graduate student Rebecca DeGraffenried, and HVO and UH Hilo colleagues) indicate that existing models predict lava flows lengths during this eruption pretty well, and show how flows evolve from initially viscosity-limited to crust-limited emplacement regimes. Rebecca says, *“Conducting field work and observing the juxtaposition of a normal-looking neighborhood with a lava flow field has really driven home the importance of our research in my mind, not only for*

scientific understanding of volcanoes but also for helping the people impacted by these eruptions.”

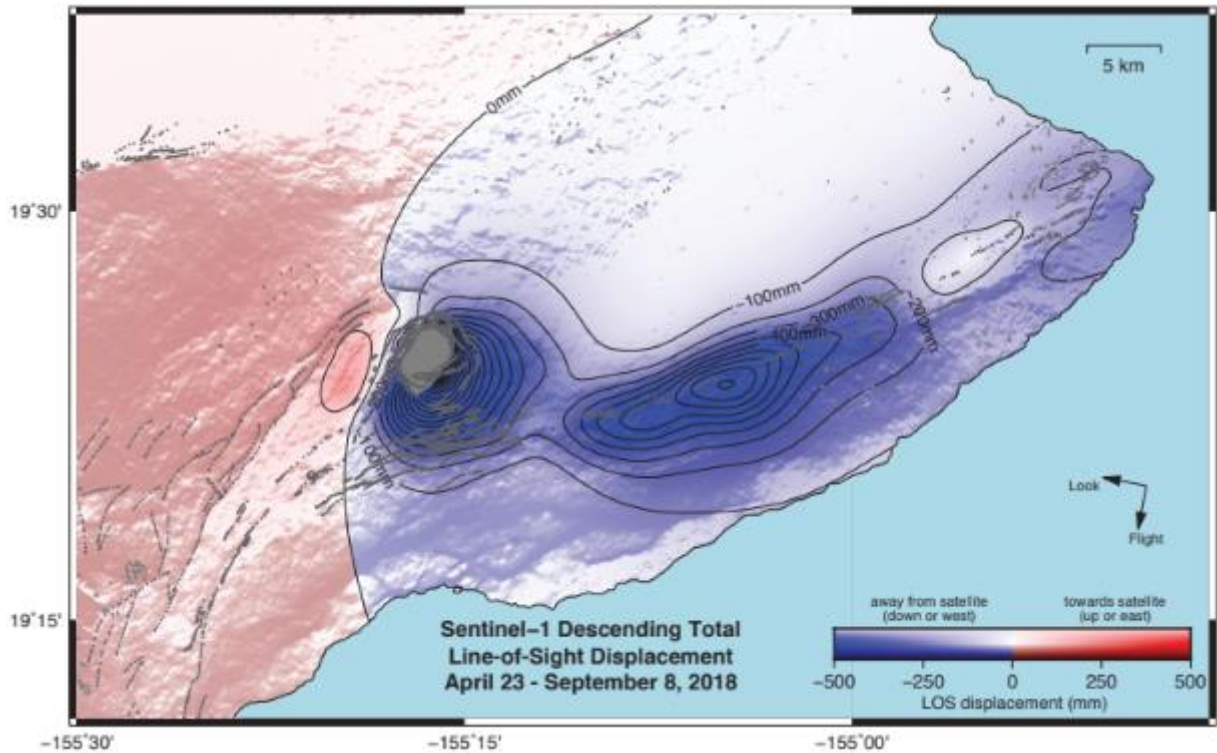
- Short-lived radioisotope studies of magma ascent, degassing and pre-eruptive storage rates (myself and post-doc Val Finlayson) indicate significant variability in (volatile) polonium content in these magmas upon eruption, implying either incomplete magma degassing during ascent/eruption or mixing of shallow storage/partially degassed magmas with less degassed materials during eruption, consistent with the olivine results. This work involves ^{210}Po , which has a half-life of just 138 days, making sampling and analysis daunting. Our next step is to apply ^{210}Pb - ^{226}Ra radioactive disequilibrium to eruption products to see how long they spent in the crust before eruption.

- Whole-rock magma compositions in the context of the 35-year-long Pu’u ‘Ō’ō eruption (Mike Garcia and U. Mass. Prof. Mike Rhodes, as well as studies by UH Hilo Prof Cheryl Ganseki and USGS colleagues) shows that some later Leilani lavas were similar to, but not exactly like, any Pu’u ‘Ō’ō lavas erupted in the last 20 years, whereas other lavas deviated significantly from recently erupted compositions. The latter is in some ways similar to prior LERZ eruptions in 1955 and 1960.

- Ground deformation using InSAR and GPS data (Bridget Smith-Konter and graduate students Liliane Burkhard and Lauren Ward, as well as HIGP’s James Foster and other colleagues) showed lots of ups and downs during the eruption, including



Rebecca deGraffenried (left) in helicopter-supported sampling mission August, 2018, collecting samples from the Fissure 22 lava flow. Adrien Mourey (right) taking a temperature measurement at one of the previously active fissures in August, 2018.



Map of net vertical and horizontal displacement at Kīlauea volcano over the course of the 2018 eruption.

complex patterns of vertical and horizontal displacements associated with magma migration and eruption. However, after all was said and done, they observed mostly net subsidence at the summit along with horizontal contraction, and a similar situation on the East Rift Zone.

Summary: While there is much more to learn from these studies and other studies to come, as well as results to mull over and integrate, we can already tell that detailed investigations like these involving students, postdocs, and faculty, along with the rich instrumental and human-collected observational data from USGS-HVO, have provided an amazing learning and research experience for all involved. Collectively, they will give us an even better understanding of one of Earth's most active and most studied volcanoes. Such knowledge will

drive additional scientific discovery in Hawai'i, as well as provide information to help inform disaster management planners during future eruptions in Hawai'i. We don't know when, but it is only a matter of time before Kīlauea or its much larger neighbor, Mauna Loa starts erupting again.

On one final note, the future looks bright for collaborations with our colleagues at USGS-HVO and UH Hilo on volcano-related research. The whole body of research will be more than the sum of the individual parts. The collaborations will translate into more, and better, opportunities for our students to participate in volcano research and to learn about active volcanism as part of their course of study in our programs.

* * *

Breaking News: Action in earthquake country, July 4-5 2019

By Bridget Smith-Konter

On July 4, 2019, a **M_w6.4** earthquake (now recognized as a foreshock) struck 17 km NNE of the city of Ridgecrest, CA, located ~150 km northeast of the San Andreas fault, rupturing across two conjugate faults striking roughly NW-SE (right-

lateral strike-slip) and NE-SW (left-lateral strike-slip). Thirty-six hours later, on July 5 (8:19 pm PST) the **M_w7.1 Searles Valley earthquake** (right-lateral strike-slip, Figure 1) re-ruptured the NW-striking fault of the M_w6.4 event and also extended the

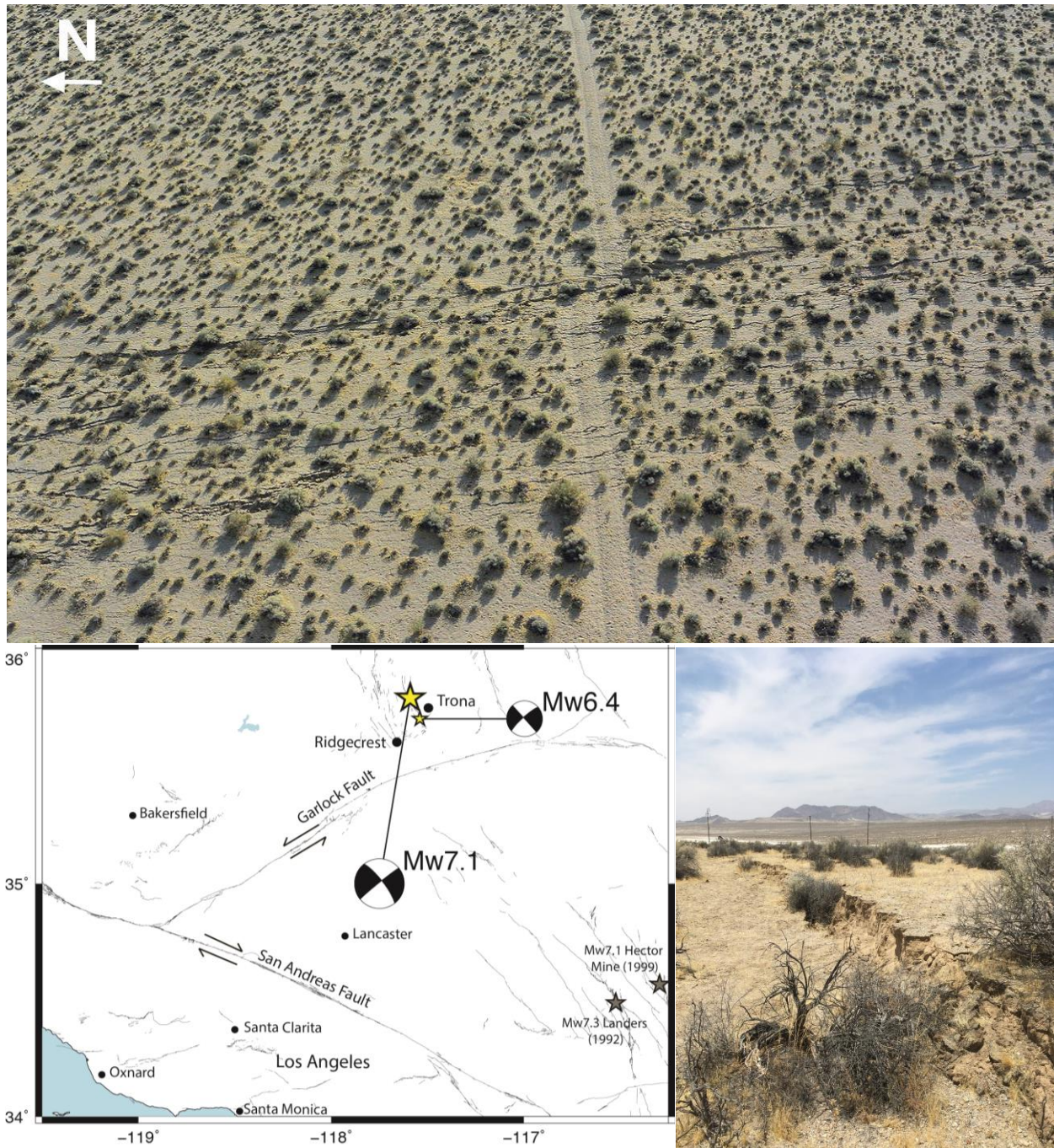


Figure 1. (Top) Oblique photograph showing surface faulting from the M_w7.1 Searles Valley earthquake. The dirt track (center) is right-laterally offset approximately 2.5 m (~8 ft). (Credit: Ryan Gold, USGS. Public domain.) (Left bottom) Regional map of the Searles Valley earthquakes. (Right bottom) Vertical offset along the rupture just south of CA Hwy 178.

rupture both to the NW and SE to at least 50 km. Field scientists report observations of 2-3 meters of right-lateral offset and at least 1 meter of vertical offset along the $M_w7.1$ rupture. This fault (previously unmapped) is now part of a series of existing paralleling fault structures residing east of the San Andreas Fault, in a region of distributed faulting called the Eastern California Shear Zone, associated with the motion of the Pacific-North American plate boundary.

Through a serendipitous turn of events, UH professors Bridget Smith-Konter and Jasper Konter (and their two sons Ryan and Wesley, Figure 2) arrived in Los Angeles 1.5 hours before the $M_w7.1$ earthquake hit on July 5. They were outside, some 180 km away from the earthquake, and still experienced an impressive range of shaking and rolling for 30-40 seconds. A day later, they joined a GPS team from Scripps Institution of Oceanography (D. Sandwell, X. Xu, J. Haase, and I. Sepulveda) to explore the southern portion of the rupture and help deploy GPS for observing earthquake afterslip.

Both earthquakes occurred within the China Lake Naval Weapons Center, thus limiting access to a majority of the surface rupture. Nevertheless, the Scripps-UH team was able to deploy 5 continuous GPS stations within the region that will continue to record postseismic deformation over the next several weeks and months. They were also able to walk several parts of the southern end of the rupture along CA Hwy 178, where they observed an extraordinary array of offset roads, fault splays and cracks, several feet of vertical offset along the rupture, and rockfalls consisting of immense cracked granite boulders near the salt mining town of Trona. Unfortunately, Trona (home to the Searles Dry Lake) suffered a lot of damaged infrastructure (collapsed masonry, buckled roads, subsided blocks of concrete).

No, it wasn't *The Big One*, but it sure is an exciting time to be an earthquake scientist. It has been 20 years since the last big earthquake in California's backyard (1999, $M_w7.1$ Hector Mine earthquake), which was preceded seven years



Figure 2. Dr. Bridget Smith-Konter, Wesley, and Ryan Konter exploring the surface rupture of the $M_w7.1$ Searles Valley earthquake. Photo acquired on July 7, 2019.

earlier by the M_w 7.3 Landers earthquake in 1992. Over the last 20 years, collaborative research efforts between several academic institutions and the USGS (via the Southern California Earthquake Center, or SCEC) have led to the development of cutting edge instrumentation, computational models, and remote sensing technology in preparation for this type of event (*and for those still to come*). Rapid response plans for surveying earthquake damage of the Searles Valley earthquake sequence were remarkably coordinated and executed by SCEC/USGS/CGS, with the rapid sharing of near-real-time data and models (within the first few hours to days following the event) substantially bolstered by social media. Furthermore, because of the timely occurrence of the M_w 6.4 earthquake the day before, many scientists were already on their way to the region (or already there!) to deploy seismic and geodetic

instruments and map the smaller rupture when the larger M_w 7.1 earthquake occurred – talk about luck! The residents of both communities of Ridgecrest and Trona were also very fortunate – whereas building and road damage was considerable, no fatalities or major injuries occurred as a result of these earthquakes.

Two InSAR satellites (C-band Sentinel-1 and L-band ALOS-2) were operational before the earthquake and continue to collect measurements of line-of-sight (LOS) deformation (Figure 3). In-progress InSAR and deformation modeling results by Xu and Sandwell (Scripps) and Smith-Konter (UH) can be found at https://topex.ucsd.edu/SV_7.1/. InSAR teaser alert: growing evidence of small of amounts of triggered slip (a poorly-understood earthquake phenomena) on the Garlock fault! Stay tuned for more!

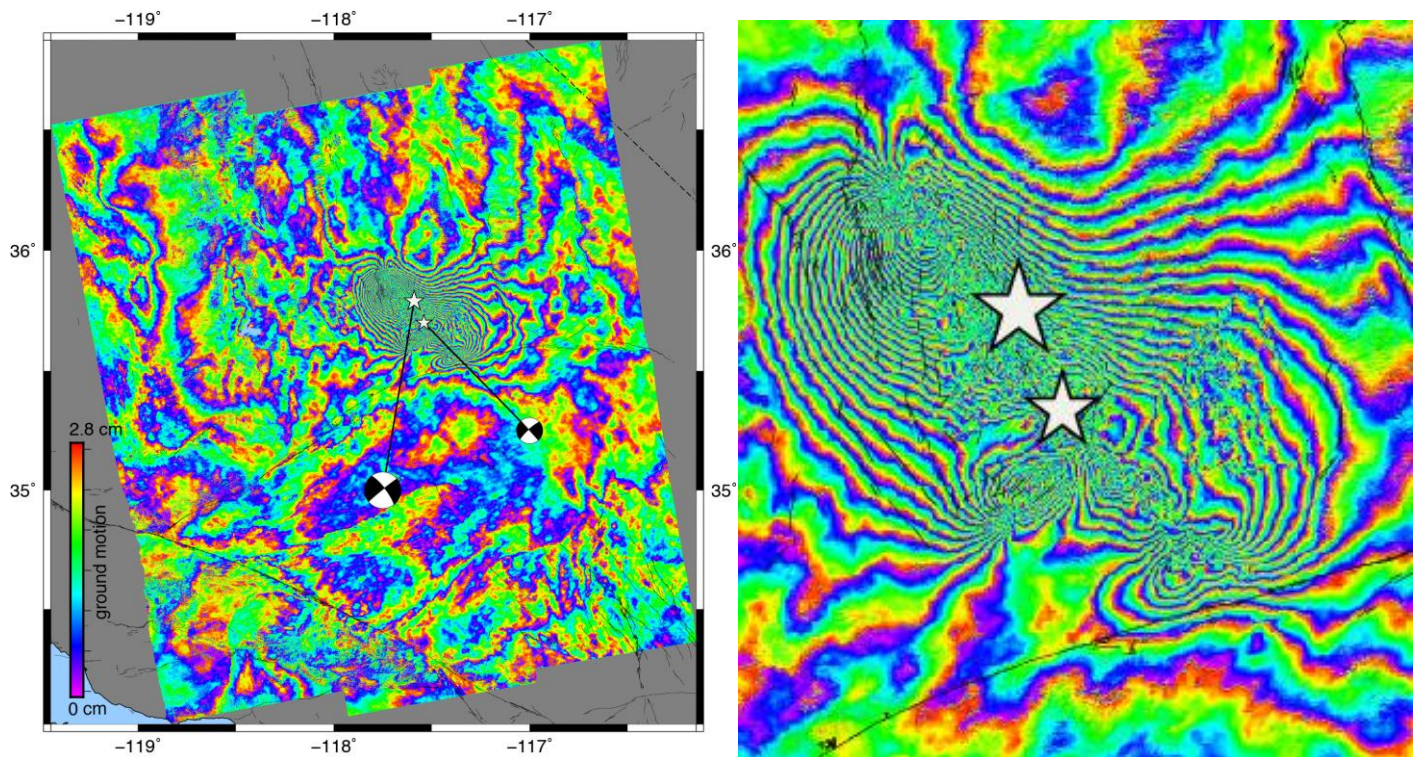


Figure 3. Sentinel-1 ascending interferogram showing surface displacement from the two Searles Valley earthquakes from radar images acquired before (7/4/19) and after (7/10/19) the earthquake sequence. Each color cycle, or fringe, represents 2.8 cm of ground motion toward or away from the satellite. The zone of intense fringes marks the rupture zone, where close to a meter of displacement towards (up and west), as well as away from (down and east), the radar satellite is observed.

* * *

Message from the Department Chair

Aloha Alumni and the Earth Sciences 'Ohana! The 2018-19 academic year is now behind us and it is time to pause and reflect on the challenges and accomplishments we have been engaged in as a group. In September 2018, the



UH President approved our department name change from Geology & Geophysics to Earth Sciences, culminating a decade of discussions on revising our name. We are late to this party as numerous other schools have already been through similar name changes, reflecting both the broadening of the research and education we are shepherding and the using of more modern nomenclature to introduce ourselves to a broader range of students who often have only heard of Earth or environmental sciences during their high school years. For some, change is harder (and I admit GG rolls off the tongue easier than EARTH for our new course alpha), but this realignment was necessary and overdue. We can now proudly state we put the “E” in SOEST.

The new name also meant rebranding our degree programs. Our graduate program is now called Earth and Planetary Sciences, acknowledging the fact that many of our graduates have faculty mentors residing in Hawai'i Institute of Geophysics and Planetology. Our undergraduate program has also been renamed but this was a much more tumultuous journey where we had to navigate around challenges from other units on campus as well as do some soul-searching on what our program actually offered. In the end, we settled on new names for our two degree programs: a BS in Earth Sciences and a BA in Environmental Earth

Science. The real work of realigning our course offerings with the aspirations implied by these program name remains and will occupy much of the faculty's time the coming semesters. I suspect real change will accelerate when faculty turnover starts to change the make-up of the department, given the anticipated retirement of half a dozen or more faculty over the next several years.

One promise I have made as Chair is to revamp our physical spaces. This is complicated by failing infrastructure outside our immediate control (A/C, external doors). However, the look and feel of our teaching and seminar rooms is the first impression we give our students and visitors, and I believe we must do our best to present teaching spaces that are modern, well-lit, and comfortable. To this end, the previous Chair (Ken Rubin) started by getting new chairs for our largest teaching lab (703), and I have done the same for our 101 laboratory (706). The computer room (733) and the undergraduate student lounge (714) are on my list for the next academic year. We have also redesigned and equipped a large former office to become our first “Collaboratorium”. This space is envisioned for group meetings (including faculty and graduate student meetings), small workshops or seminars, hosting outreach activities, a space to work on collaborations, “REU Central” for our Research Experience for Undergraduates program during the summer and more, with ample open time for chance meetings and discussions over tea or coffee. We also turn it into a “Celebratorium” when our students successfully navigate their MS or PhD defenses and celebrations are in order. I have pledged to host an open “Chair's Coffee Hour” each week during which time anyone in the department is invited, and the Dean of SOEST (Brian Taylor) will do the same on the first Tuesday of each month. We think these informal settings will offer anyone access to the high and mighty within our

organization and reduce the power differentials, perceived or otherwise.

The spring semester was packed with events: In February, we were part of a 3-day on-campus external review of SOEST academic programs and will be responding to their recommendations over the next year. In April, we celebrated the 90th birthday of Ralph Moberly, Professor Emeritus and super-human with 60 years of service to the department (see separate story). A few days later, the department faculty took part in a two-day retreat at Turtle Bay Resort (sponsored by an anonymous donor) to work on all aspects of our department (degree programs, research, collegiality, digital infrastructure, and more), providing a laundry-list of action items that it will be my job to ensure are enacted. Finally, we ended the semester with our inaugural Alumni Days event, a smashing success (see another separate story).

As you can hopefully tell, we have had an eventful year and we are eager to continue the momentum into the next academic year. Our challenges are the usual ones: limited funding for activities essential to an earth science

undergraduate major (e.g., field trips off island), limited funds for graduate fellowships and TAs, and decadal decline in returned overhead funds to allow the department to explore new research venues by inviting established and up-and-coming scientists to visit us and share their insights. We have no other universities a few hours' drive down the road so we must have the ability to augment internal speakers with invited external ones. I will explore avenues for such support from local companies and donors but we also hope faculty, friends and alumni can help as well. A new department fund earmarked our seminar series has been established as well. As always, tax deductible donations can be sent our way by visiting our donations page (<https://giving.uhfoundation.org/give/giving-gift.aspx?allocation=12077204>).

Despite an action-packed year, I am pleased to announce that I am still standing and more energized than ever to lead this amazing group of faculty and students to greater heights. I wish you all a happy and productive 2019-2020 academic year!

Paul Wessel



POST 723, part-way through its renovation and painting.

* * *

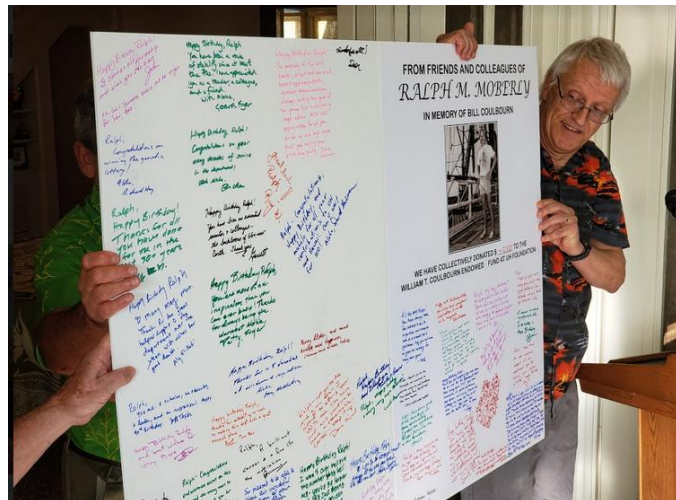
Happy 90th birthday, Ralph!!

On April 17, more than 70 people gathered on a beautiful relaxed afternoon at College Hill to celebrate Ralph Moberly's 90th birthday and his 60th year in our department. In 1959, Ralph was the third faculty member hired by what was then the Department of Geology. University president David Lassner attended the birthday party and the celebrants at the party spanned nearly all of Ralph's tenure with the University of Hawai'i. Sharing stories among this group was a special treat. In addition to Ralph's decades of teaching and research, he has also been the unofficial historian of the department (see:

<http://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/6841/historygeologygeophysics.pdf?sequence=1>).



Ralph and a few of the many people who came to wish him a happy 90th birthday.



Dept. Chair, Paul Wessel presents Ralph's birthday card, with the help of University System President David Lassner (green shirt hiding in the back).

* * *

Kost Pankiwskyj

We are sad to report that retired Earth Sciences professor Kost Pankiwskyj passed away May 9 after a brief bout with cancer. Kost joined the department in 1964 (only 6 years after its establishment), and he retired in 1995. He studied Salt Lake and 'Āliamanu craters, but was most noted

for his teaching. He taught Mineralogy, Field Methods, and Theoretical Petrology, and was renowned for his in-class enthusiasm, liberal use of colored chalk, adventurous field trips and field exercises, long hair, and wild beard. Mike Garcia wrote: "Kost was a devoted teacher and taught

rigorous classes. The students enjoyed his teaching even though he expected much from them”. Scott Rowland wrote: “I first met Kost when I TA-ed his GG301 mineralogy class. Glenn Brown was the other TA (there were a lot of students that semester). I don't know about my students, but I sure learned mineralogy a heck of a lot better than I supposedly did already. I also took his GG602 Theoretical Petrology class, which was super-hard (for me). Kost used up a handful of colored chalk every lecture, which he gave with the aid of class notes on an old legal pad that looked like the Dead Sea scrolls.”

After Kost retired, he stayed very active in the Sierra Club, leading hikes and service trips into the backcountry. Kost is survived by his wife Gina and their daughter Kamakana.



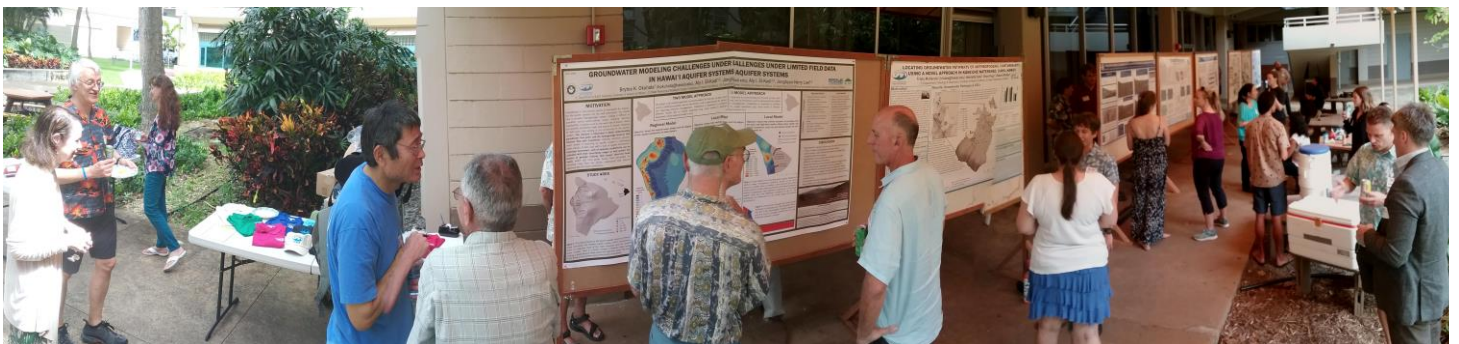
Kost, overlooking the north coast of Moloka'i in 1986.

* * *

Alumni Days!!

The Earth Sciences Department hosted its first-ever “Alumni Days” event May 17-18. Over 20 alumni from as long ago as the 1960s and from as far away as Rhode Island attended. Friday’s on-campus events included a breakfast meet-and-greet with the Chair, an update on the department, tours of Earth Science and HIGP research labs, a poster session highlighting current students’ work, a public presentation on Space Tourism by 2019 Distinguished Alumnus Jim Bell, and a tasty group dinner at the Himalayan Kitchen in Kaimukī.

Saturday was spent on an all-day field trip to Wai‘anae, led by Professor and alum Scott Rowland, with great assistance from Profs. Julia Hammer and Steve Martel, as well as from alums Michael Knight and Elizabeth Zbinden. All who attended thought it was a great success and encouraged us to hold another one next year. We would also like to establish an alumni association (run by alumni, not the department), so please keep an eye out for e-mails related to this. Finally, we have an alumni [Facebook page](#) if you are of that persuasion.



Alumni, faculty, students, and various passers-by mingle in the HIG courtyard to learn about some of the cutting-edge research that our students are accomplishing.



Elizabeth Zbinden (MS 1984) revisits the glory days of her Wai'anae dikes field area, with Dept. Chair **Paul Wessel** (left) and recent MS graduate **Eric Welch** (right).

Here are a few comments from some of the alumni who participated:

The field trip was a lot of fun and it was great meeting everyone!

~ Sarah Glancy

Thanks again for all your great efforts in putting together Alumni Days. Jim's talk was science fiction meets reality – an adventuresome topic.

~ Brian Iwatake

The Wai'anae trip felt like old times, and I made a lot of connections.

~ Amy Kitchener

It was a great opportunity to reconnect with old friends, colleagues and associates.

~ Mike Knight

I really enjoyed the chance to chat with alumni from different eras, including current students. Seeing the ongoing research, as well as the ideas for improving the department, was enlightening. I hope that more alumni might be convinced to participate in future meetings and ultimately to help strengthen the program.

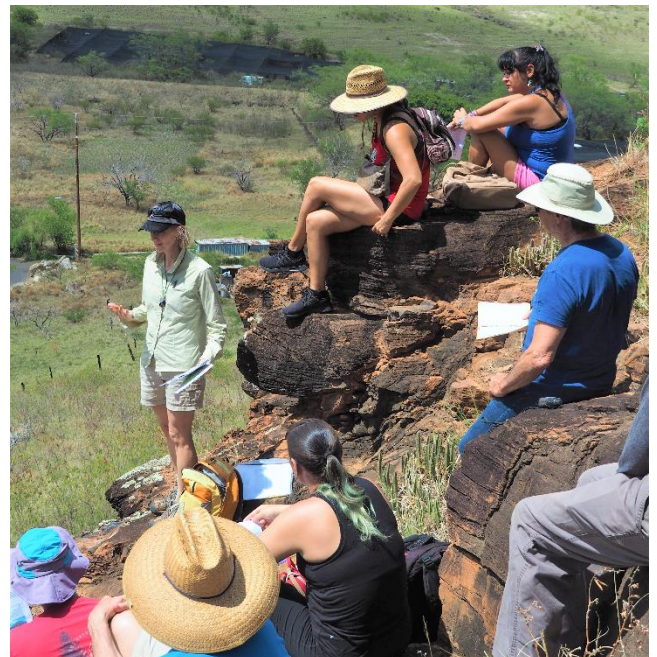
~ Rachel Lentz

I cannot wait to do this again.

~ Heidi Reiter

Thanks so much Scott and Paul and everyone else who made Alumni Days happen! We had a great time: being on campus, visiting the labs, re-connecting with old classmates and profs as well as meeting other alumni and students. It was a terrific field trip too. We would love to return next year!

~ Lynne Rodgers-Miller



Julia Hammer explains the significance of amphibole at Mauna Kūwale.



Wai'anae field trip participants at Kāneana.

Nice to see what your current students are doing. Jim Bell's talk was an interesting talk from a good public speaker.
~ Steve Spengler

I hope there are two or three other ready-made field trips on O'ahu to run in rotation, because much as I liked this one it would get old to run it all the time. If the Alumni Association really gets swinging, we could do one on a neighbor island. I was impressed to discover that at least one poster was made especially for this event, and not left over from a conference presentation. Was interested to see the distribution of topics.
~ Elizabeth Zbinden



* * *

Degrees, Awards & Honors

UNDERGRADUATES

Ashley Carothers BA Spring 2019
Amber Perez BA Spring 2019
Hailey Shea BS Spring 2019
Brian Swilley BS Spring 2019

MASTERS OF SCIENCE – PLAN A THESIS

http://www.soest.hawaii.edu/GG/academics/gg_theses.html (or click on an individual thesis title)

Elizabeth Benyshek – *Tectonic Reconstruction of the Ellice Basin* (Advisor: P. Wessel, Fall 2018)

Sasitorn (May) Chornkrathok – *Structure and Behavior of the Ni End-Member Schreibersite, (Ni₃P), Under Deep Earth Conditions* (Advisor: P. Dera, Spring 2019)

Katherine Herries – *Biogeochemical Alteration Effects on U-TH Dating of Pleistocene Corals* (Advisor: K. Rubin, Fall 2018)

Nipaporn (Nina) Nakrong – *The Structure of the Oceanic Crust on the Northeast Hawaiian Arch Imaged by Pre-Stack Depth Migration of Active-Source Seismic Data* (Advisor: G. Moore, Spring 2019)

Alexandra Pleus – *In-Situ Rheology of the Oceanic Lithosphere Along the Hawaiian Ridge* (Advisor: G. Apuzen-Ito, Fall 2018)

Tommy Yong – *Investigation of the High-Pressure Behavior of Amphiboles* (Advisor: P. Dera, Spring 2019)

MASTERS OF SCIENCE – PLAN B NON-THESIS

http://www.soest.hawaii.edu/GG/academics/gg_ms_final_reports.html (or click on an individual report title)

Macey Sandford – *Global Cloud Property Models for Real Time Triage Onboard Visible-Shortwave Infrared Spectrometers* (Advisor: S. Sharma, Spring 2019)

Eric Welch – *Nutrient and Pesticide Transport and Fluxes in a Small Island Watershed* (Advisor: H. Dulai, Spring 2019)

MASTERS OF GEOSCIENCE FOR PROFESSIONALS

http://www.soest.hawaii.edu/GG/academics/gg_mgeo_project_reports.html (or click on an individual report title)

Elizabeth Dionne – *Green Roof Proof of Concept for Honolulu, Hawai'i* (Advisor: H. Dulai, Fall 2018)

Karl Gerstnecker – *Small Scale Wind Energy for Hawai'i* (Advisor: G. Ravizza, Fall 2018)

Allison Krieder – *Investigating the relationship between plant biomass and defense against coastal erosion on O`ahu* (Advisor: G. Ravizza, Spring 2019)

DOCTOR OF PHILOSOPHY

http://www.soest.hawaii.edu/GG/academics/gg_dissertations.html (or click on an individual dissertation title)

Karina Asmar-Toro – *Modernizing Infrasound Systems: Characterization and Analytics Approaches for the Next-Generation Sensors* (Advisor: M. Garcés, Spring 2019)

Erin Fitch – *Mechanisms and Dynamics of Explosive Lava-Water Interactions* (Advisor: S. Fagents, Fall 2018)

Yi Hu – *Metastable Pyroxenes and Their Role in the Subduction Process* (Advisor: C. Dera, Fall 2018)

Hauhani Kane – *Coastal Evolution of Pacific Islands in Response to Sea Level Change During the Mid-Holocene* (Advisor: C. Fletcher, Spring 2019)

Jason Lackey – *Tectonic Influences on Surficial Processes and Deformation Along the Nankai Accretionary Prism, Southwest Japan* (Advisor: G. Moore, Spring 2019)

Xiaoqing Lai – *Carbon in Deep Earth From High-Pressure and High Temperature Studies of the FE-C System* (Advisor: B.Chen, Spring 2019)

Samuel Mitchell – *Deep Submarine Silicic Volcanism: Conduit and Eruptive Dynamics of the 2012 Havre Eruption* (Advisor: B. Houghton, Fall 2018)

Christopher Schuler – *From Recharge to Reef Assessing the Sources, Quality, and Transport*

of Groundwater on Tutuila Island, American Samoa (Advisor: A. El-Kadi, Spring 2019)

Hannah Shelton – *Compressional Behavior of Hydrogen-Bonded Crystals: Anhydrous Comparisons and Polymorphism* (Advisor: C. Dera, Fall 2018)

STUDENT AWARDS

AGATIN ABBOTT MEMORIAL AWARD

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

Ted Brennis

FRED M. BULLARD 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.

Emily Costello

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.

Brytne Okuhata

ARCS AWARD

Awarded by the Achievement Rewards for College Scientist Foundation, in memory of Toby Lee.

Lauren Ward

OTHER FELLOWSHIP, SCHOLARSHIPS & AWARDS

Both **Krista Evans** and **Trista McKenzie** are 2019 GSA Graduate Student Research Grant Recipients. Trista's proposal was awarded with an Outstanding Mention for having exceptional merit in conception and presentation.

* * *

2018-2019 GG Faculty Research & Teaching Highlights

Garrett Apuzen-Ito and **Niels Grobbe** (HIGP) are co-advising **Kenzie Lach** (MS) who is studying the structure of Martian volcanos. Congratulations to **Alexandra Pleus** for completing her MS on a marine gravity and bathymetry study of the lithosphere beneath the Hawaiian volcano chain. Alexandra is currently teaching earth science at 'Iolani School. Garrett wishes **Elise Leroux** (MGeo 2018) well as she relocates back to her home town of Toronto, Canada. Garrett, **Justin Higa** (BS 2018, now a graduate student at UCLA), **Robert Whittier** (MS 1997) and investigators from HIGP have completed a gravity survey and analysis of the Salt Lake and 'Āliamanu Craters to gain insight on the subsurface material properties that influence groundwater flow. Garrett continues to work with **Nicole Lautze's** (HIGP) group, including **Neil Frazer** and **Steve Martel**, on a DOE-funded project to evaluate geothermal energy resources in Hawai'i. **Robert Dunn** is the Hawai'i PI working with Garrett and **Paul Wessel**, along with scientists from the University of Oxford and Lamont-Doherty Earth Observatory, including **Brian Boston** (MS 2014, PhD 2015), on a two-leg, marine seismic investigation of the crustal



Map of the marine seismic reflection/refraction experiment that was done around the Hawaiian Islands in Fall 2018. Robert Dunn is the Hawai'i PI, collaborating with G. Ito and P. Wessel. Robert is not pictured here because he is at sea completing the second seismic expedition along the Emperor Seamount chain. Bon voyage Rob! (Editor's note: Rob made it back in time to provide a write-up – see at right).

and lithospheric structure of the Hawaiian-Emperor Chain. He published:

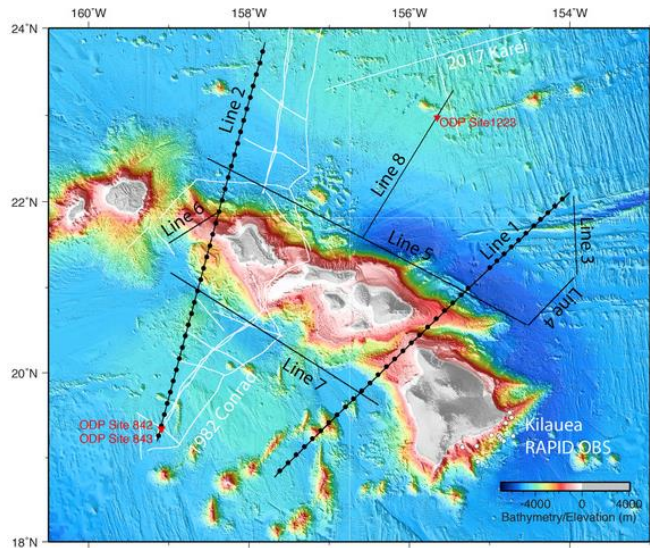
Weiss, J., **G. Ito**, B. J. Brooks, J. Arthur-Olive, G. F. Moore, J. H. Foster (2018) Formation of the frontal thrust zone of accretionary wedges by top-down propagation of the protothrusts, *Earth Planet. Sci. Lett.*, 495, 87-100, <https://doi.org/10.1016/j.epsl.2018.05.010>

Robert Dunn and his group are continuing research on the tectonic and magmatic evolution of mid-ocean ridges, arc and back arc systems, and hotspots. Last year, he and colleagues carried out a 6-week geophysical experiment across the Hawaiian Ridge to study ocean island formation and the loading and bending of the Pacific plate. This year, they carried out a companion expedition to the Emperor seamounts. Both are part of a larger NSF-funded collaboration between UH scientists and scientists at Lamont-Doherty Earth Observatory, Oxford University, the USGS, and GEOMAR. Graduate student **Charu Lata** (MS) continues her work on seismic data from the Fiji-Tonga area as part of Robert's Accomplishment-Based Renewal Grant from NSF. She is developing new techniques to extract seismic shear wave information from active-source data to gain new insight into the volcanic structure of oceanic crust in backarc environments. **Deborah Eason** has also been helping process data from this study, and the

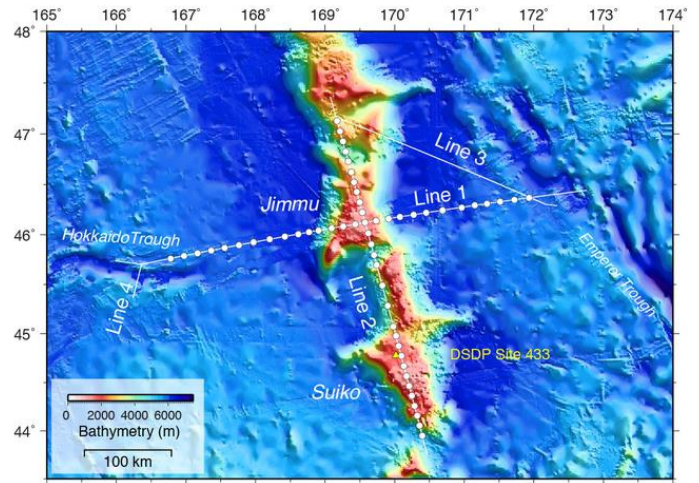


Graduate Students Charu Lata (UH) and Bridgit Boulahanis (Lamont) disassembling an ocean bottom seismometer.

lab now has a database of over 460,000 seismic measurements to be used for full crustal and upper mantle imaging along the Eastern Lau Spreading Center. Robert continues progress toward mapping the gravitational field of the Ala Wai watershed on Oahu as part of a study that involves graduate and undergraduate students. This fall Robert welcomes new PhD student **Brandon MacGregor** to the lab, who will work on the Hawaii-Emperor datasets.



News from **Aly El-Kadi's** hydrology group includes the departure of a Postdoctoral Fellow, Olkeba Tolessa Leta, who has moved to Florida for a permanent position with the Bureau of Watershed Management and Modeling, St. Johns River Water Management District. For about three years, Olkeba's research focused on analyzing the sustainability of watersheds' hydrology and groundwater resources in the Pacific Islands through the use of watershed models. His work on Oahu explored venues for mitigating the effects of climate change by assessing water availability at the Nu'uanu Reservoir #4 on O'ahu. The project, which was funded by the Board of Water Supply (BWS) and NOAA, was aimed at conserving water by capturing surface water generated in wet areas and its ground injection in a drier area. **Brytne Okuhata** (MS 2017), a Ph.D. graduate student, is utilizing data obtained from Olkeba's work to model the response of the aquifer to surface water injections in terms of water quantity and quality. The harvested reservoir water



will be piped down for about 600 feet through a hydro-electric plant and then into injection wells that will recharge the aquifer up gradient from the Kalihi pump station. The great news in that the BWS has moved the project into the engineering-feasibility and environmental-assessment phase for future implementation.

Aly is also leading the 'Ike Wai hydrological modeling team and also serves as a member of the Leadership Team. The 'Ike Wai's research, which is a part of an NSF's EPSCoR project, concerns the west side of the Island of Hawaii dealing with understanding the areas' hydrogeology, compiling the necessary information, and improving on models and their applications. The models will also be used in identifying management policies by adopting a number of land-use and climate change scenarios. We have developed a number of three-dimensional and cross-sectional models for the area



Groundwater Hydrology students learn about the Mānoa landslides from alumni Steve Spengler (left).



Brytne Okuhata setting up a copper tube and aluminum channel to sample groundwater for tritium/helium from a pumping well on the kona side of the Big Island.

that will utilize field data, such as age isotopes and water age, in this regard. Brytne, a member of the modeling team, has won the 2019 Stearns Award from the Department of Earth Sciences. She will complete geochemical analysis of groundwater samples to identify the source of the nitrate contamination throughout the aquifer system. Potential sources include on site disposal systems, such as cesspools, and agricultural activities. The results will support the 'Ike Wai modeling and also help towards properly managing groundwater resources. Congratulation Brytne!

News also includes the recent graduation of **Chris Shuler** with a Ph.D. degree. Chris's research was dealing with a number of projects on Tutuila, American Samoa, where groundwater resources are essential for maintaining human habitability and for sustaining coastal and aquatic ecosystems. On Tutuila, groundwater is the only source of drinking

water for 90% of the island's approximately 60,000 residents. However, the island's population faces numerous water quality and water quantity challenges, including well salinization, aquifer contamination by anthropogenic sources, and environmental water quality degradation. The purpose of Chris's work was to contribute to new understanding of these issues in a tropical island environment, by exploring a wide range of hydrogeologic phenomena targeting critical water resources management questions. Congratulations Chris!

Neil Frazer has been working with **Garrett Apuzen-Ito** on algorithms for resource reconnaissance which have been used by the SOEST Play Fairway geothermal exploration group, a joint EARTH-HIGP effort with **Nicole Lautze** (HIGP), **Don Thomas** (HIGP), **Steve Martel**, Garrett and others. The group has located promising geothermal prospects on all the main islands, as detailed in a series of four papers in the journal *Geothermics*. Neil also works with **Rhett Butler** (HIGP) on probabilistic earthquake prediction algorithms for application to the Cascadia subduction zone. When not thinking about research, Neil is fully occupied with his courses titled "Literate Programming with R and RStudio" (ERTH 615) and "Bayesian Data Analysis" (ERTH 695). Both courses draw graduate students from outside SOEST, as well as EARTH students.



Students in EARTH 455 (Groundwater Hydrology) visiting the Waihe'e tunnel.

Julia Hammer continues to study igneous processes in a variety of settings.

New student **William Nelson** (PhD) jumped into research on the moon's most fascinating sample from the Apollo era (troctolite 76535). He came quickly up to speed on microprobe analysis and diffusion modeling, thanks to **Eric Hellebrand** and **Tom Shea**, respectively, and presented his estimates of its magmatic cooling rate (its fast!) at the 2019 Lunar and Planetary Science Conference in Houston. With his qualifying exam in the rearview window, Will is ready to crank out a paper.

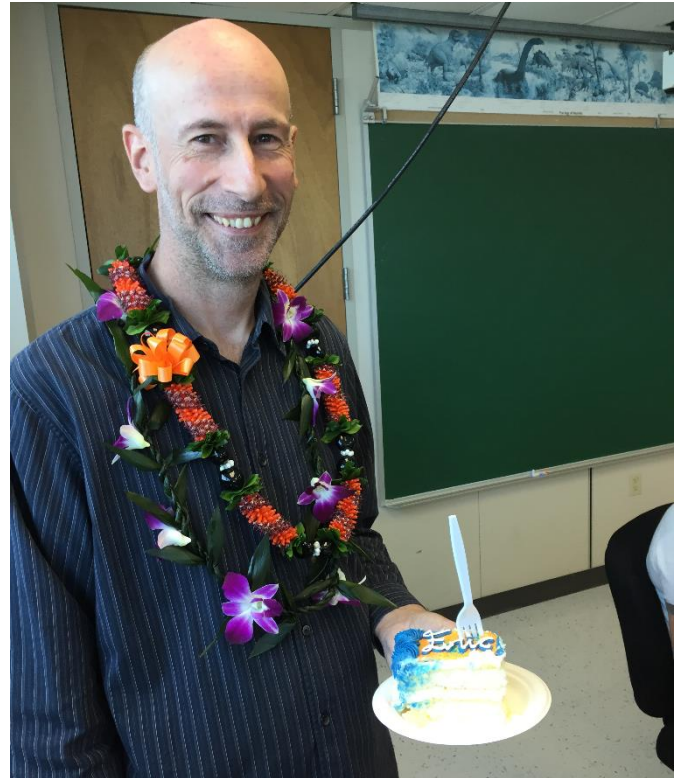
Without question, the most exciting event of the year for the experimental petrology and volcanology groups was the eruption at Kīlauea's lower East Rift Zone. The volcanology group at UHM was buzzing with activity—tracking (and speculating on) the data streams coming from the USGS, hopping to Hilo to catch commercial helicopter overflights, giving interviews to TV and radio news outlets, and gearing up a suite of research projects concerning subsurface magma dynamics and lava flow emplacement. In August, after the lava cooled somewhat, PhD graduate students **Rebecca deGraffenried** and **Adrien Mourey** (advisor, Tom Shea) collected samples in collaboration with USGS/HVO.

Research surges on other fronts as well. Julia traveled to Switzerland to carry out experiments in the unique centrifuging piston cylinder apparatus (lab of Max Schmidt at ETH Zurich) to examine effects of fluid flow on feldspar nucleation kinetics. A collaborative project examining the accommodation of phosphorus in the olivine crystal lattice with transmission electron microscopy includes **Hope Ishii** (HIGP), **John Bradley** (HIGP), and **Benoît Welsch** (participating from Brown University).

Julia was named Fellow of the Geological Society of America at the annual meeting in Indianapolis.

Eric Hellebrand left the warmth of Hawai'i to return to the Netherlands. Eric ran the microprobe and XRF in our department starting in 2006, and the data from these machines contributed to countless

papers, theses, dissertations, and proposals. Eric also participated in the research that led to all these various publications, not only in the interpretation of the data, but also in the field work. Finally, Eric trained a huge number of students and faculty on how to use the equipment. We will miss him and we wish him well.



Bruce Houghton reports that the physical volcanology team has had many reasons to celebrate over the past year, beginning with their involvement in the extensive scientific response to



GG601 field trip to White Island, NZ.



Bruce Houghton led an epic GG601 field trip to New Zealand right after spring break. Pictured here are Olli Beucler, Bruce Houghton, Rebecca Carey (PhD 2008, University of Tasmania [UT]), Adrien Mourey, Joy Cline, Acacia Clark (UT), Brett Walker, Malia Zinn, Imbi Simpson (UT), and Caroline Tisdale. Mahalo to all of you who donated to the Earth Sciences Field Trip fund at the UH Foundation – your continued support makes trips like these possible for our students.

the 2018 Kīlauea eruption, which culminated in a \$550K achievement-based NSF award for the group. There have been major personnel changes and a reduction in group size. Both R.V. Fisher postdoctoral fellows have finished their Kīlauea research. **Sébastien Biasse** has secured a prestigious research position at the Earth Observatory in Singapore. **Sam Mitchell** (PhD 2018) completed his PhD studies on the 2012 Havre eruption and returned to the United Kingdom; **Sebastian Mueller** has moved to Berlin to accept a job as an associate editor for Nature Geosciences.

Bruce Houghton was honored in 2018 as an American Geophysical Union Fellow during the AGU Fall Meeting in Washington, DC.

Working for the National Preparedness Training Center **Wendy Cockshell** (BS 2016) and Bruce, in conjunction with volcanologists from all five of the U.S. volcano observatories, have produced a new revised and shortened Volcanic Crises Awareness course currently being processed for FEMA certification. Plans are in place to debut the course in June at Mammoth Lakes, CA.

PhD candidate **Brett Walker** (MS 2017) continues her research into aspects of the 2018 LERZ eruption submitted a manuscript to Geology in May 2018.



GG300 field trip to the Big Island.

Caroline Tisdale (BS 2018) has joined our team as an RCUH research assistant, focusing on image analysis of high resolution videos from Kīlauea and Stromboli. She has already been actively assisting in field work to the Big Island, Taupo Volcanic Zone, New Zealand and two excursions to Italy; one for training and another to assist Bruce Houghton on his expedition to Stromboli volcano.

Past postdoc Sébastien Biasse visited us in January to collaborate and complete further lava fieldwork on the Big Island. Two research papers resulted from this visit.

We are grateful for our lab assistants **Cameron Macdonald** and **Maxwell Bourne** and our once lab assistant, **Joy Cine** (BA 2018, currently MS candidate).

Jasper Konter's research has focused on a number of different topics, mainly related to the geochemical composition of hotspots. A collaborative study with OSU (PI Anthony Koppers) and UCSB (PI Matthew Jackson) on tracing the Rurutu hotspot has culminated in the publication of former student **Val Finlayson**'s (PhD 2017, now at U. Maryland) paper on the track of the Rurutu hotspot. This work has defined a bend in the Rurutu track that is equivalent to the bend in the Hawaii-Emperor hotspot track (published in *Earth and Planetary Science Letters*). Our collaborative efforts with OSU and UCSB also resulted in a paper showing how the Hawai'i-Emperor hotspot moved independently from the Louisville and Rurutu hotspots, which were stable with respect to each other (published in *Nature Communications*). Finally, during the sampling cruise, nearly 600 samples were analyzed for their composition identifying several groups of unrelated volcanoes using the relatively new LIBS technique (spectroscopy of a laser-generated plasma). In collaboration with **Shiv Sharma** (HIGP), we examined the capabilities and limitations of the technique and instruments used (published in *Applied Spectroscopy*). Our efforts in using LIBS instrumentation are continuing with new MSc student **Olli Beucler**. We are investigating the systematics of metals on the surfaces of spatter

from Kīlauea Volcano, in collaboration with **Ken Rubin**. In collaboration with Matthew Jackson and Thorsten Becker (UT Austin), we have investigated the possible location in the Earth's mantle for extreme mantle isotope-geochemical reservoirs, which represent crustal material that is recycled back into the mantle at subduction zones. We found a high likelihood that these reservoirs are hosted in the mantle's seismically defined yet still mysterious "large low shear wave velocity provinces", and that there are latitudinal variations in these compositions (published in *Earth and Planetary Science Letters* and *Geochemistry, Geophysics, Geosystems*). Konter was also involved with Matthew Jackson's PhD student's projects studying the isotopic variability in olivine-hosted melt inclusions from Hawai'i and Samoa, finding much reduced variation compared to previously described lower-precision data for Hawai'i, yet more significant variation in Samoa (published in *Chemical Geology*). The student's second project involved the geochemical study of a drill core through the final stages of volcanic activity on Tutuila (Samoa). This represents the first drill core dataset for Samoa, and provides the first timed sequence that shows the timing of Tutuila's most recent activity versus the island's decreasing distance from the Tonga Trench, which may have affected Samoan volcanism (published in *Geochemistry, Geophysics, Geosystems*). Related to Samoa, Konter participated remotely in NOAA's Okeanos Explorer ROV expedition to the eastern part of the Samoan islands and seamounts, which resulted in the discovery that Samoa's currently active volcano, Vailuluu Seamount, has continued to build a cone inside its crater. In addition, mapping south of Tau Island revealed that the breached crater at the surface feeds an 80 km submarine fan with a lack of identifiable fragments of the volcanic edifice, implying far less catastrophic volcanic collapse processes than may have operated in parts of Hawai'i (Field season report in *Oceanography*, detailed publication in progress). Konter also hosted an REU student that worked on similar Okeanos Explorer samples from 2016, and will continue to

participate in the REU program this summer. Finally, a collaboration with scientists at the USGS and UTEP regarding the origin and evolution of brackish groundwater in western Texas and its potential suitability for use in fracking, used geochemical methods to define the water's history, and found the water suitable for specific industrial uses (Environmental Geosciences).

Steve Martel's main research focus remains on how topography affects stresses in the Earth, and the implications for fracturing and permeability in the upper crust. Steve is applying the results to two projects. The first is with **Garrett Apuzen-Ito** and **Neil Frazer** in this department, and **Nicole Lautze** in HIGP, to reappraise geothermal resources in Hawai'i. The second project is a multi-national effort directed at fracturing in the bedrock of Sweden to assist high-level nuclear waste disposal efforts. Steve is also working to finish a pair of structural geology books with Dave Pollard and plans to use them in the undergraduate structural geology class this coming fall term. In the summer of 2018, Steve had the pleasure of working with Annika Dechert in the department's Research Experience for Undergraduates (REU) program. Annika conducted a series of laboratory experiments on dike

propagation in gelatin and applied fracture mechanics principles to understand how the density contrast between the host rock and the fluid in a dike affects the three-dimensional shape of the dike. Annika will be attending the University of Oregon this coming fall. Steve continues to represent the department on the Hawai'i Earthquake and Tsunami Advisory Committee.

Greg Moore's group continued with its work on several subduction margins and on the NE Hawaiian Arch. Ph.D. student **Jason Lackey** finished the 3rd paper of his dissertation (about structural restoration of thrust faults and associated sedimentation in a Nankai trench slope basin). Jason will be returning to his job as an officer (Major) in the US Air Force. MS student **Nipaporn (Nina) Nakrong** finished her thesis on analysis of 2D seismic reflection imaging of the MoHo reflection NE of O'ahu -- a potential site for IODP MoHo drilling in the future. Nina will be returning to Thailand soon. Ph.D. student **Hannah Tilley** presented the main part of her first Ph.D. dissertation paper at the Fall AGU and GeoPRISMS meetings. She is studying the faulting at the seaward margin of the Nankai accretionary prism and will also be working on 3D seismic data from the Hikurangi margin. Greg



Steve Martel and the EARTH 454 Engineering Geology class, with Honolulu and its myriad engineering geology challenges in the background.

joined IODP Expedition 358 in an attempt to drill to the plate boundary fault in Nankai (nope -- didn't get there) and finished a paper on mélanges on the western margin of Myanmar (northern Sunda subduction zone).

Brian Popp continues his isotope biogeochemical research focusing on nitrogen cycling in marine environments, marine food web studies and the marine mercury cycle. As this is being written, Natalie Wallsgrove and Brian are diving at 4100 m in ALVIN at Station M, off Point Conception (~200 km from the California coast).



Natalie Wallsgrove boards ALVIN for a trip to the bottom of the ocean.

Scott Rowland: It was a pretty standard year for me, with teaching and a bit of research and Mars work. In the fall, I taught GG103, 306, and 461, and in the spring it was GG305. Alumnus Mike Jackson came through big-time to help support the Mojave Desert trip, and all the students were very, very grateful for his generosity. I am advising **Brian Shiro** (PhD), **Joy Cline** (MS), and **Jason Tremblay** (MS).



Bryson Aiu, Katie Dungan-Bunao, and Michelle Tatsumura-Yoshioka

In April, GG graduates **Bryson Aiu** (BA 2013; Geolabs), **Katie Dungan-Bunao** (BS 2014; Enviro Services), and **Michelle Tatsumura-Yoshioka** (BS 1991; MS 1995; 'Iolani School) took time out of their schedules to come and talk to current undergraduates about what they can expect out in the real world. Mahalo for making the effort to encourage and educate the next generation!

Mahalo also to the GG101L TAs for their hard work this past year: **Erin Fitch** (F18), **Eric Welch** (F18), **Jordan Mason** (F18), **Malia Zinn** (F18, S19), **Krista Evans** (S19), and **Olli Beucler** (S19).

Ken Rubin spent a lot of effort this past year as the new chair of the Leadership Council for the National Science Foundation EarthCube program, a



Ken presenting on the state of EarthCube at its annual meeting in Denver, June 2019.

large-budget cyberinfrastructure and data literacy effort for the Foundation's GEO Directorate (Earth, Ocean, Atmospheric and Polar divisions). In this role, he is the lead voice and strategic director of this decadal initiative, which hopes to fundamentally improve science workflows through digital solutions to data and data resource use, enhancement of the findability, accessibility, and interoperability of data, tools and models, and scientist education on best data practices. Ken also participated in a German research expedition looking at submarine volcanoes in Tonga, marking his 7th in the region since 2009, and has been heavily involved in investigating short-lived radioisotopes in spatter and lava from the 2018 Kīlauea eruption.

Tom Shea, like others in the department, and his graduate students have been working extensively on the 2018 eruption of Kīlauea Volcano since last year. Tom was fortunate to be there in May of 2018 and later contribute to field work efforts with the Hawaiian Volcano Observatory. He was awarded funds as part of a VGP team grant (NSF RAPID) to investigate the magmatic processes that led to the eruption, as recorded in the mineral cargo. PhD student **Rebecca deGraffenried** has been working on the rheology of lava flows emitted during the first weeks of the eruption, in parallel with her petrological investigations of tiny open inclusions

(‘melt embayments’) in minerals such as quartz and olivine aimed at extracting magma ascent timescale information. PhD student **Adrien Mourey** is examining all the mineral phases of the 2018 eruption, characterizing their geochemical characteristics, and determining the times between mixing of the different magmas prior to this eruption. Most of this work since last year has been done in close collaboration with the USGS. Tom was also busy setting up the first instrument in his new lab, a microscope heating stage that will allow investigating high temperature (>1100 degrees C) processes like magma crystallization directly under the scope! Finally, Tom and **John Sinton** organized a memorable field trip to Maui in Spring 2019 with the EARTH302 petrology students (see below), where everyone got to put their hands directly on important volcanological features/concepts such as transitions between shield and post-erosional volcanic stages, historically defined in the Hawaiian Islands.

Bridget Smith-Konter and her crustal deformation research group had an exciting and productive year. PhD graduate students **Lauren Ward** and **Liliane Burkhard** successfully passed their Comprehensive Exams this past spring and are now officially on their way to studying deformation of the San Andreas Fault System and tidal stresses of



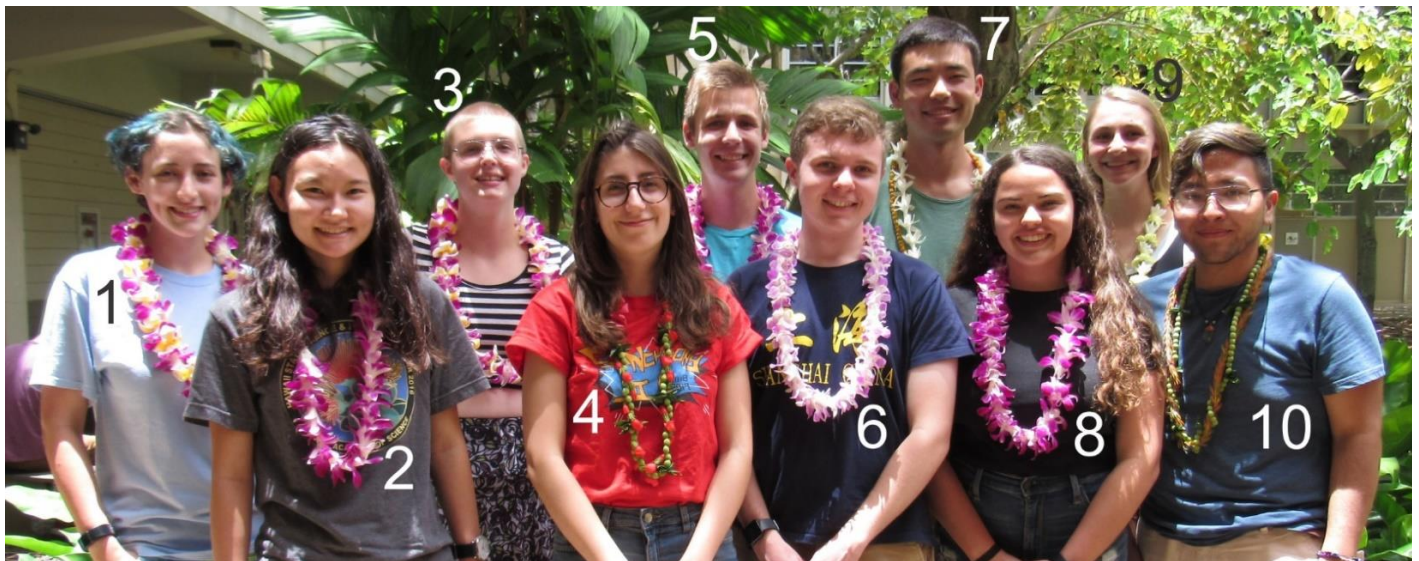
Students (and friends and family of students) enjoying the view, rocks, and thin air on the rim of Haleakalā during the EARTH 302 Maui field trip.

icy moons. Congratulations to Lauren Ward for receiving the Toby Lee ARCS Award in Earth Sciences and the ARCS Scholar of the Year Award! Additionally, congratulations to **Dr. Marissa Cameron**, who defended her Ph.D. last spring, on landing a job at NASA’s Jet Propulsion Laboratory as an Applied Science Systems Engineer. Together, our group attended two international meetings (Southern California Earthquake Center Annual Meeting, and AGU) with 5 submitted abstracts. We also published three papers, in topics ranging from variations in creep rate along the San Andreas Fault System due to Coulomb stress changes from large regional earthquakes (*Xu et al., 2018*) to tectonic morphology and tidal stresses of Ganymede (*Cameron et al., 2018; 2019*). We also have two mature manuscripts about to be submitted for peer review on seismic moment accumulation rates (*Ward et al., 2019*) and earthquake cycle stress rates (*Burkhard et al., 2019*) of the San Andreas Fault System. Our group also dedicated a lot of time this past summer and fall on providing near-real-time InSAR data of the 2018 Kīlauea eruption. New Sentinel-1 radar data were acquired every 3 days, and we continuously processed these data into

phase change and line-of-sight maps through the end of September 2018 (*Smith-Konter et al., 2018*; http://pgf.soest.hawaii.edu/Kilauea_insar).

Bridget also continues to serve on the Southern California Earthquake Center (SCEC) Science Planning Committee.

On the educational front, Bridget focused most of her time teaching graduate course GG631 (*Geophysics – Solid, Fluid, and Wave Mechanics*) and undergraduate course GG451 (*Earthquakes and Crustal Deformation*). Also this year, we launched *The Earth Moves Me!* Program, which delivers interactive geoscience educational activities to local classrooms with a focus on teaching students about plate tectonics and connecting students with geoscientists in the community. This pilot program is funded by NSF and provides salary stipends for 10 undergraduate students that participate in the program. The Earth Moves Me! Program attended several education and outreach events this year, visiting the campuses of, or hosting students from, Hawaiian Mission Academy, Kailua High School, Leilehua High School, Kamehameha Schools, Waipahu Intermediate School, Wai’alae Elementary School, and several others during the Mānoa



2019 REU participants shortly after their arrival in Honolulu. Names in parentheses are their faculty advisors. 1) **MJ Wilner**, Whitman College (Garrett Apuzen-Ito & Niels Grobbe); 2) **Nerissa Barling**, Colorado College (Celia Smith); 3) **Madeline Hunt**, U North Carolina (Garrett Apuzen-Ito & Niels Grobbe); 4) **Meri Colet**, Carleton College (Rhett Butler); 5) **Jake Harrington**, U South Carolina (Craig Glenn); 6) **Jacob Switek**, Colorado State U (Murli Manghnani); 7) **Grant Kirchhoff**, U California Berkley (Brian Glazer); 8) **Jiana Blaha**, American University (Celia Smith); 9) **Molly Cunningham**, Rensselaer Polytechnic Inst (Jasper Konter); 10) **Gerardo Barrera Giron**, SUNY Buffalo (Aly El-Kadi).



In front of the R/V Kilo Moana, getting ready to explore an uncharted rift zone southwest of Kaho‘olawe.

Experience. Bridget also led the UH effort to participate in the *Great Hawaiian ShakeOut* earthquake preparedness event in October (in conjunction with the international *Great ShakeOut* event). At UH, the ShakeOut has grown to include over 450 students, faculty, and staff. Finally, because **Paul Wessel** is now Dept. Chair, Bridget took over administration of the last year of our Research Experience for Undergraduates (REU). 342 very good applicants were whittled down to 10 excellent participants. They arrived in early June and are now well into their 9 weeks of research. They, along with REU participants in other UH departments, will be presenting their results at an undergraduate research symposium here on campus August 2nd. If you are on campus that day, please come by to see what these remarkable young scientists have been able to accomplish.

This is our third summer hosting the Earth Science on Volcanic Islands (ESVI) REU NSF site program. Our program offers undergraduate students a unique opportunity to visit Hawai‘i and work with individual faculty mentors on cutting edge research projects. This year we are hosting 10 undergraduates and each student spends nine weeks working on a research project with their

individual mentor or mentor pair, studying active and inactive Hawaiian volcanoes, environmental science in tropical watersheds and coastal environments, effect of ground water discharge on corals, mapping and modeling of Earth processes, and much more.

In addition to research, our group has many cohort activities on their summer calendar: (1) A three-day oceanographic cruise on the R/V Kilo Moana, led by Chief Scientist **Jasper Konter** and Co-Chief Scientist **Deborah Eason**, to explore a rift zone southwest of Kaho‘olawe. We are also hosting two Kapi‘olani Community College students and two teachers from Kamehameha Schools on this voyage; (2) A three-day geologic field trip to the Big Island, led by **Bruce Houghton** and **Caroline Tisdale**; (3) A visit to the Hawai‘i Institute for Marine Biology (HIMB), Coconut Island; (4) A Quaternary geology kayak expedition to the Mokulua Islands, led by **Chip Fletcher**; (5) An East O‘ahu geology field trip lead by **Julia Hammer**; (6) Several professional development workshops sponsored by the UHM SURE (Summer Undergraduate Research Experience) program; (7) and several short courses and computing workshops on MATLAB, ArcGIS, and Python programming.



Steve Stanley has left the Earth Sciences Dept., but he made it very clear that he has *not* retired. Instead, he has moved to Baltimore and will work on a variety of research projects including aspects of Brachiopod and Trilobite functional morphology (among other things). He will be working from the Smithsonian as well as the University of Florida. Best of luck, Steve!

Paul Wessel has been somewhat side-tracked by being Department Chair this academic year, but nevertheless managed to graduate his MS student **Elizabeth Benyshek**, in no small part thanks to the plate tectonic expertise of our Dean **Brian Taylor**. We are working on papers resulting from Elizabeth's thesis at the moment, with one submitted. After

almost 30 years of developing and maintaining the Generic Mapping Tools (gmt.soest.hawaii.edu) supported by the US National Science Foundation, we are working with NSF and other stakeholders on a succession plan for GMT so that this key piece of research infrastructure will continue to see development and maintenance after the current developers, especially Wessel, reach the end of their research careers. To that end, we had a developer's summit in Faro, Portugal in January and are now working on a white paper to guide the final GMT transition proposal writing. We will have another GMT developer's summit at Scripps this summer, where NSF program managers and the GMT steering committee will be participating. It is an unusual situation of planning for what will happen after you cease to participate at the present level. While all this is going on, we are trying to release the latest and greatest GMT version (6) this summer. Paul has also taken on a new master's student for the fall semester (to work on absolute plate motion modeling) and is part of a new group effort lead by **Jasper Konter** to sample West Pacific seamounts in a bid to better understand both Pacific plate and plume motions. I smell another busy academic year coming up.



L -> R: GMT developers Florian Wobbe (Germany), Paul Wessel (Hawai'i), Joaquim Luis (Portugal), and Leo Uieda (Earth) showing off GMT beer glasses mailed by a grateful GMT user during a developer summit in Faro, Portugal, January 2019.

* * *

Distinguished Alumnus

Jim Bell (PhD 1992 in Geology & Geophysics)

Professor at Arizona State University's School of Earth & Space Exploration

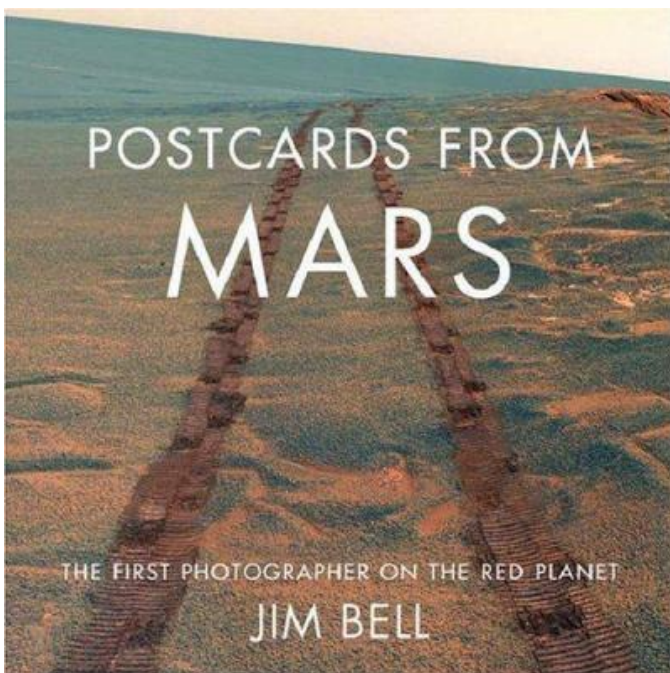
Our distinguished alumnus for 2019 is Dr. James (Jim) Bell. Jim earned a BS from CalTech, and then came to Hawai'i where he earned both a masters (1989) and PhD (1992) in Geology & Geophysics. Jim's graduate research used telescope-derived spectral data of Mars, as well as field-based and laboratory analyses of Mars analog materials and features, and his advisor was Dr. Tom McCord. Since graduating, Jim has been incredibly successful as a professor in the Dept. of Astronomy at Cornell, and since 2011 as a professor in the School of Earth and Space Exploration at Arizona State U. Jim has taught 17 different courses at Cornell and ASU combined. He is first author of 38 articles and co-author of >160. Jim's greatest professional achievement (as Co-PI or PI) has been the development of cameras on the Spirit, Opportunity, Curiosity, and Mars 2020 rovers. He and his students use the many hundreds of thousands of images from these cameras, along with images collected from orbit, to study the geologic history of Mars. The raw beauty of the rover-camera images inspired Jim to write his first public-audience book, Postcards From Mars, and he has gone on to write 6 more. Despite all this

teaching and research, Jim still finds time to be President of the Planetary Society, give numerous public lectures each year, and paddle outrigger canoe. His official website is here:

<http://jimbellsese.asu.edu/>

Jim writes: Back in the day when I was a UH grad student (late 80s/early 90s), the Planetary Geosciences Division (PGD) of what was then the Hawai'i Institute of Geophysics was a group of some 50 or so people who worked in the basement of Sinclair Library, on the west side of the Mānoa campus. We were packed into fairly close quarters, but there was also a great sense of aloha and kōkua because all of us – faculty, staff, and students – were "in the basement" together. It's ironic that we were all reaching such great heights at the same time.

Back then, the *Viking* missions to Mars had recently ended, and there were very few deep space robotic missions going on. One of the few was *Voyager 2*, which did its flyby of Neptune in 1989, and I was fortunate to be invited by Professor Fraser Fanale, a member of my graduate committee, to



Jim at the wheel of his beloved jeep during a practice Mars-rover mission at a secret spot in Arizona.

experience the latter as a grad student guest at JPL, meeting many of the colleagues who I would eventually get to work with in the field. Another NASA mission that several UH researchers were eager to work on was *Mars Observer*, but that spacecraft wouldn't get to Mars until 1993, and unfortunately it failed (due to a propulsion system problem) just 3 days before getting to Mars.

All that meant that there was a heavy focus in PGD on using telescopic observations from UH and NASA facilities on Mauna Kea to study the surface composition and mineralogy of the Moon, Mars, asteroids, and outer solar system satellites. A number of us also collaborated with planetary astronomy colleagues in the UH's Institute for Astronomy on such proposals, and then on the ensuing observing runs, to collect some great imaging and spectroscopy data sets.

I was lucky in the timing of my graduate career, because Mars happened to be going through a very favorable set of bi-annual close approaches, or "oppositions", in 1986, 1988, and 1990, and my graduate advisor (Tom McCord) and committee member Paul Lucey were interested in collecting some new data sets using some of PGD's new,

cutting-edge telescopic instruments. I was also lucky that there were two "small" telescopes up on Mauna Kea back then that not many astronomers were using, especially around Full Moon time – meaning that a lowly UH grad student like me could get a LOT of telescope time on either the "Air Force" or "Planetary Patrol" 24-inch telescopes. For the Mars imaging and spectroscopy work that I wanted to do, I didn't actually NEED a big telescope. Mars is super bright, so all I needed was a clear observing site and a great *resolution* (what astronomers call "plate scale") on Mars, because I was aiming to measure small, individual regions on Mars that had looked potentially interesting from the *Viking Orbiter* data.

So I spent a lot of time flying over to the Big Island, sometimes with an industrial coffee-urn-looking spectrometer belted into its own seat beside me and steaming liquid nitrogen vapor out the top (It looked like a bomb! Can you imagine trying to get on an airplane with something like that as your carry-on luggage these days???), then driving up to the summit of Mauna Kea for a week or two of observing at a time. It was physically draining but also a lot of fun – I got to spend some daytime hours hiking around among the amazing Mars-like



Jim (green and blue jacket) on the slopes of Mauna Kea (with Mauna Loa in the background), along with a few of his Cornell graduate students, during a NASA Volcanology workshop. They have all gone on to great careers.

landscapes of that spectacular volcano, and even worked on a little study of altered Mars-like volcanic soils with some field help from a much younger (but just as generous with his time as today) Scott Rowland.

I have enormous gratitude to the people who helped me learn geology as well as how to set up and use cameras and spectrometers on telescopes, and how to process large and complicated data sets in innovative ways. In particular, staff member Pam Owensby (“Pam-O!”) taught me almost everything I know about designing experiments, setting up equipment, and collecting data. I still use her advice, wisdom, paranoia, and guidance in my work today with spacecraft instruments and data sets. And my other major mentor, Paul Lucey (who, even 30 years ago, *still did not have hair*), taught me how to collect, process, and interpret brand new kinds of *imaging spectroscopy* data that let me detect and map iron-bearing minerals on Mars at then-unprecedented resolution. I like to think that the work we did back then at PGD using the telescopes at Mauna Kea helped set the stage for the incredible results coming back these days from similar instruments now on orbiters, landers, and rovers all across the solar system.

I'm proud to be an alum of the G&G program at UH, so happy that I still get to work with many of the friends and colleagues that I met during my time in Mānoa, and thrilled to have had the opportunity to continue to paddle canoe once in a while and to



A highlight of our Alumni Days event was a fascinating public presentation that Jim gave about the future of space tourism “We already know where all the (inter) national parks will be.”

make new island-style friends even in the Arizona desert. The aloha spirit is worldwide. Sincere mahalos to everyone who helped me along the way!

* * *

Alumni News

Hannah Azouz (BS 2016; MS 2017): My whereabouts...currently living in 'Aiea, Hawai'i while finishing up my KUPU internship on the eastside for Hui o Ko'olaupoko. In January of 2018, I founded an environmental startup company for conservation and geologic project monitoring called **Land Water Air**.

Jennifer (Beyer) Hatch (BS 2012): Since graduating in 2012, I've spent some time working in New Zealand, earned my M.S. in Geosciences from the University of Texas Arlington, completed two industry internships with Pioneer Natural Resources and Chevron, and I am currently finishing my Ph.D. at the University of Massachusetts Amherst where I am focused on geomechanical modeling of the southern San Andreas Fault. After I defend my dissertation this summer, I will be starting as a full-time faculty member at The Hotchkiss School, an elite private boarding school in Connecticut, where I will be teaching physics while I develop geology electives!

On a more personal note, in July 2018, I married my best friend, Ben Hatch. We live with our rescue family: our dog, Kelsie, and our two cats, Bumi and Pixel. When not hunkered down finishing my dissertation, Ben and I are hiking, camping or skiing the Berkshire Mountains.



Congratulations, Jennifer and Ben!

James Bishop (BS 2012; MS 2015): Natalie and I are living in Los Osos, CA and I'm working as an Engineering Geologist for the Central Coast Water Board in San Luis Obispo. The region is an incredibly productive agricultural area and as a result, has a long list of water quality and water supply problems. I work on a variety of groundwater-related projects, including the development of a regional groundwater monitoring network, groundwater age dating, nitrate source identification, groundwater pesticide characterization, and cannabis cultivation impacts to water resources. On a personal note, Natalie and I are laying down roots in Los Osos - we bought a house in 2017 and are expecting our first child later this year! The picture below is from a five-day backpacking trip we did in the summer of 2018 in the Mineral King area of the southern Sierras. We are standing on Sawtooth peak and the Kaweah peaks in the background are a meta-volcanic roof pendant overlying the granitic rocks of the southern Sierra.



Natalie and James

Kim Bitterwolf (GES 2014; thesis advised by **Henrieta Dulai** and **Craig Glenn**): I'm currently located back home in Lihu'e, Kaua'i. My final year of the PhD (Ocean Sciences, UCSC) is being supported by an NSF INTERN grant, through which I'm interning part-time at the National Tropical Botanical Gardens while also writing my manuscripts. My PhD defense date has been set for

December 6th, 2019 - the Friday afternoon before AGU. My research is on Li, Mg, Ca, Sr, and Ba isotopes in rivers, groundwater, and seawater. During the summers, I'm teaching with UH Mānoa's Oceanography Department's "Mauka 2 Makai" Program. Last summer's class was truly impressive and I'm looking forward to the cohort that this summer will bring!



Kim Bitterwolf

Daniel Dores (MS 2018): I graduated in July with my Masters in Geology and Geophysics, working with **Craig Glenn**. I have since started a position at RCUH in September as a Geothermal Geology Technician for Hawai'i Groundwater and Geothermal Resources Center, headed by GG alum **Nicole Lautze**. I am working on the Hawai'i Play Fairway Project as well as a few other groundwater investigations across the state.

Ashton Flinders (MS 2009): I recently relocated to Hilo, Hawai'i, as a Presidential Management Fellow at the Hawaiian Volcano Observatory. For the past three years, I was at the California Volcano Observatory as a Mendenhall Post-doctoral Fellow. My post-doctoral research focused on using high-performance computing and full-waveform seismic tomography to image the magma reservoir beneath

the Long Valley Caldera. This work produced the first high resolution, deep imaging of the volcano's magma reservoir, and was published in 2018 in the journal *Geology*. During my time at CalVO, I was lucky enough to work with the now departed "Mr. Long Valley" Dave Hill. At HVO, I will continue to pursue seismology-related research, but will also expand into microgravity research of Kīlauea and Mauna Loa. Gravity and potential-field inversions were the focus of my masters research while at SOEST and I am excited about the return to this field of research and Hawai'i. I spend my weekends exploring the beaches of the Big Island with my long-time trusted companion Boomer, a seven year old



Boomer exploring the beaches of Big Island



*Left-Right: **Daniel Dores**, **Eric Haskins** (MS 2002), **Colin Ferguson** (MS), **Nicole Lautze** (PhD 2006), and **Kevin Humphry** (Pūlama Lāna'i), about to send a water-sampling device down a 1400'-deep water well in the Lāna'i basin. This is part of Phase 3 of the Hawai'i Play Fairway Project, headed by Colin and funded by a grant to Nicole.*

spoiled Rhodesian-Ridgeback/Labrador mix who loves belly rubs and who hopes to one day make it off the acknowledgments section and be listed as a co-author.

Patty Fryer (MS 1973; PhD 1981; Researcher at Hawai'i Institute of Geophysics & Planetology): I was invited to participate as a science adviser in the Mariana Trench expedition of Victor Vescovo from Apr. 24, to May 9, 2019. The submersible *Limiting Factor*, that he had built for him by Triton Submarines, dove 4 times in the Challenger Deep area, reaching the greatest depth record, and once in the Sirena Deep, which is the second deepest part of the Mariana Trench (discovered by the SOEST MR-1 system in 1997). The "Limiting Factor" can take two people during its dives and is now officially certified to dive to unlimited depth. Victor brought back some sediment and a couple of rocks from the Sirena Deep and I'm working on them now. He also had invited Don Walsh as an adviser. Don Walsh and Jacques Piccard were the first people to dive to bottom of the Challenger Deep. They accomplished that feat in the Trieste bathyscaphe in 1960. The Limiting Factor sub will be made available for future dives and will open a new era of hadal marine discovery.

After Victor completed the deepest dive in the Challenger Deep, I made sure he was adequately adorned with a maile and 'ilima lei as a token of



Left-Right: Don Walsh (who, with Jacques Piccard, completed the first dive to Challenger Deep in 1960), Patty Fryer, Steve Chappell, and Victor Vescovo.

esteem. What a thrill to have been able to participate!

Here is the web site for the expedition: <https://fivedeeps.com/home/expedition/> It contains info about the hadal-capable sub and the most recent description of the results of their first successful HOV dive.

Lerma Gamiao (BS 2014): After four years of working for the U.S. Army Corps of Engineers in Honolulu, I decided to leave my position as a GIS Technician to join Akimeka, LLC as a GIS Analyst in their 9-1-1 operations. Many people have asked why I left, and it's simply because I felt that I have learned all I could from the USACE and I needed to grow elsewhere.

I celebrated my first anniversary with Akimeka on January 8, 2019. Akimeka maintains the GIS Public Safety database that Hawaii first responders use to accurately pin-point 9-1-1 emergency call. I'm a remote worker, aka "work-at-home," and I maintain the Honolulu GIS database for the state of Hawai'i. In a short year, I have learned a lot about GIS and public safety. I hope to continue improving the data, response times, and routing for emergency responders. Although my work involves little to no geology work, I'm glad that I'm able to help our community through the improvements I continue to contribute to the project.

In other news, Robert, my boyfriend since my G&G days proposed on our first trip together to



Congratulations, Lerma & Robert!

Seoul, South Korea in February. We plan to get married in the year 2021.

Nicole Lautze (PhD 2006): I'm now an Associate Researcher with a joint position between the Water Resources Research Center (WRRC) and HIGP. I was appointed Associate Director of WRRC Jan. of this year and I founded and direct the Hawai'i Groundwater & Geothermal Resources Center (HGGRC). I married Mike Maresca, a physical therapist born and raised in Honolulu. We have Alexander (3 years old) and Gabriella (almost 2).



Nicole, Alexander, Gabriella, & Mike

Jonathan Low (MS 1995): I am working for Military Systems Group in Nashville, TN. <https://milsysgroup.com/>

I am presently working on a muzzle brake for artillery. Hot expanding gasses spiral in to minimize recoil, while not subjecting the gun crews to too much blast concussion. (Not your typical incompressible fluid flow at constant temperature homework problem.)

I use fluid physics, stress-strain, and other stuff, much of which I learned at SOEST. We build all kinds of weapons, turrets, shielding (more than just armor), and such. Yes, we are hiring and expanding.

I still do some tinkering with electronic warfare stuff, including counter measures, trying to prematurely detonate enemy explosives, etc. (by methods other than shooting them). We always shoot live ammo because the live ammo is cheaper than the dummy ammo. Economy of scale.

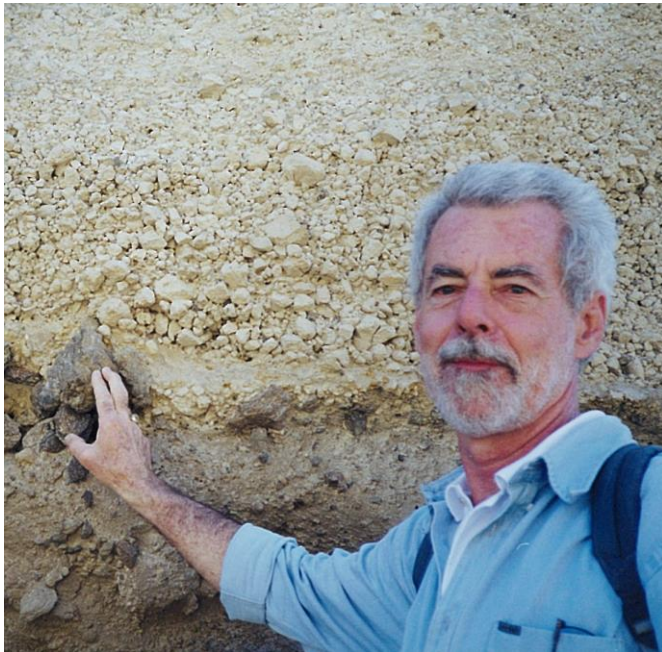


Jonathan Low

Michael Mathioudakis (MS 2018): After graduation last year, I took a job with Arcadis in Honolulu. I am working on a wide variety of environmental remediation and water resources projects for multinational and local clients alike. My wife Mikayla and I love living in Hawai'i, and we just adopted a new puppy (Lucy) this past Fall. *(picture on the next page)*

Floyd McCoy (BS 1962, MS 1965): continues on the faculties at Windward CC as Prof. in Geology, Geophysics and Oceanography, and at Mānoa on the Cooperating Graduate Faculty. Research

interests focus on the Late Bronze Age eruption of Thera (Santorini) in Greece, and scattered field projects here in Hawai'i (none of which are getting done thanks to a heavy teaching load...)



*For many years I have been studying the late Bronze Age (~1600 BCE) eruption of Santorini. This photo shows the deposit left by early, small, phreatomagmatic eruptions prior to the enormous Plinian phase. These smaller eruptions warned inhabitants living on the volcano to evacuate. I am advising Earth Sciences Masters-degree student **Krista Evans**, who is studying this layer.*

Marc McGowan (MS 2004): It has been a busy few years since my last update. Our family has grown with the addition of our son, Desmond, who was born in 2015. In late 2016, we undertook a big



Marc, Vivienne, Erin, & Desmond



Mikayla, Lucy, & Michael

move across the country from Perth in Western Australia to Brisbane in the state of Queensland.

My wife, Erin, has recently taken up a position as a Communications Officer with Brisbane City Council which she really enjoys. Our daughter, Vivienne, is now 5 years old and started school in January which has been a big and exciting step for her. I continue to work for BHP within the Water Planning team, approaching 8 years with the company. My activities are wide ranging and encompass most facets of mine site water management, including pit dewatering, sourcing water supplies, and managing surplus water. With the highly variable rainfall here in Queensland (some say we have two seasons: drought and flood), we quite often switch from one extreme to the other by not having enough water to having too much. Planning to manage such extremes is one of the challenging aspects of my work that I enjoy.

Adrienne Oakley (PhD 2008). I am an associate professor at Kutztown University of Pennsylvania (KU) where I teach introductory and advanced



Chris, Quinn, Adrienne, Miles, & their family dogs

I live in rural PA with my husband, **Chris Bochicchio** (also a G&G alum), two sons: Miles (age 5.5) and Quinn (age 2.5), two dogs, two cats, a fish, and an axolotl. I will be taking my first sabbatical during the 2019-2020 and am really looking forward to finding a little time for some hobbies!

Christina Richardson (MS 2016): I am living in Santa Cruz, California, and working on my Ph.D. in the Earth and Planetary Sciences Dept. at UC Santa Cruz. I qualified for candidacy in 2018 and have plans to graduate in 2020.

Chris Shuler (MS 2016, PhD 2019): I am finally graduating after 6 years as a student in the GG department. Prior to my final semester, I took a remote-work-paternity-leave sabbatical to North Carolina, Arizona, California, Australia, and Puerto Rico with my wife and new baby to finish up a couple of publications and to explore some point-breaks near possible locations to look for future employment. It turns out the cost of living in Hawai'i really isn't that bad compared to anywhere else in

courses in marine science and geology to a broad audience, many of whom are first generation college students. My research focuses on deep ocean basins and coastal zones. In the deep ocean, I map seafloor bathymetry and subsurface structure to investigate processes that occur within subduction zones. Along the coast, I study the effects of sea level rise and environmental change on barrier islands and salt marshes. My active research program at KU involves several undergraduates is made possible through partnerships with the Chincoteague Bay Field Station, Chincoteague National Wildlife Refuge, and NASA's Wallops Flight Facility.

I am currently the chair of the Academic Advisory Council for the Chincoteague Bay Field Station of the Marine Science Consortium in Wallops Island, VA and coordinator for Kutztown's Marine Science Program. In February, I was chosen to be a 2019 AGU Voices for Science Advocate in the Media/Public Communications track.



Chris and daughter Ollie at Yosemite.

the world with similar access to both an ocean and to broadband internet, so I plan to stay with the University of Hawai'i Water Resources Research Center for at least a few more months to continue developing a water-centric applied research program in American Samoa. Presently I am getting excited about merging the fields of data-science and hydrology, and have been working on creating a collaborative groundwater modeling framework with partners at American Samoa's only water utility. The modeling is open-source, cloud-based, and process oriented to make modeling more accessible, transparent, reproducible, and stakeholder driven:

https://github.com/cshuler/ASPA-UH_Integrated_Modeling_Framework



Installing a weather station in American Samoa.

Mike Theune (BS 2007): I am still based at Sequoia and Kings Canyon National Parks, and was called back to Hawai'i a second time in 2018, this time in August for the Keauhou Fire within Hawai'i Volcanoes National Park (HVNP) to serve as the lead fire information officer for the National Park Service. The Keauhou Fire was made more complex as it started during the months-long eruption event that

caused the park to be closed. The fire became one of largest to strike since the park's establishment in 1916. It burned over 3,700 acres, closed the Mauna Loa Road, and threatened both Kīpuka Kī and Kīpukapuauolu Special Ecological Areas.

Besides serving on incidents in Hawai'i, I was dispatched to other fires and incidents in California. This included two of the largest that year, the Woolsey Fire in southern CA and the Carr Fire in northern CA, both impacting national park sites in their respective locations.

At the end of May, I will again return to HVNP to teach the week-long *Introduction to Incident Information* course for those participating in wildland fire and all-hazard incidents at all levels of government. The course is composed of students from federal, state, and local agencies.



Mike Theune

Jason Woycke (BS 1994): I have great memories of my time at SOEST. I'm also very thankful for the opportunities I had there. My favorite memories include some of the many awesome geology field trips we took to places like California, Maui, and the Big Island, working for John Sinton on his research between Easter Island and Acapulco, and the great friends I met at SOEST (unfortunately I can only think of two that I'm still in contact with).

I left Hawai'i in '96 and eventually settled in Seattle via New Mexico. I worked various jobs (not geology) until I went back to school to get a masters in urban planning from the University of Washington. I graduated in 2011 and am now working as a planner in a small city just 20 minutes south of Seattle named Des Moines (yes similar to

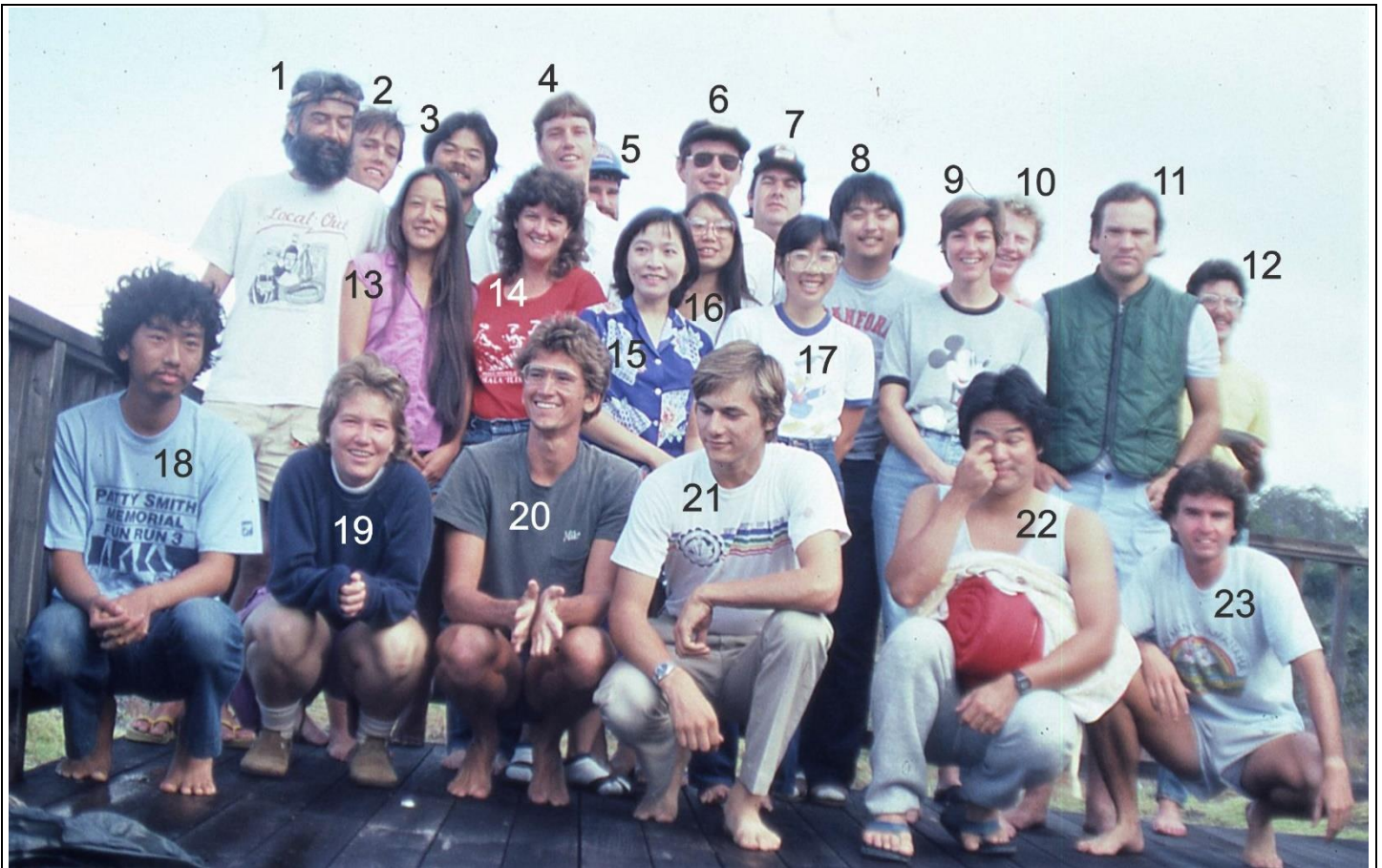
the city in Iowa). It took me a few years but finally got a desk job! I love it.

I have a wonderful family. My son almost ended up playing soccer for Hawai'i Pacific but instead chose to do some studying abroad (photo is from France) and follow in the footsteps of my wife, Elyce, and focus on music. He'll be filling in on keyboards for reggae legend Clinton Fearon off and on this summer. I think Clinton played Honolulu earlier this year.



Jason & family in France

* * *



Speaking of alumni...while looking for photos of Kost Pankiwskyj, we came across this one. We're pretty sure it was the GG305 trip to Hawai'i Island in 1984, but are unable to identify many of the folks in the photo. If you can help us out, that would be great. Here's who we know and don't know: 1) Kost Pankiwskyj; 2) ?; 3) Gary Yoshiba; 4) Andrew Meeko; 5)?; 6) Glenn Brown; 7) ?; 8) Geary Tagawa; 9) Donna Buxton; 10) ?; 11) ?; 12) David Lassner; 13) Gail Yamada; 14) Lynne Rogers; 15) ?; 16) Lori Liu; 17) Debbie Kim; 18) Guy Inaba; 19) ?; 20) ?; 21) Tom Behnke; 22) Norris Uehara; 23) Scott Rowland.

Field Trips

GG 101 & 103



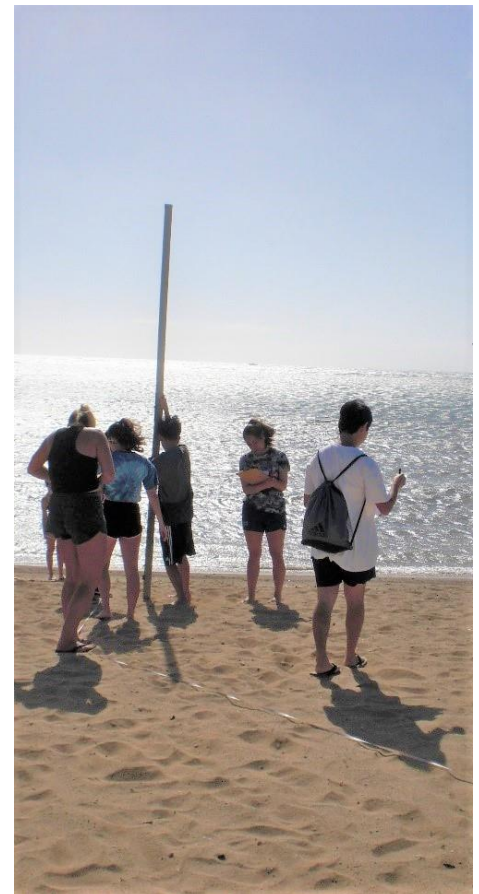
Everybody ready for the hike to Pu'u Wa'awa'a, Fall 2018.



A couple of GG majors and the HiSEAS habitat, on Mauna Loa, Fall 2018.



GG101, 101L, and 103 students at the HiSEAS habitat, Mauna Loa, Fall 2018.



GG101L students constructing a beach profile at Wai'alae beach park, Fall 2018.



GG101L and Botany 450 students hiking to Ka'ena Pt. to learn about rocks, plants, birds, and seals, Spring 2019.



Taking a break on the way to Waipo'o falls, Fall 2018.



GG101, 101L, and 103 students at Waimea Canyon lookout, Fall 2018.



Warming up in the sun after a lower-40s (°F) night at Kōke'e, GG101, 101L, 103 trip, Fall 2018.



GG101L Geo-time lab. Mahalo to substitute TAs **Warren McKenzie, William Nelson, Jordan Mason, and Eric Welch** for filling in while the regular TAs were in Aotearoa.



GG101L students navigating their way up Wa'ahila with GPS.



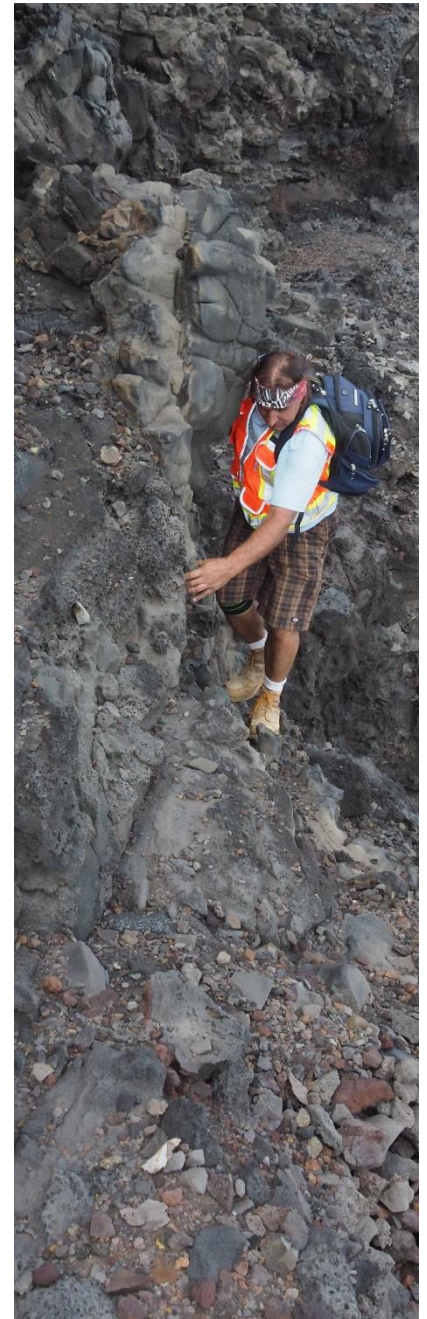
GG305 students learning how to use Brunton compasses in the civilized confines of UH campus before the real world.



Creating a measured section above the Makapu'u tidepools.



Collecting isopleth data, Tantalus.



Not all rocks are convenient.



One of the many perks of majoring in a field-based science.



First day in the Mojave Desert – fresh faces, smiles, and clean maps!



Actual rain (and thunder) in the mapping area this year.



Mapping the highs and lows of the Basin and Range.



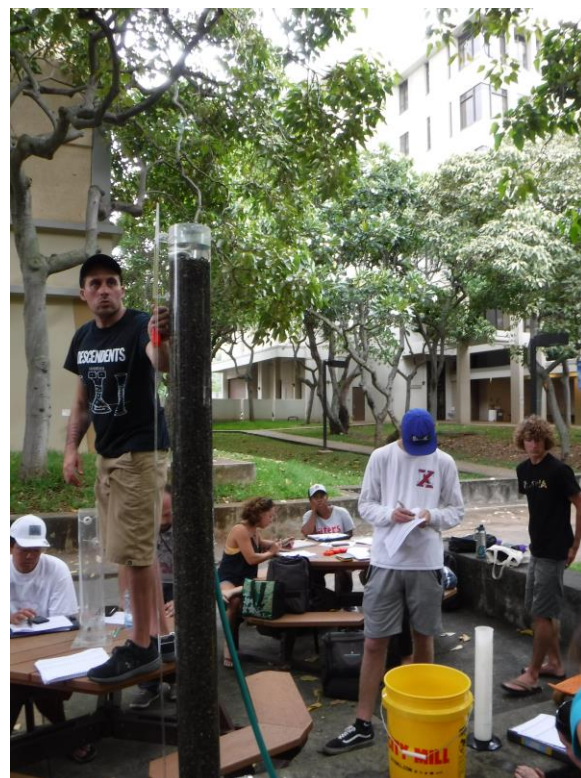
Bad water at Badwater.



No more mapping!!!



GG306 students feeling the groundwater all around them, Waihe'e.



Checking to see if Darcy's law works. It kind of didn't, actually, but figuring out why was part of the exercise.

Donation

Remember when...

You held your first rock specimen in a class or took your first geology field trip?

You made your first map, learned about a useful isotope, or looked at a seismogram?

The GG department became your academic home, a place of learning with friends and colleagues?

Help others have that experience with a gift to the Earth Sciences department. Your donation will maintain and replace aging teaching infrastructure, support field excursions, and provide modern computing and audiovisual equipment for our classrooms and computer lab.

Please contribute to the Earth Sciences department fund at the University of Hawai'i Foundation and help make those *geo-dreams* come true for a new group of emerging geoscientists.

Consider making a gift today through the UH Foundation website:

<https://giving.uhfoundation.org/give/giving-gift.aspx?allocation=12077204>

Or click the "donate" button on the Earth Sciences home page. *Thank You!*